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A BRIEF REVIEW OF THE ADVANCES IN MOLECULAR NANO-TECHNOLOGY FOR THE BIO-MEDICAL ENGINEERING APPLICATIONS

Dr. T.C.MANJUNATH[1], PAVITHRA G.[2], Prof. RASHMI JAGADISHA[3]

[1]Ph.D. (IIT Bombay), Sr. Member IEEE, Fellow IE, Fellow IETE, Chartered Engineer
Prof. & HOD, ECE, DSCE, Bangalore, Karnataka
Email : dr.manjunath.phd@ieee.org

[2] VTU RRC Research Scholar, Belagavi, Karnataka

[3] Asst. Prof., EEE Dept., SJBIT, Bangalore & VTU Research Scholar, Belagavi, Karnataka
dr.manjunath.phd@ieee.org pavitthra84.pc@gmail.com rashmi.jagadisha@gmail.com

ABSTRACT

This paper presents a brief review about the recent advances in the field of molecular nano-technology. The word nano-technology means different to different people. For some, it conjures up images of fabulous new materials, lighter and stronger than steel. Others envision microscopic robots that clean plague from our arteries and tartar from our teeth. Nanotechnology has captured the attention of the scientific community, the media and now, the public. In the purest sense, Nanotechnology is the science of small…very small things measured in units called nanometers, which is one-billionth of a meter. Nanotechnology, better known as Molecular Nanotechnology, uses well-known physical properties of atoms and molecules to make novel devices with extraordinary properties. The technology completely abides by the laws of physics. This review paper would introduce you to the world of Nanotechnology in an exorbitant manner. The theory behind this extraordinary technology is Molecular Building Blocks. These blocks manipulate matter on nano-scale and this is an inevitable consequence of continued advancement in the fields of chip manufacture, biology, chemistry, computers and several major scientific disciplines. The future with nanotechnology is quite promising and sure to effect the present technology dynamically. This review paper definitely gives a total grip on the basic of nano-technology, especially those who want to pursue a career in this exciting & dynamic field.

Keywords- Genetics, Swarms, Nanotubes, Molecules.

I. INTRODUCTION

The invention of germanium transistor way back in June 1946 was the starting point of the microelectronics technology. In the late 1940s, a thinking that integrated circuits can act as brain to different products gained ground resulting in the birth of microprocessor 4004 in the year 1971. The late 1990s saw system on chip at 0.18 microns to 180 nanometres. Thus, between 1940 and 1950, the semiconductor technology emerged from R&D laboratories. Nanotechnology involves the manipulation and manufacture of objects on an atomic scale. One nanometer is roughly the length of three atoms in a row, or 1/10,000th of the diameter of a human hair.

Molecular nanotechnology (MNT) is a technology based on the ability to build structures to complex, atomic specifications by means of mechanosynthesis [1]. This is distinct from nanoscale materials. Based on Richard Feynman's vision of miniature factories using nanomachines to build complex products (including additional nanomachines), this advanced form of nanotechnology (or molecular manufacturing[2] would make use of positionally-controlled mechanosynthesis guided by molecular machine systems. MNT would involve combining

physical principles demonstrated by biophysics, chemistry, other nanotechnologies, and the molecular machinery of life with the systems engineering principles found in modern macroscale factories.

Molecular nanotechnology is defined as the technology which is used for engineering the mechanical or functional machines at molecular scale or we can say machines having atom by atom arrangement are known as molecular machines. Its concept was originated in 1992 when the panel of researchers was exploring the diversity of nanotechnology. Usually molecular nanotechnology is abbreviated as MNT.

This is one of the most advanced forms of nanotechnology which is used to manufacture the machinery at miniature level. MNT would involve the physical demonstration of the existing principles of chemistry and physics.

How molecular nanotechnology works?

Molecular nanotechnology is quite different from nanotechnology; it works at the molecular level. It arranges and configures its devices and instruments atomically. This technology is based on the concept of nano arrangements of the machines to explore the new components form the existing ones. It doesn't works on randomization of the molecules but on the systematic positioning of every single molecule.

Capabilities and applications of molecular nanotechnology - Molecular nanotechnology encompasses a wide range of applications in the filed of chemistry, medicine, electronics and research. It has the capability of retrieving the ability of a material to respond other materials differently for example nano sensors are one of the biggest inventions of molecular nanotechnology ,these sensors have the ability in them to respond the toxic and live saving drugs differently. Smart materials and tools, replicating robots, medical nanorobots all these devices have molecular arrangement in them. With the help of molecular nanotechnology the most efficient machines could be developed which would be of great advantage to the world.

Risks and disadvantages of molecular nanotechnology - Massive to destructive weapons. Molecular nanotechnology is on of the emerging technologies but thee are certain convincible issues and risks regarding this technology. Some researchers have significant point that excess advancement and generalism of molecular nanotechnology would make it easier for the criminal hands to approach the most destructive weapons easily and also nuclear weapons arrangement could be easily accessible which is very dangerous for the living world. Extreme utilization of molecular nanotechnology would make the nuclear weapons cheaper.

Objects created using molecular nanotechnology will be precise to within the size of a molecule. Machined components will no longer abrade one another because they will fit together with molecular precision. Moreover, they will have been made with virtually no waste or pollution. They will have been made one atom at a time with readily available components like carbon, oxygen and nitrogen as their building blocks

Medical science will be able to create devices small enough to enter the body's bloodstream to repair damage and treat diseases at the cellular level. For example, instead of treating cancer using chemotherapy that weakens the entire body, nanotechnology will one day produce medical devices that can identify cancer cells and repair or destroy them with no damage to healthy tissue.

This manufacturing revolution will also give rise to startling advances in material science. Instead of steel or aluminum being mined from the ground, new materials will be made from carbon atoms in the form of nanotubes and related structures. A single-walled, carbon nanotube is a strawlike structure with a one atom thick wall of carbon atoms. Lighter, stronger and more flexible than steel, carbon nanotubes are believed by many to be the most promising of all nanomaterials [1].

While carbon nanotubes are still too expensive to use in everyday construction materials, the cost of producing them has decreased twenty fold over the past five years. As they continue to get cheaper to

produce, manufacturers will develop innovative uses for them in a wide array of manufacturing applications. The presence of carbon nanotubes today doesn't prove we'll one day be able to produce tiny medical devices that enter the body and cure cancer. Scientists believe this sort of thing will be possible because of the nature. Living cells are perfect examples of nanoscale devices that assemble structures one atom or molecule at a time [2].

II. MOLECULAR BUILDING BLOCKS

Making a self-replicating diamonded able to manufacture a wide range of products is likely to require several major stages, as its direct manufacture using existing technology seems quite difficult. For example, existing proposals call for the use of highly reactive tools in a vacuum or noble gas environment. This requires an extremely clean environment and very precise & reliable positional control of the reactive tools. While these should be available in the future, they are not available today. Self-replication has also been proposed as an important way to achieve low cost.

A more attractive approach as a target for the near term experimental efforts are the use of molecular building blocks (MBBs). Such building blocks would be made from dozens to thousands of atoms (or more). Such relatively large building blocks would reduce the positional accuracy required for their assembly. Because this approach uses positional assembly at the molecular scale, and because positional assembly of molecules was, until recently, not a possibility that had been considered seriously, there has been remarkably little research in this area [3].

Fig. 1 : MBB

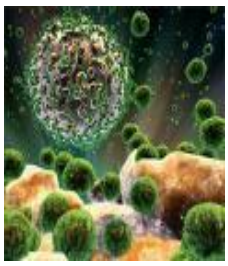

Fig. 2 : Wet nanotechnology

MBBs with four linking groups quite naturally form strong, stiff three-dimensional solids in which the unit cell is composed of two MBBs (as in diamond). MBBs with five linking groups can readily form strong, stiff three-dimensional solids in which the unit cell is composed of six MBBs. MBBs with six linking groups readily form strong, stiff three-dimensional solids in which the unit cell is composed of a single MBB. They can also form very stiff sheets if all linkage groups are in plane, though this arrangement sacrifices stiffness out-of-plane. MBBs with twelve linking groups can form very strong and stiff three-dimensional solids.

While MBBs can have any number of linkage groups, MBBs with fewer linkage groups are usually (though not always) more readily synthesized. If we seek an MBB with the least number of linkage groups that can still readily form strong, stiff three-dimensional structures, then MBBs with four linkage groups are quite attractive. A high symmetry structure with four linkage groups will have tetrahedral symmetry (with an inter-linkage angle of approximately 109 degrees).

III. TYPES OF NANO-TECHNOLOGY

The different types of nanotechnology are the wet nano-technology, dry nano-technology & the computational nano-technology. These in turn are explained briefly one below the other as follows [5].

Wet nanotechnology : It is the study of biological systems that exist primarily in a water environment. The functional nanometer scale structures of interest here are genetic material, membranes, enzymes and other cellular components. The success of this nanotechnology is amply demonstrated by the existence of living organisms whose form, function and evolution are governed by the interactions of the nanometer scale structures.

Dry nanotechnology : This derives from science and physical chemistry. It mainly focuses on the fabrication of structures in carbon (e.g., fullerenes and nanotubes), silicon and other inorganic materials. Unlike the Wet technology, the Dry techniques admit use of metals and semiconductors. The active conduction electrons of these materials make them too reactive to operate in a 'wet'

environment, but these same electrons provide the physical properties that make 'dry' nanostructures promising as electronic, magnetic and optical devices. Another objective is to develop 'dry' structures that possess some of the same attributes of the self-assembly that the wet ones exhibit [6].

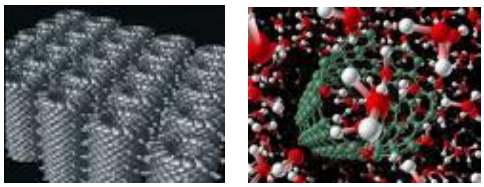

Fig. 3 : Dry nanotechnology

Computational nanotechnology : This permits the modeling and simulation of complex nanometer scale structures. This predictive and analytical power of computation is critical to success in nanotechnology: nature required several hundred million years to evolve functional 'wet' technology; the insight provided by computation should a low us to reduce the development time of a working 'dry' nanotechnology to few decades, and it will have a major impact on the 'wet' side as well.

Fig. 4 : Computational nanotechnology

IV. APPLICATIONS OF NANOTECHNOLOGY

Nanoparticles offer radical breakthrough in areas such as materials and manufacturing, electronics, medicine and healthcare, environment and energy, chemical and pharmaceutical, biotechnology and agriculture, computation and information technology, and national security. Scientists are discovering how to custom design exotic nanoparticles and processes with almost limitless potential.

Some of the possibilities we might see in the next decade include: polymer-based paints that defy scratching and corrosion, iron polymer batteries that generate twice as much power, resilient metal-composite car body panels that pop back into place, light-weight composites that boost jet-engine performance etc… Let us consider a few important applications briefly, Nanocomputers, The field of medicine, Space science, Nanocomputers [7].

Fig. 5 : Nano Computer

In the computer industry, the ability to shrink the size of transistors on the silicon microprocessor will soon reach its limits. Nanotechnology will be needed to create a new generation of computer components. Molecular computers could contain storage devices capable of storing trillions of bytes of information in a structure the size of a sugar cube.

While making a microprocessor, we handle big groups of semiconductor molecules and structure them into the form we need. This form of handling matter produces severe limitations as how small these circuits can be made. Present day lithographic technologies are at 0.13 microns. After the 0.13micron limit, it is very difficult to etch the circuits precisely and effectively on the silicon substrate. This is where nanotechnology steps in.

Biocomputing : cross-fertilization of biotechnology with the information technology reveals the inherent formation theories of natural life sciences with high-end computational techniques. Efforts have been made to compile full genetic information stored in nucleus and the mitochondria as digital repositories of information.

Fig. 6 : Carbon nanotubes

Fig. 7 : Genetic material

Molecular computing : researchers have built an electronic switch consisting of a layer of several million molecules of an organic substance called rotaxane. By linking a number of switches, the researchers produced a rudimentary version of an AND gate. One of the simplest active devices was a

molecular based on a string of 3 benzene rings in which orbitals overlapped throughout.

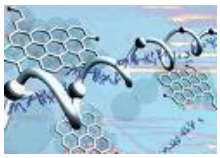

Fig. 8 : Molecular computing

Fig. 9 : Optical comp. instr.

V. THREATS OF MIS-USE

It is on the side of caution where more of the weight should be felt. Molecular nanotechnology, if developed in secret and without the strictest controls possible, can be dangerous beyond precedent. Self-replicating systems pose two major risks. One risk is that a self-replicating system will continue to replicate unchecked. The other is that during replication there will be changes or alterations in the self-replicating system that will allow mutations that lead to some sort of evolutionary process. This could result in a system that does things that you don't expect – possibly quite unpleasant things that you don't expect.

Molecular manufacturing makes it possible to build weapons at a much faster rate than is now possible, but a more frightening prospect is the development of dangerous programmable "germ" nano-machines for warfare. The possibility of accidental world destruction also exists, if one thinks about the implications of the escaped replicating machines eating organic materials throughout the earth. Indeed nanotechnology in the wrong hands could have disastrous consequences, but even those responsible for its beneficial use must be wary of the potential dangers.

VI. CONCLUSIONS

This paper presented just a brief review about the basic fundamental concepts of nano-technology & its vast and diversified applications in the modern day world. Molecular nanotechnology is predicted to be the most powerful technology yet developed by mankind. It will lead to major changes in our civilization. Three key breakthroughs are necessary : nanomanipulation, mechanochemistry and system design. There is an immense amount of work to be done. There is no question that will see major steps towards the goal of creating molecular nanotechnology in the next decade. In the future, nanotechnology will let us take off the boxing gloves. We'll be able to snap together the fundamental building blocks of nature easily, inexpensively and in most of the ways permitted by the laws of physics. This will be essential if we are to continue the revolution in computer hardware beyond the next decade, and will also let us fabricate an entire new generation of products that are cleaner, stronger, lighter and more precise. Momentum towards this technology is fast building up as researchers, private companies and government agencies all over the world rush to be leaders in this very exciting race. Every body goes from nano to macro, but now the world is going in the reverse way, i.e., from the macro to the nano. The future is small, but it promises to benefit us all !!!!!

REFERENCES

http//en.wikipedia.org/wiki/nanotechnology

http//www.zyvex.com/nano

http//www.nanotechnology.com

Press Release: American Elements Announces P-Mite Line of Platinum Nanoparticles for Catalyst Applications, October 3, 2007.

Platinum nanoparticles bring spontaneous ignition, April 25, 2005

Electrocatalytic oxidation of methanol.

Hillie, Thembela and Mbhuti according to sunil this method of catalysis will surely improve the performances of the old catalysis methodsHlophe. "Nanotechnology and the challenge of clean water." Nature.com/naturenanotechonolgy, November 2007: Volume 2.

Hillie, Thembela; Hlophe, Mbhuti (2007). "Nanotechnology and the challenge of clean water". *Nature Nanotechnology* **2**: 663–664. doi:10.1038/nnano.2007.350.

Waldner, Jean-Baptiste (2007). *Nanocomputers and Swarm Intelligence*. London: ISTE. p. 26. ISBN 1847040020.

Suresh Neethirajan, Digvir Jayas. 2009. Nanotechnology for food and bioprocessing industries. 5th CIGR International Technical

Symposium on Food Processing, Monitoring Technology in Bioprocesses and Food Quality Management, Postdam, Germany. 8 p.

Nano-foods: The Next Consumer Scare? http://www.islamonline.net/servlet/Satellite?c=Article_C&pagename=Zone-English-HealthScience%2FHSELayout&cid=1216208224637.

http://www.sainsce.com/agriculture.aspx

http://wifinotes.com/nanotechnology/what-is-molecular-nanotechnology.html

https://en.wikipedia.org/wiki/Molecular_nanotechnology

Pavithra G. was born in Bangalore, Karnataka, India on Sep. 8, 1984 & received the B.E. Degree (Bachelor of Engg.) in Electronics & Communication Engineering stream from Basava Academy of Engg. (VTU, Belgaum) in the year 2006, M.Tech. Degree in ECE branch with specialization in RF Communications from the prestigious Jain University in the year 2012 in First Class with Distinction & First Rank (gold medalist) and is pursuing her Ph.D. in the field of bio-medical image processing from the prestigious Visvesvaraya Technological University (VTU Belgaum) since 2015 respectively under the supervision of Dr. T.C.Manjunath. She did her entire schooling (from 1st standard to 10th standard) in New Public School in Vijayanagar in Bangalore and her college (1st PUC & 2nd PUC) in the reputed KLE Institutions in Bangalore. She has got a teaching (academic), research experience of more than 9^{+} years in various engineering colleges in the Karnataka state. She has worked in the levels of Lecturer-Asst. Prof. (> 4^{+}) in the colleges where she has worked in the ECE department apart from having industrial experience (> 4^{+} yrs). Currently, she is doing her Ph.D. in VTU as a research scholar on the topic "Design & development of novel algorithms for diagnosis of glaucoma in different types of images using advanced image analysis techniques". She has published more than 60^{+} papers in various National, International journals and Conferences in India & abroad. She is a member of IEEE since 3 years. She has given a couple of guest lectures / expert talks and seminars in couple of institutions across the country and participated in more than 40^{+} CEP / DEP courses, seminars, workshops, symposiums, FDPs, besides conducting a few courses in the institutions where she had worked/working. She also got the best paper award in couple of conferences where she went as a presenter. Her areas of special interest are DSP, AI, IP, Biomedical Signal & Image Processing, Signals & systems, Basic Electrical Engg., Basic Electronics, Network Analysis, Field Theory, Circuits & Networks, Matlab, Research Methodologies, Satellite Communications, RF & Microwaves, Analog & Digital Communications, etc.

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SMART CAMERA TRAP

ANAY ANIL SHETGAONKAR[1], Dr.VIVNAYAK SHET[2]

[1]ME, MICROELECTRONICS, ELECTRONICS & TELECOMM DEPT,GOA COLLEGE OF ENGINEERING, FARMAGUDI, PONDA-GOA,GOA UNIVERSITY.

aarocks4@gmail.com

[2] PRINCIPAL,GOA COLLEGE OF ENGINEERING,FARMAGUDI, GOA UNIVERSITY, PONDA-GOA.

vns@gec.ac.in

ABSTRACT

Normally camera traps are the typical devices that are used in the field for the study of wildlife species in deep and remote forests but here using the basic idea of camera trapping ,we are trying to reduce the damage or the man animal conflict, that is coming up these days, everywhere on a massive scale, that is we are using the principles of bioacoustics and image processing, we are trying to reduce the problems or damages caused by wild animals to the farmers, hence considering this fact that since humans, day by day have encroached into the forest and thereby since there is a reduction in green cover which in turn reflects in the migration and transit pattern of animals thereby animals land up in human habitation . Hence we make use of high frequency and high intensity sound waves to drive away the animals that cause harm or loss, along with the concept of image processing so as to identify the particular animal and emit those particular frequencies which are most sensitive to that particular animal and hence thereby causing a neurophysiologic effect such that a particular animal will get affected and go away from the site where it is causing damage. As the name Bioacoustics itself means biology and acoustics i.e. it's a cross-disciplinary science that combines biology and acoustics. Since sound is an important component that is used in communication, hence every sound or call in animals or human beings is having certain significance. Suppose like for example in birds, the early morning calls are to mark the territory, that is each bird marks a territory within that it is specified that a certain of bird is living and a bird of similar species cannot enter its territory. Similarly some birds can imitate calls of other birds; these calls are emitted with a motive of food competition. Similarly we are trying to make use of sound waves but here it's not just sounds that we make directly use of but instead we use the parameters of sound that is frequency and intensity. Now since each animal is having its own auditory field hence the hearing range of each animal would be different so the frequency that is emitted would be specific for every animal hence, therefore it is necessary to identify each animal. Now Identification of the animal would be carried out, such that camera would be placed in the path where the animal would come. Once image is clicked by camera it would be processed and further would help to identify a particular animal and hence would ease the task of emitting the particular band of frequency.

I. INTRODUCTION

As all of us know that we humans have a hearing range of about 20 Hz- 20 KHz. But in real life it much varied that is every person to person hearing will be different. Also the above mentioned range is not precise it varies practically on both upper and lower sides. Similarly each and every animal has its own hearing range hence every species is sensitive to only a certain range of frequencies and intensity as well. Since every animal is sensitive to only a certain range of

frequencies this range of frequencies is the most sensitive range.

The way we hear the sound, it varies that is the faintest level of sound that we can hear is about at an intensity of 0 dB to the sound that can damage our ear about 140 db. But in between this range of frequencies and intensities only at certain range of frequency is the most sensitive to human ears. That is about 1 KHz – 4 KHz, remaining range is not much within the highly sensitive area of ear. Similarly in the sensitive frequency range even the sound with slightest intensity can be detected. Also if the intensity of sound is highly increased than also it is possible to hear the sound of high intensity. Now as mentioned earlier at low intensity the threshold of hearing is at about 0dB producing an intensity of $1*10^{-12}$ W/m^2 whereas at about 130 dB producing an intensity of $1*10^{1}$ W/m^2 that is giving rise to pain in ears.

The below graph shows the various range of sound for different activities. In the sensitive range of hearing at an intensity of about 130 dB is the pain area as shown in the graph, which is our point of interest. As this is our point of interest such that there is neurophysiological affect in animals such that animal will be forced to go away from the source of sound due to irritation.

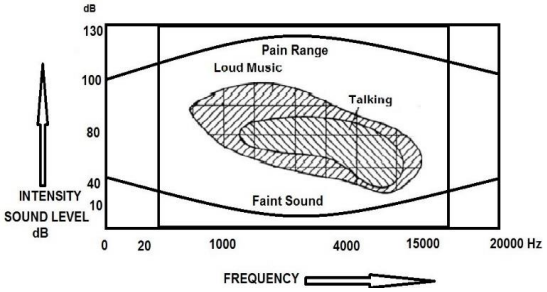

Fig 1:Hearing range of Human ear and various effects in different ranges.

II. PROCEDURE

Device Construction

The device would be constructed in two phases. In the first phase the main function would be in fabricating frequency generator and frequency controller that is the generation of high frequency and high intensity sound waves. In Second phase, task would be of making it automated that is building up the feature of making it independent to recognize an animal on its own, which is achieved, using image processing. A camera would click upon activation of sensor and image would be processed that is to confirm as to which animal is present and accordingly emit that particular band of frequencies.

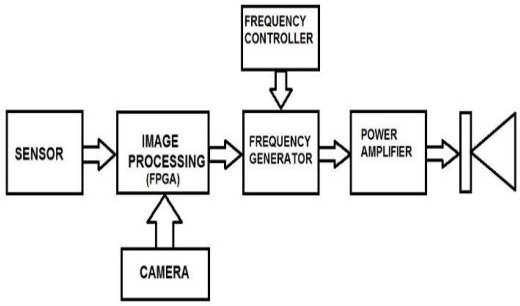

Fig2: Block Diagram of device

The camera as shown in the block diagram Figure 2, would be installed at such a location that there maximum chances of animal approaching in that particular path. Once movement or entry of animal is there, sensor will be triggered and the camera will capture it and this image will now be processed.

During image processing, the databases will be stored in the memory of FPGA for which a dictionary would be built wherein the images would be stored, which would act as the reference, now during the working the captured image would be tried to match with the database image and hence it would identify the most precisely, which animal is present in front of camera, now this output of image processing would be fed as an input to the Frequency controller. Now the frequency controller as per detected animal would produce frequencies in those ranges that are within sensitive hearing range of that particular animal. Now this sound wave will be having a comparatively low intensity as they are produce by low powered boards. This output will further go to power amplifier where in it will amplified to a quite a high level so as to increase its intensity, further its impedance is matched and is connected to a piezo or speaker to transmit the required output.

The image processing would be done by using SIFT (Scale Invariant Feature Transform) descriptors that is image would be recognized with all local features

such that it would be helpful to recognize almost any animal.

III. PRIMARY HARDWARE

Frequency Generator

The frequencies would be generated using ICL 8038, as the basic frequency generator which along with simple assembly of capacitor and resistor network would be able to generate sine waves in different ranges with a wide and stable output.

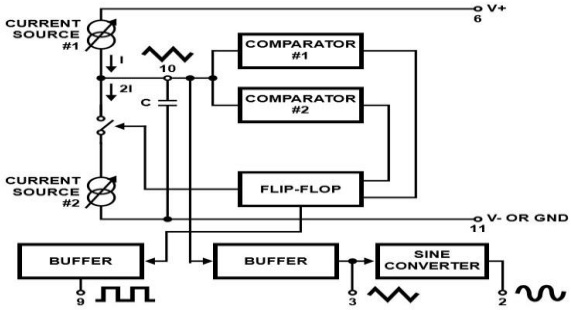

Fig3: Internal working of frequency Generator

Triangular waves were produced by charging and discharging a capacitor with constant currents.

As from fig 3, While charging of capacitor due to, source 1 when it reaches level of comparator1 (2/3 of supply), flip flop triggers, changes state and releases from current source 2.This current is twice (2I), now cap is discharged with a net current I voltage drops at set level of 1/3 of supply and flip flop is triggered to original state. The triangular waves were converted to sine waves involving a non-linear network of transistors and thin-film resistor.

Entire bias for current sources is created by modulating signal and a very large sweep range.

Frequency becomes dependent on supply voltage.

$T1=(c \times v)/I= (RA \times C)/0.66$ (1)

$T2= (RA \times RB \times C)/0.66(2RA - RB)$ (2)

$I = 0.22(V+ -V-)/RA$ Optimum performance 10uA to 1mA.

Frequency Controller

Controlling of frequency, can be achieved by forming a large combination of R2R ladder network along with 8051 microcontroller which would help to generate frequency in a given range in form of incrementing and decrementing form in a stepwise manner that is, it would generate frequency in the in the most sensitive range and thereby would be most affecting the animal by switching between lowest to peak point of the sensitive hearing range.

Controlling of frequency in as stepwise manner is achieved by controlling the value of resistance between the output and ground terminal of frequency generator that is achieved by formation of R-2R ladder network, such that 8051 microcontroller is programmed in such a way that when a particular band is selected, every 200ms just one of the pin that is connected to output becomes high, now each these pins is connected to a preset resistors which are set to a particular value, such that selection of a particular band will sum up to the desired sensitive frequency output from the lowest frequency to the peak frequency in a step wise increment and decrement such that there is a maximum impact on the animals.

FPGA

The preferred hardware would be Digilent NEXYS4 DDR, as to it is having better capabilities to perform image processing. The Artix-7 FPGA is optimized for high-performance logic, and offers more capacity, higher performance, and more resources than earlier designs. With its large, high-capacity FPGA (Xilinx part number XC7A100T-1CSG324C) and collection of USB, Ethernet, and other ports, the Nexys4 DDR can host designs ranging from introductory combinational circuits to powerful embedded processors. Several built-in peripherals, including an accelerometer, a temperature sensor, MEMs digital microphone, speaker amplifier, and plenty of I/O devices allow the Nexys 4 DDR to be used for a wide range of designs without needing any other components.

Power Amplifier

The output of the device would small be of low intensity, hence in order to achieve high intensity sound we need to boost the signal by increasing its intensity before it is fed to speaker or piezo.

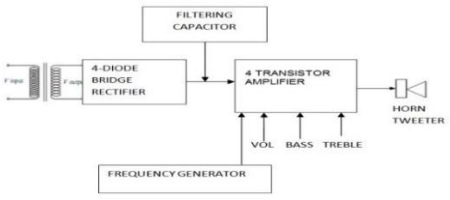

Fig 4: Power Amplifier

Also output should be emitted by an aluminium piezo or horn tweeter as it would be able to produce a high frequency and high intensity sound waves without much distortion or noise.

After rectification if there's any AC component left then it is cleared by filtering capacitor. Then the pure DC supply is given to 2N3055 transistor which performs the main function of amplifying the signal. Transistor is connected to 4 knobs i.e. **input signal, volume, bass and treble**. Input signal is a signal generated by frequency generator (sine, square, triangular) with particular frequency Volume knob in nothing but just a potentiometer with maximum resistance at initial position of volume knob. This knob can also be called as Amplitude knob.

When amplitude knob is at 0 level, minimum current flows through the 2N3055 transistor. Now gradually we try to increase the volume knob thus allowing more current to flow through the transistor. Higher the current, more is the amplification of signal with higher audio frequency output signal from horn tweeter.

Gain in dB=10 log10G

Every doubling wattages there is 3dB increase in gain. So in order to obtain high gain, very high output power is required.

IV. SOFTWARE

A) *Vivado:* Vivado Design Suite is a software suite produced by Xilinx for synthesis and analysis of HDL designs, superseding Xilinx ISE with additional features for system on a chip development and high-level synthesis. Vivado represents a ground-up rewrite and re-thinking of the entire design flow.Vivado is a design environment for FPGA products from Xilinx, and is tightly-coupled to the architecture of such chips, and cannot be used with FPGA products from other vendors.

B) *Keil uVision4 IDE & Nuvoton ISP-ICP utility*: Also Keil uVision4 IDE and Nuvoton ISP-ICP utility, v7.10 were used to feed program in the frequency controller and generator.

V. ALGORITHM

A. *IMAGE MATCHING*

The Image that is stored in memory, would be like dictionary images that is the data which needs to be collected on field by camera trapping in the areas of man animal conflict. Now these images which would be referred or used during comparison are in form of vector or arrays that is using the Scale Invariant Feature Transform (SIFT), we extract the descriptors of these images. Also now the image that clicked during operation of device , need not be saved as we are only concerned with the image data, that is type of animal that is present which is achieved by the extracting the vector of the image that is being clicked. The SIFT, scale Invariant Feature Transform, algorithm would help to describe the image in detail as to with respect to the features and types of animals precisely.

Since we are applying SIFT after feature detection and description, each local image is abstracted by local patches that is represented by feature descriptor. In SIFT we are applying the following steps

[1] **Constructing a scale space: This** is the initial preparation. You create internal representations of the original image to ensure scale invariance. This is done by generating a "scale space".

[2] **LoG Approximation:** The Laplacian of Gaussian is great for finding interesting points (or key points) in an image.

[3] **Finding keypoints**: With the super-fast approximation, we now try to find key points. These are maxima and minima in the Difference of Gaussian image we calculate in step 2.

[4] **Get rid of bad key points:** Edges and low contrast regions are bad keypoints. Eliminating these makes the algorithm efficient and robust.

[5] **Assigning an orientation to the keypoints:** An orientation is calculated for each key point. Any further calculations are done relative to this orientation. This effectively cancels out the effect of orientation, making it rotation invariant.

[6] **Generate SIFT features:** Finally, with scale and rotation invariance in place, one more representation is generated. This helps uniquely identify features.

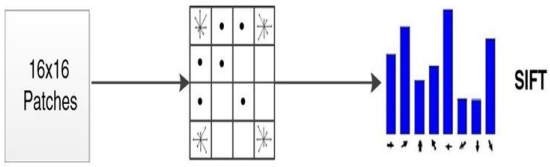

Fig 5: SIFT descriptor

B. ***5.2 DICTIONARY GENERATION***

In dictionary building, we try to convert vector-represented patches to "codewords" (analogous to words in text documents), which also produces a "codebook" (analogy to a word dictionary). A codeword can be considered as a representative of several similar patches. One simple method is performing k-means clustering over all the vectors. Codewords are then defined as the centers of the learned clusters. The number of the clusters is the codebook size.

VI. APPLICATION

As mentioned earlier this device, as a standalone device would be of great importance to farmers and farmhouses.

Also to solve issue of man animal conflict, which is increasing, it would be best as it is a non-detrimental way of driving away wild animals without any injury or harm to the animals. Also now a days with growing railway network we see an increase in the deaths of wild animals due to collision of animals with railways, in this scenario it can prove very useful thereby help to protect our wildlife which is an important wealth and pride of our nation.

VII. CONCLUSION

The Devices needs to placed such that there has to be slight or preliminary study of animal harm or damage since we are emitting very high frequency and intensity sound waves it is highly directional and changes with inverse square relationship hence we need to keep this in mind before is placed on site. Also With respect to automatic identification of animals we need to see that closer the animals to the camera more will be similarities and hence easy for image processing or to identify the animals. Also we need to have a huge database and images in various positions and angles of all possible pests such that they are easily identified.

VIII. REFERENCES

[1] "Rhesus Monkeys (*Macaca mulatta*) Hear Rising Frequency Sounds as Looming", Asif A. Ghazanfar (Princeton University), Joost X. Maier (Duke University), Behavioral Neuroscience ©2009 American Psychological Association2009,Vol.123,No.4, 822–827 0735-7044/09/$12.00

[2] "Evaluation of a deer-activated bioacoustic frightening device for reducing deer damage in cornfields" (2004). *USDA National Wildlife,* Gildorf, Jason M.; Hygnstrom, Scott E.; VerCauteren, Kurt C.; Clements, Greg M.; Blankenship, Erin E.; and Engeman, Richard M.

[3] EURASIPJournalonImageandVideoProcessing 2013,2013:52 RESEARCH OpenAccess Automated identification of animal Species in camera trap images.

AUTHOR PHOTOS AND BIOGRAPHY

ANAY ANIL SHETGAONKAR
B.E. (ELECTRONICS &TELECOMMUNICATION) from Goa University. Currently Pursuing M.E. (Masters of Engineering) in Goa College of Engineering. Along with Academics working with recent trends and issues in Environment like man animal conflict in the Western Ghats.

Dr.VINAYAK SHET
PRINCIPAL,
GOA COLLEGE OF ENGINEERING. FARMAGUDI, PONDA-GOA.
A Power Engineer and an expert in the field of Power Engineering. Had guided many Masters and PHD students at various levels. There in teaching field and research since more than couple of decades.

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IMPLEMENTATION OF ROAD SIGN RECOGNITION SYSTEM

MOHIT MAHATME[#1], SONIA KUWELKAR[#2]

[#]Electronics and Telecommunication Department, Goa College of Engineering
Farmagudi, Goa, India
[1]mohitm2602@gmail.com; [2]sonia@gec.ac.in

ABSTRACT

This paper introduces a new approach for detection and recognition of road signs. Road sign recognition is a basic segment in self-governing vehicles and it can likewise be utilized as a part of driver help systems. Road signs are designed to be effortlessly perceived by drivers as a result of their color and shapes which are not quite the same as indigenous environment. The system performs two primary tasks, road sign detection and recognition for a picture size of 336x448. The algorithms introduced incorporate RGB to Red transformation for capturing the red part in the image, filters for noise reduction and edge detection, thresholding and segmentation to extract the road sign from image and a Single Layer Perceptron network for recognition. This system has been implemented in Matlab and works efficiently and successfully with the database of Indian road signs created as a part of the project.

I. INTRODUCTION

Road sign detection and recognition has been a critical issue for Intelligent Vehicle System and Driver Assistance System. This work traces back to the 1960s. But, Road Sign Recognition system has been a challenging task due to complex environment, for instance, atmospheric conditions, illuminations and geometric distortions.

A vision based vehicle guidance system for vehicles has three main tasks: 1) road detection; 2) obstacle detection; and 3) sign recognition. The initial two have been considered for quite a while; however road sign recognition is a less-analyzed field.

The task of Road Sign Recognition includes two primary steps, detection and recognition. Challenges in the detection stage include figuring out how to wipe out all the non-sign objects in the picture while retaining enough of any signs in the picture. Recognition then takes these detected signs and recognizes them so as to give relevant information to the user. Numerous algorithms have been proposed for detecting and recognizing road signs to help the driver and furthermore prevent accidents. However, an algorithm that achieves high accuracy as well as quick execution speed is required. The image is first acquired. The detection stage then involves different procedures which eliminate the non-sign objects while retaining the road signs in the picture. Detection algorithms for the most part utilize color or shape as a strategy for deciding the regions of interest in the picture. It is common to use color segmentation on the input to remove the background. Since RGB values are sensitive to lighting changes, these methodologies usually convert the pixels into another color space typically Hue Saturation Intensity or Hue Saturation Value (HSI/HSV), and others such as CIECAM97 and Yuv have also been used. After color segmentation, the classification of remaining objects in the image is done usually by shape. This process is very much efficient since numerous background shapes are removed. Some algorithms utilize shape detection as the first step to detect signs in the input image, because this allows them to use grayscale images that can be

processed faster. The shape detection algorithms are usually optimized for a shape, such as a circle, or use some other method to eliminate detected shapes which do not represent road signs in the image. Once the signs are detected, they are usually recognized by employing an artificial neural network or Support Vector Machines or template matching [6].

This paper aims to demonstrate a system wherein we do not use the conventional color segmentation and shape detection algorithms but have employed algorithms that achieve higher accuracy and faster execution speed. In this system, the acquired image is first preprocessed to convert it from RGB to a red thresholded image which is then filtered to remove the noise and for detecting the edges using non-linear filters. The filtered and edge detected image is then thresholded and segmented to get the road sign in the image which is recognized by using an artificial neural network.

II. RELATED WORK

In [5] HSV (Hue-Saturation-Value) color model is used for color segmentation. The color in the outdoor images on the roads is sensitive to variation in illumination. The conventional methods normally employ Hue to segment the color regions. But, Hue becomes meaningless when Value is low or high. Hence, most researchers utilize Saturation and Value to determine the chromatic zone for the red. This chromatic zone is then used for segmentation of the red region[5].

In [5] SVM is used as a method of recognition and uses OpenCV software. This system is targeted for FriendlyARM Tiny4412 board.

In [6] HSV (Hue-Saturation-Value) color model is employed for color segmentation. It uses Canny edge detection, Hough Circle Transform and Ramer-Douglas-Peucker algorithm which is implemented in OpenCV to approximate a shape. Template maching in OpenCV is used as a method of recognition. This system is targeted for Xilinx Zynq-7020 chip on a Zedboard[6].

In [8], HSV (Hue-Saturation-Value) color model is employed for color segmentation. The images are pre-processed with image processing techniques, such as, threshold technique, Gaussian filter, Canny edge detection technique, Contour and Fit Ellipse. The knn method is used for classification. In this work, the first objective is to reduce the number of inputs of the MLP by preprocessing the image, and the next objective is to find for the best network architecture with reduced complexity by selecting a proper error criterion during training. The system is then trained with training data set, and validated with a data set to search for the best network architecture[8].

In [9], RGB color model is employed for color segmentation. Various shape detection algorithms have been used for triangular, rectangular and circular shape detection. The multilayer perceptron network was chosen for recognition. Several networks with different number or layers and nodes were trained and compared[9].

III. PROPOSED ALGORITHM

The task of Road Sign Recognition involves two main steps, detection and recognition/classification. The detection phase then involves image acquisition, image pre-processing, thresholding and segmentation. The overview of Road Sign Recognition system is shown in Fig. 1.

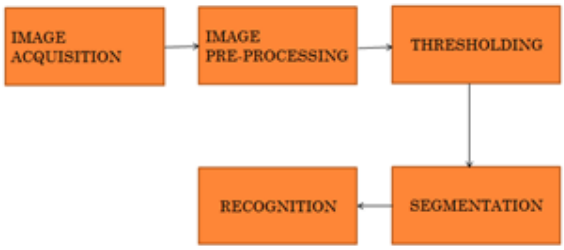

Fig. 1 Overview of Road Sign Recognition System

The image is first acquired in the image acquisition phase and then it is pre-processed. Next, it is thresholded and segmented. Then the Single layer perceptron neural network is used to recognize the road sign in the image.

A. Image Pre-processing

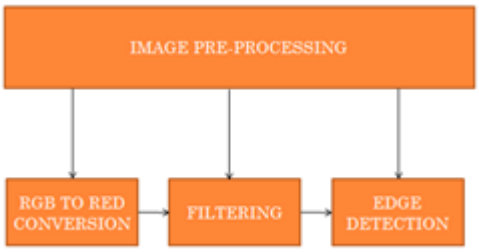

Fig. 2 Image pre-processing

The input image in this system is initially converted from RGB to Red. Then it is filtered to remove the noise and for detecting the edges using blurring filter and non-linear filters like median filter.

1) RGB to Red Conversion

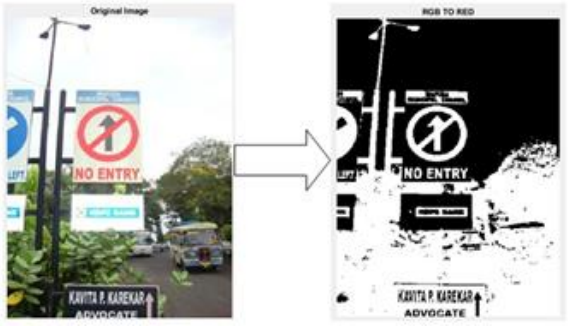

Fig. 3 RGB to Red Component converted image

Every image is composed of three components, Red, Green and Blue often abbreviated as RGB. But for our purpose, we are more interested in the Red component present in the image because road signs on the road have a dominant Red color. So the image is converted from RGB to Red setting a threshold value for Red component present in every pixel, and choosing only those pixels where red color is dominant and above the threshold value.

2) Filtering and Edge Detection

Filtering is a technique which modifies or enhances an image. For instance, you can filter an image for emphasizing certain features or removal of certain features. Image processing techniques implemented with filtering involve smoothing, sharpening, and edge detection.

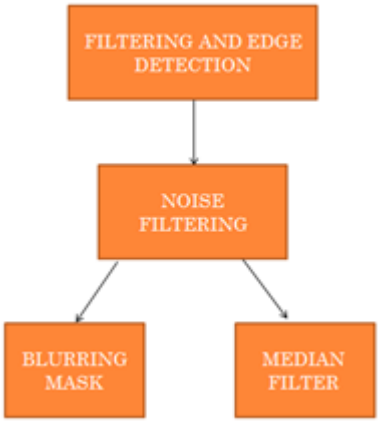

Fig. 4 Filtering and Edge detection

We have used a median filter which is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is usually a pre-processing step inorder to enhance the results of later processing. It preserves edges while removing noise. Hence it plays a major role in edge detection. In this filter, we replace the pixel value with the median value. The Median is calculated by first arranging all the pixel values in ascending order and then replacing the pixel being computed with the intermediate or middle pixel value.

Fig. 5 Filtered and Edge detected output of Red Thresholded Image

The blurring mask normalizes the pixel values and also blurs the background objects in the image thus making the edges more dominant.

This mask is used for edge detection in addition to the median filter which serves the purpose of noise reduction plus edge preserving.

B. Thresholding

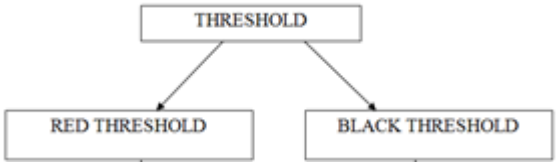

Fig. 6 Thresholding

Thresholding can be used to create binary images from a grayscale image. In thresholding, we replace each pixel in an image with a black pixel if the image intensity is less than some fixed constant T or a white pixel if the image intensity is greater than that constant.

When the image is initially converted from RGB to Red, a threshold value is set for Red component present in every pixel, and choosing only those pixels where red color is dominant and above the threshold value. This is where Red threshold is used.

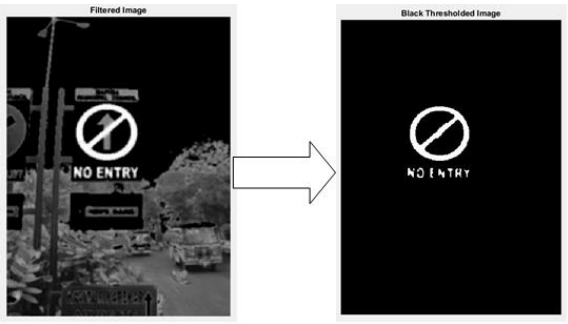

Fig. 7 Thresholded Image Output

Once the image is filtered and edge detected, it is thresholded to convert it to a binary image where each desired pixel in the image is replaced by a white pixel and an undesired pixel is replaced by a black pixel. This is where black threshold is used.

C. Segmentation

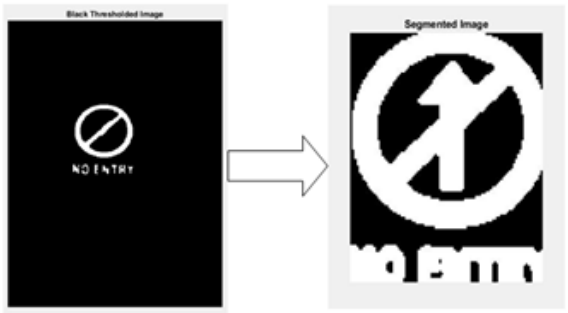

Fig. 8 Segmentation

Segmentation is performed to get the desired part of the image containing the road sign from the thresholded image. The method of segmentation used here is quite different from conventional segmentation.

The thresholded image is first scanned from left to right, then from top to bottom, bottom to top and right to left to search for the first white pixel in each direction in thresholded image. Then a box is drawn taking the 4 points from the scans performed and it is dot multiplied with the filtered image to reconstruct the features inside the box.

This is how segmentation is performed and we get the desired road sign from the background environment.

D. Recognition

Once the road signs are detected, recognition takes place. This is often performed by Neural Networks or Support Vector Machines but other approaches, such as template matching have also been used. The method of recognition used in this project is a Single layer perceptron network which is a neural network.

The perceptron is an algorithm for learning binary classifiers. It is a linear classifier, i.e. a classification algorithm which makes its predictions based on a linear predictor function combining a set of weights with the feature vector. The algorithm allows for online learning, in that it processes elements in the training set one at a time.

The perceptron is an algorithm for learning a binary classifier: a function that maps its input x which is a real-valued vector to an output value f(x) which is a single binary value[12].

$$f(x) = \begin{cases} 1 & \text{if } w \cdot x + b > 0 \\ 0 & \text{otherwise} \end{cases}$$

where w is a vector of real-valued weights, w.x is the dot product where

$$\sum_{i=1}^{m} w_i x_i,$$

m is the number of inputs to the perceptron and b is the bias.

The perceptron algorithm is also called the single-layer perceptron, to differentiate it from a multilayer perceptron, which is a more complicated neural network. The single-layer perceptron is the simplest feedforward neural network as a linear classifier, [12].

IV. RESULTS

The proposed algorithm for Road Sign Recognition system based on RGB to Red color segmentation and Single Layer Perceptron was designed for an image size of 336x448 and implemented successfully in Matlab R2015a. The network is required to be trained only once and then any number of test images can be fed to the network for recognition. The system showed a detection accuracy of 92.45%. The time taken to train the entire network over the database with image size of 336x448 is 829.644secs as shown in Fig. 9.

The time taken to recognize a test image is 0.253secs as shown in Fig. 10.

Function Name	Calls	Total Time	Self Time*	Total Time Plot (dark band = self time)
image_train_1_dec28	1	830.896 s	0.140 s	
full_func_till_seg_rev_nov15	38	829.442 s	0.023 s	
median_filter	38	408.384 s	176.427 s	
median	5601504	231.957 s	231.957 s	
img_process	38	195.659 s	195.659 s	
rgb2red1	38	108.312 s	108.312 s	
threshold	38	97.077 s	97.077 s	
red_segmentation1	38	19.987 s	19.987 s	
imread	38	1.314 s	0.062 s	

Fig. 9 Profiler for training the network

Function Name	Calls	Total Time	Self Time*	Total Time Plot (dark band = self time)
single_perceptron_Recognition_jan2017	1	0.253 s	0.253 s	

Fig. 10 Profiler for Recognizing test image

Fig. 11 shows the simulation output of the recognition phase which detects the road sign.

```
Command Window
>> image_train_1_dec28
>> single_perceptron_Recognition_jan2017
No Entry
>> single_perceptron_Recognition_jan2017
Pedestrian Crossing
>> single_perceptron_Recognition_jan2017
No Entry
fx >>
```

Fig. 11 Command Window Output of Recognition Phase

V. CONCLUSION

The proposed algorithm was implemented and verified successfully in Matlab over a database of Indian road signs with high accuracy. We also achieved a high detection rate with high computation speed due to less parameters that were needed to be processed as compared to the traditional methods. This algorithm could be later used over large images with a size of 1080x1920 pixels. It could be further implemented on an FPGA or a GPU for low cost and high speed real time implementation.

REFERENCES

[1] David Soendoro, Iping Supriana,"Traffic Sign Recognition with Color-based Method, Shape-arc Estimation and SVM", IEEE Journal 2011.

[2] Yan Han and Erdal Oruklu, "Real-Time Traffic Sign Recognition Based on Zynq FPGA and ARM SoCs", IEEE Journal 2014.

[3] Sheldon Waite and Erdal Oruklu,"FPGA-Based Traffic Sign Recognition for Advanced Driver Assistance Systems", J. Transp. Technologies 2013.

[4] Erdal Oruklu, Damien Pesty, Joana Neveux, and Jean-Emmanuel Guebey,"Real-Time Traffic Sign Detection and Recognition for In-Car Driver Assistance Systems", IEEE 2012

[5] Truong Quang Vinh, "Real-Time Traffic Sign Detection and Recognition System Based on FriendlyARM Tiny4412 Board", IEEE Journal 2015.

[6] Matthew Russell and Scott Fischaber, "OpenCV Based Road Sign Recognition on Zynq", IEEE Journal 2013.

[7] Samuele Martelli, Roberto Marzotto, Andrea Colombari, Vittorio Murino, "FPGA-Based Robust Ellipse Estimation for Circular Road Sign Detection", IEEE Journal 2010.

[8] Mrs. P. Shopa, Mrs. N. Sumitha, Dr. P.S.K Patra, "Traffic Sign Detection and Recognition Using OpenCV", IEEE Journal 2014.

[9] Arturo de la Escalera, Luis E. Moreno, Miguel Angel Salichs, Jos´e Mar´ia Armingol, "Road Traffic Sign Detection and Classification", IEEE 1997.

[10] Alberto Broggi, Pietro Cerri, Paolo Medici, Pier Paolo Porta, Guido Ghisio "Real Time

Road Signs Recognition", IEEE Journal 2007.

[11] Saturnino Maldonado-Bascón, Sergio Lafuente-Arroyo, Pedro Gil-Jiménez,Hilario Gómez-Moreno, Francisco López-Ferreras, "Road-Sign Detection and Recognition Based on Support Vector Machines", IEEE Journal 2007

[12] "Perceptron- Wikipedia" Internet: https://en.wikipedia.org/wiki/Perceptron

[13] "ZedBoard Zynq-7000 ARM/FPGA SoC Development Board" Internet: https://www.xilinx.com/products/boards-and-kits/1-elhabt.html

AUTHOR PHOTOS AND BIOGRAPHY

Mr. Mohit Bhairav Mahatme

Graduated from Padre Conceicao College of Engineering, Verna, Goa in Electronics and Telecommunication Engineering. Presently pursuing Masters in Engineering in Microelectronics at Goa College of Engineering, Farmagudi, Goa. Working on detection and recognition of Road signs under the esteemed guidance of Mrs. Sonia Kuwelkar, Assistant Professor, Department of Electronics and Telecommunication Engineering, Goa College of Engineering, Farmagudi, Goa.

Mrs. Sonia Kuwelkar

Currently working as Assistant Professor in Department of Electronics and Telecommunication Engineering, Goa College of Engineering, Farmagudi, Goa. She has about 11 years of experience in the field of teaching and research. She has Competed Masters of Engineering in Microelectronics at Goa College of Engineering, Farmagudi, Goa.

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Implementation and performance analysis of SDN Controller for mobile data offloading

SREEHARI T[#1], MILIND FERNANDES[*2]

[#] PG Student, Electronics & Telecommunication Department, GEC Farmagudi, Goa
[1]sreeharigvr@gmail.com

[*] Professor, Electronics & Telecommunication Department, GEC Farmagudi, Goa
[2]mf@gec.ac.in

ABSTRACT

Mobile data offloading is the technique of transferring data traffic from cellular network to a complimentary network such as Wi-Fi so as to reduce the congestion and thereby improving user experience. Traffic offloading requires a dynamic control over this heterogeneous network environment and intelligently coordinate with other network elements to make the offloading decisions. Software defined networking can be leveraged for seamlessly coordinating these network with its capability of dynamic programmability of the underlying network. In this work we design a centralized SDN controller to manage the traffic offloading, based on network conditions and keeping user data traffic experience at acceptable levels.

I. INTRODUCTION

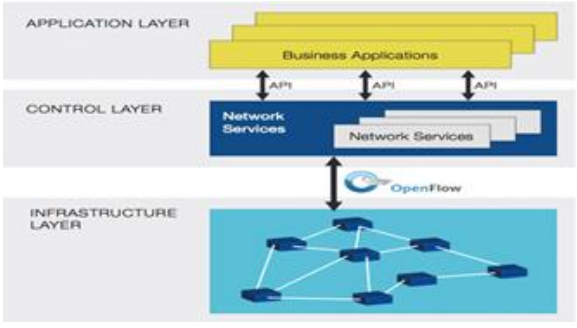
The major problem faced by the service providers today is the exponential growth of data usage due to introduction of various value added over the top services such as real-time video streaming, multimedia cloud processing and storage etc. Mobile data offloading seems to be a viable solution for moving the burden of exponential data traffic from the core cellular network to a complimentary network with lesser radio coverage footprint but serving more users with higher bandwidth requirements. In this paper we discuss the strategy of moving the user traffic to the complimentary network without affecting the user experience. This requires a coordination between the complimentary network and the core cellular network with a central control so as to have knowledge about the conditions of both the networks and thus making the offloading decisions dynamically over time. Software defined networking can be leveraged in this scenario since it provides the capability of a centralized control plane for coordinating the heterogeneous network. We have implemented the proposed SDN controller and thereby analysed the performance of our design.

II. SOFTWARE DEFINED NETWORKING

Nowadays computer networks are evolving at a greater pace than the historical growth rate due to the higher demands imposed by various internet based new generation services. This increased the complexity of deploying and managing new infrastructure into the current networks. The consumer IT products and services are currently undergoing a complete overhaul due to the automation techniques and improved machine intelligence. But in case of computer networks the automation capability is very limited due to the legacy architecture of keeping the control plane and data plane of network elements tightly bound to each other reducing flexibility and innovation capabilities. The control plane decides how and where traffic is delivered by a networking device (which can be considered as the logical "brain" of the device), and the data plane is concerned to forward packets according

to the policies defined by the control plane. For example, the policies in a switch's flow table constitute the control plane, and the whole forwarding process can be regarded as the data plane (e.g. looks up destination addresses of incoming packets, determines paths by using the flow table, and delivers packets through the forwarding fabric). As we can see, the control plane and data plane for legacy switches and routers are closely coupled together. This integration of control plane and data plane may be beneficial for building a small network with few devices: simple forwarding policies can be easily defined on separated switches and routers, and quickly updated later. However, this may result in big challenges if the network scales to more than hundreds of devices and thousands of hosts. Since the controlling logic is integrated into underlying devices, nearly every device needs to be set up separately. Configuration and management are notably laborious in this scenario, let alone to update the whole network for global changes.

Software defined networking helps in having a centralized control plane and thus enable abstraction of underlying resources paving way for developers to easily extent the current software development tools to the networking infrastructure. The de facto protocol used for software defined networking is Openflow which is an open communication protocol for data exchange between the central controller and the data switching equipment. SDN aims at ease of configuration, network management, security, availability, and network and data center virtualization. A typical software defined network architecture is shown in the below diagram:



III. MOBILE DATA OFFLOADING

Data offloading plays a vital role in the current mobile network optimization schemes. Different approaches have been proposed to enhance its effectiveness and improve the amount of traffic offloaded to complementary networks. To support the increasing traffic in mobile networks is quite challenging. One possible solution is to upgrade current network capacity. Nowadays operators are rolling out their next-generation networks such as LTE (Long Term Evolution) and WiMax to increase average cellular bandwidth. However, this may not promise an economical result both for users and operators. Even in 4G networks, bandwidth is still a limited resource under a flat price structure. When users are paying flat rates for data usage, the operators cannot obtain more from customers for extra data consumption. It is hard to balance end-user requirements and upgrading investments as well as operating costs of cellular networks. Another feasible solution for this explosive traffic is offloading mobile data to auxiliary networks. For example, offloading traffic from cellular to Wi-Fi can reduce mobile data in cellular networks, and may gain better performance. For operators, it is extremely cheaper to build more Wi-Fi hotspots than cellular network upgradation. In addition, current networks have provided a superb environment for Wi-Fi offloading. For instance, more and more organizations have already deployed a lot of Wi-Fi access points (APs), which means users can easily find an auxiliary Wi-Fi hotspot to transmit traffic offloaded from mobile network. Due to the economical benefits of mobile data offloading on both infrastructure and spectrum costs, there are widespread research going on integrating this heterogeneous network setup so as to seamlessly transfer data to and forth the complimentary network.

To address this problem, we present a new platform for traffic offloading with a global network view. This platform is based on a software-defined-networking (SDN) approach, where cellular and wireless resources are

managed by a centralized controller implemented on Ryu SDN Controller. Ryu is a component-based software defined networking framework that provides software components with well-defined API that make it easy for developers to create new network management and control applications.

IV. RELATED WORKS

Different approaches have been proposed to enhance the effectiveness and improve the amount of traffic offloaded on to the complimentary network. The major difficulty in offloading design is unpredictability of subscribers' behaviour as well as network conditions. Some of the techniques proposed are [2-4]:

- Offloading Based on Bandwidth
- Offloading Based on Opportunistic Communications and Social Participation.
- Offloading using Disruption Tolerant Networking
- Device-to-device (D2D) Offloading
- Network-Assisted Offloading

The work of Jude Okwuibe[1] et al. proposes a network assisted offloading scenario which is ideal for implementing software defined networking approach to this problem since all authentication and offloading decisions are carried centrally by the network itself and not the user equipment. In their work they have used simple bash scripts to switch the data flow to complimentary network using only time as offloading parameter. This architecture cannot not scale in an actual production environment since well-defined programming frameworks and APIs will be needed to integrate and communicate with all the network elements.

In this work we propose to use a scalable Ryu SDN controller framework to manage the data offloading and also consider adding more network parameters such as user density, traffic pattern etc. derived from other network entities for making offloading decisions.

V. IMPLEMENTATION

The proposed testbed implementation is given in the figure below:

Mininet network simulator is used to simulate the proposed architecture. The LTE and Wi-Fi modules of the UE are considered as separate end hosts wired to two different ports of the openflow capable switch. Ryu SDN controller is used to manage the flow entry in the switch. The controller is supplied with pseudo data of network conditions and user density of each network thereby simulating the presence of other network elements through the controller API. The LTE and Wi-Fi media are simulated by the following link parameters.

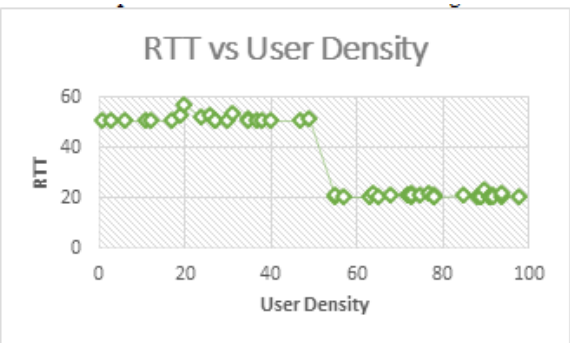
Parameter	LTE	Wi-Fi
Bandwidth	16	25
Delay	25ms	10ms
Loss	1%	1%
Max Queue size	1000bytes	1000bytes
Jitter	8ms	8ms

ICMP echo-reply is used to measure the network latency. IPERF is used to measure the network throughput. Random values for user density is fed into the controller via the API and then the latency and throughput is measured. The measurements are repeated 50 times.

VI. RESULTS AND ANALYSIS

Measured values of round trip time and throughput corresponding to the random user density parameter is recorded. As the user density crosses the threshold value, the controller pushes an offload flow entry into the openflow switch so that data traverses through the network with

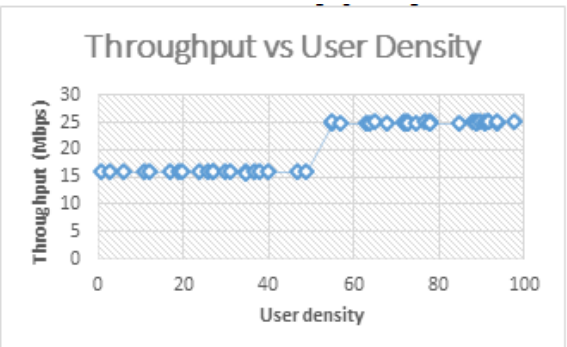
lesser load. Controller logic designed such that when user density crosses an arbitrary value of 50 the offload decisions to Wi-Fi will be initiated so as to cater for increased load but lesser area of radio footprint. The results were obtained as given below:



As we can see that there is nearly about 60% reduction in round trip time when user data is offloaded to the Wi-Fi network from the congested LTE network.The UDP throughput is also improved since Wi-Fi network is having improved bandwidth and also cater to lesser number of users per access points. Users will be offloaded to multiple access points available so that the increased load is evenly distributed in the Wi-Fi hotspot area.The improvement in the throughput is recorded in the graph given below:

VII. CONCLUSION

Mobile data offloading can provide a viable solution to cater the increasing user data demands and also distribute the traffic onto complementary networks from the over stressed cellular network infrastructure. SDN can play a vital role in heterogeneous network architecture because of its dynamic programmability and global network view.



REFERENCES

[1] Jude Okwuibe, Madhusanka Liyanage, Mika Ylianttila., "Provider Assisted Wi-Fi Offloading Leveraging on SDN," in European Wireless 2016, 22th European Wireless Conference Proceedings of.

[2] I. Ruckus Wireless, "Interworking Wi-Fi and Mobile Networks The Choice of Mobility Solutions," 2013

[3] M. Amani, T. Mahmoodi, M. Tatipamula, and H. Aghvami, "Programmable Policies for Data Offloading in LTE Network," in Communications (ICC), 2014 IEEE International Conference on. IEEE, 2014, pp.3154–3159.

[4] J. Costa-Requena, J. Llorente Santos, V. Ferrer Guasch, K. Ahokas,G. Premsankar, S. Luukkainen, I. Ahmad, M. Liyanage, M. Ylianttila,O. Lopez Perez et al., "SDN and NFV Integration in Generalized Mobile Network Architecture," in Networks and Communications (EuCNC), 2015 European Conference on. IEEE, 2015, pp. 154–158

[5] R. Wolski, S. Gurun, C. Krintz, and D. Nurmi, "Using Bandwidth Data to Make Computation Offloading Decisions," in Parallel and Distributed Processing, 2008. IPDPS 2008. IEEE International Symposium on. IEEE, 2008, pp.1–8.

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Direction and Velocity Estimation Using Reichardt Model for Autonomous Vehicle

Shyla M, Nikhil C, Midun Sai C V, Muralidhara M, Dr. P. Cyril Prasanna Raj
Department of Electronics and Communication Engineering, M S Engineering College, VTU
Navaratna Agrahara, Sadahalli P.O., Off Bengaluru International Airport,
Bengaluru-562110,Karanataka, India.

ABSTRACT
The main scope of the project is to detect the direction and estimate the velocity of an obstacle for Autonomous navigation of Vehicle. The Image Data Acquisition System (IDAQ) captures image and transmits to base station via wired-wireless medium. The Autonomous Vehicle is also controlled by a semiautomatic control unit. The object is sensed in a particular direction and velocity is estimated once the sensors like IR senses a signal while avoiding the obstacles in its path. Obstacle detection and avoidance is essential for safe deployment of Autonomous Vehicles. IR sensors are typically used to detect and localize potential obstacles. We propose an obstacle detection algorithm for Autonomous Vehicles which is based on Reichardt model which is different from the existing techniques. Reactive Obstacle Avoidance (OA) is an important step in attaining greater autonomy in Autonomous Vehicles. For Autonomous Vehicles that conduct surveys, avoidance of uncharted obstacles can improve vehicle survivability
Keywords— Autonomous Vehicle; IR Sensor; Reichardt model

I. INTRODUCTION

An Autonomous Vehicle is a robotic device that is driven by a propulsion system, controlled and piloted by an onboard computer, and manoeuvrable in three dimensions. Autonomous Vehicles have become important tools for assessing the environment, whether it is assessing a threat or the collection of data these vehicles provide users a better understanding of the environment. Sensor data collected by the Autonomous Vehicle is automatically geospatially and temporally referenced and normally of superior quality.

An Autonomous Vehicle is a robot which travels without requiring input from an operator. Autonomous Vehicle fall in mobile robotics sector and are of brilliant importance to the present world military and commercial requirements. The need to find cutting edge in military research includes the invention of Autonomous Vehicle.

Autonomous Vehicles are the next revolution in transportation sector. Autonomous Vehicles are expected to revolutionise vehicle ownership structures through on demand services. Autonomous Vehicles have been used already for several decades in logistics, but so far only within the clearly defined boundaries of a controlled environment such as ports, distribution centers and production plants

II. REICHARDT MODEL

The first computational motion process theory was proposed by Reichardt (1957, 1961). According to Reichardt's theory, corresponding to every small neighborhood of visual field, there is an array of Reichardt detectors of different scales and different orientation that compute motion direction in this neighborhood. The output of the Reichardt detector gives only a measure of motion-strength in a particular direction, not a measure of velocity. Although velocity cannot be derived from an individual Reichardt detector, it can be derived from the outputs of an array Reichardt detectors. Each individual Reichardt detector is optimally stimulated

y a particular velocity, an appropriate rule enables an array of Reichardt detectors to signal the most likely velocity.

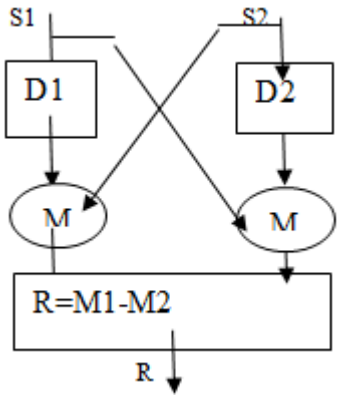

Fig.1: Reichardt model

S1 and S2 are the sensor position shown in Fig.1, the sensors are fixed at a particular distance. D1 and D2 are the delays used as a temporary storage to store the sensor values. M1 and M2 are the multipliers where the value stored in the delay and the other sensor value are multiplied. The value of delay D1 and second sensor value S2 are multiplied to obtain M1. The value of delay D2 and first sensor value S1 are multiplied to obtain M2. The output R is obtained by the difference between the outputs of multipliers M1 and M2.

$$R = M1 - M2 \quad (1)$$

An array of sensors is connected to detect a very big obstacle, if an array of sensors are connected, then the reichardt model output is obtained by

$$\sum R = M1 - M2 \quad (2)$$

III. DESIGN

The Autonomous vehicle is first interfaced with three IR sensors which in such a way that Autonomous Vehicle can detect the obstacle in left, right, top and bottom directions. With the three IR sensors, only small obstacles can be detected.

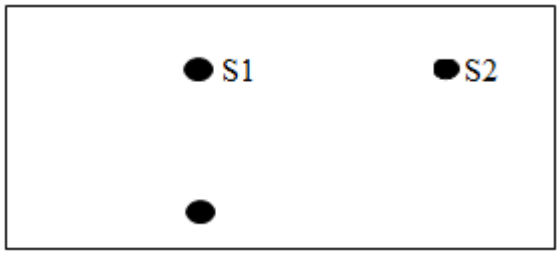

Fig.2: Interfacing 3 IR sensors

The Fig.2 shows interfacing three IR sensors, which is used to detect the small obstacles. Sensor S1 is used as reference sensor for detecting the obstacle at left and also at top. The sensor S2 is used to detect the obstacle at right, and the sensor S3 is used to detect the obstacle at the bottom.

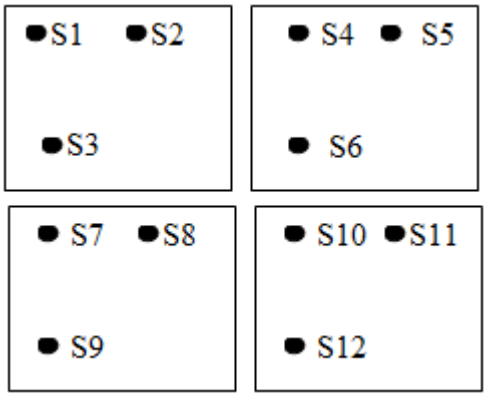

Fig.3: Interfacing an array of sensors in 2x2 matrix

The Fig.3 shows the interfacing of an array of sensors in 2x2 matrix. Connecting IR sensors in this way, Autonomous Vehicle can detect smaller and larger obstacles in all directions.

IV. BLOCK DIAGRAM

This section will discuss the design procedure and the real-time implementation of the system. The working principle of the Reichardt model based Autonomous Vehicle is visually explained in the schematic block diagram shown in Fig.4. The object block consists of an obstacle which is to be detected by the Autonomous Underwater Vehicle. The array of IR sensor block contains the IR sensors connected together, when an obstacle is detected by the IR sensors, the transmitted light from the IR transmitter strikes the obstacle and the IR light is reflected back to the IR receiver, sending a signal to the microcontroller that an obstacle is detected. A pre-processor block is a program that processes its input data to produce output that is used as input to another program. The direction estimation block is used to detect the direction of an obstacle with respect to the IR sensors placed. The velocity estimation block is used to estimate the velocity at which an obstacle is travelling. The three blocks, pre-processor, direction estimation, velocity estimation is implemented using a microcontroller.

The direction and velocity estimation output can be seen on the serial monitor that is the output block. The camera block is used to capture images of the obstacle. The data acquisition is done through a mobile application. The camera setup and the microcontroller are implemented on the Autonomous Underwater Vehicle. The Autonomous Underwater Vehicle is controlled by a semiautomatic control unit which is used to control the Autonomous Underwater Vehicle.

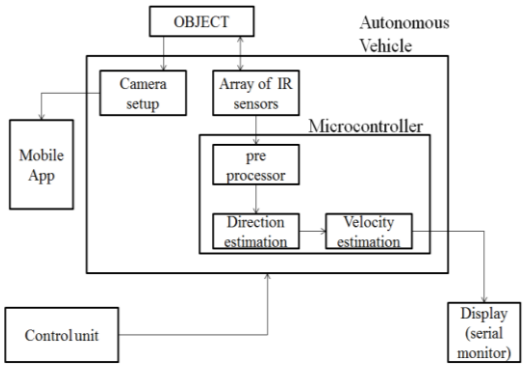

Fig.4: Reichardt model based Autonomous Vehicle

The control unit is visually explained in the schematic block diagram shown in Fig.5. The control unit is used to control the Autonomous Underwater Vehicle, the control unit consists of control switches, which is used to move the Autonomous Underwater Vehicle in a particular direction. The control unit is connected to the microcontroller; the driver block is a program that controls a particular type of device that is connected to the microcontroller. Battery is used to supply power for the microcontroller.

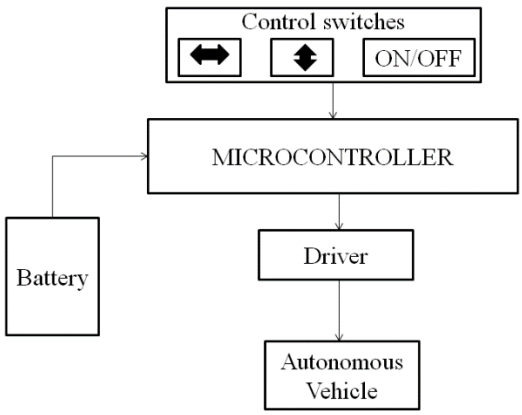

Fig.5: control unit for Autonomous Vehicle

V. RESULTS

The Autonomous vehicle can detect the obstacles of any size and autonomously avoid those obstacles and estimate the velocity. The same design can be implemented underwater and in air, but in case of Autonomous underwater vehicle, the range of the IR sensors gets reduced. Suitable high range sensors are to be used underwater.

VI. FUTURE SCOPE

Autonomous Vehicles could perform assessments of pipelines and links and in addition significantly increment our capacity to investigate submerged domains. On the military side, AUV's could go into shallow waters to perform secretive missions in spots where maintained submarines will be likely recognized.

VII. ACKNOWLEDGMENT

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in ushering in a great deal of effort, time and valuable guidance. I would like to thank our guide and Dean of Research and Development Dr. P. Cyril Prasanna Raj at M S Engineering College, for providing valuable suggestions, relentless support, help and guidance throughout the course of our project.

VIII. REFERENCES

[1]. H. Choset, K. Nagatani, N. A. Lazar, "The Arc-Transversal Median Algorithm: A Geometric Approach to Increasing Ultrasonic Sensor Azimuth Accuracy", *IEEE Transactions on Robotics and Automation*, vol. 19, no. 3, pp. 513-522, June 2003.

[2]. J. Borenstein, Y. Koren, "Error eliminating rapid ultrasonic firing for mobile robot obstacle avoidance", *IEEE Transactions on Robotics and Automation*, vol. 11, pp. 132-138, February 1995.

[3]. Dey M K 2016 International Journal of Soft Computing and Engineering 6 66-9 J.C. Kinsey, R.M. Eustice, L.L. Whitcomb: A survey of underwater vehicle navigation: Recent advances and new challenges, IFAC Conf. Manoeuvering Control Mar. Craft (2006).

[4]. Shoval S, Borenstein J and Koren Y 1994 Proceeding of 1994 IEEE Robotics and Automation Conference.

[5]. F.S. Hover, R.M. Eustice, A. Kim, B.J. Englot, H. Johannsson, M. Kaess, J.J. Leonard: Advanced perception, navigation and planning for autonomous in-water ship hull inspection, Int. J. Robotics Res. **31**(12), 1445–1464 (2012)

[6]. Candelas F A, Garcia G J, Puente S, Pomares J, Jara C A, Perez J, Mira D and Torres F 2015 IFAC Workshop on Internet Based Control Education.

[7]. M. F. Yahya Underwater, Control and Robotics Group, School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Engineering Campus, 14300, Nibong Tebal, Pulau Pinang, Malaysia.

[8]. A. BOBKOV, JU. S. BORISOV, "NAVIGACIJA PODVODNOGO APPARATA NA MALYH DISTANCIJAH PO OPTICHESKOJ INFORMACII (UNDERWATER VEHICLE NAVIGATION ON SMALL DISTANCES FROM OPTICAL DATA)," MEHATRONIKA, AVTOMATIZACIJA, UPRAVLENIE, NO 2. PP. 75–78. (IN RUSSIAN), 2010.

[9]. Mitsuhiro Kojima "3D Acoustic imagery generation by interferometric analysis of log baseline using Interferometric Real Aperture Sonar", OCEANS2015 Washington. pp. 1–7, Oct., 2015.

[10]. D. Sun, C. Zheng, H. Qian, "Application of Underwater Acoustic Positioning Systems in Ocean Engineering", *Technical Acoustics*, vol. 31, no. 2, pp. 125-126, 2013.

[11]. J. Ning, Y. Wu, D. Sun, "Development Status and Application of Long Baseline Acoustic positioning System", *Hydrographic Surveying and Charting*, vol. 24, no. 1, pp. 72-75, 2014.

[12]. "Underwater positioning and navigation technology[M]" in , Beijing:National Defence and Industry Press, 2007.

[13]. C. Fang, S. Anstee, "Coverage path planning for harbour seabed surveys using an autonomous underwater vehicle" in OCEANS 2010 IEEE-, Sydney:, pp. 1-8, May 2010.

[14]. Paull, L., Saeedi, S., Seto, M., Li, H., "AUV Navigation and Localization: A Review", IEEE Journal of Oceanic Engineering, 39 (1), 131–149, 2014.

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DESIGN AND DEVELOPMENT OF EFFICIENT AUTOMATIC MATERIALS SORTER USING ARM7 MICROCONTROLLER

PRIYA[1],SUSHMA N[2],SHOBHA R[3]
[1,2,3]UG Student Dept. of ECE
Sapthagiri College of Engineering

ABSTRACT
Now-a-days the wastes are dumped as landfill waste and the major problem in solid waste disposal is plastic bottles, glass bottles, metal can separation and they are separated manually and recycled. So it is necessary to have a suitable solid waste treatment plant. The economic value of waste is best realized when it is segregated. Currently there is no such system for it. The paper describes an automated waste segregation; the work intends to develop a prototype for separating plastic, glass bottles, metal cans and paper from solid waste material using ARM-7 Microcontroller. Different capacitive, proximity sensors etc. to detect and segregate each object in a single bin are to be surveyed. The paper describes recent advances and challenges to develop automatic sorter machine.
Keywords—Proximity Sensor, ARM Microcontroller, LDR

I. INTRODUCTION

Solid waste management has become one of the main issues in both urban and rural areas all over the world. Still the social and cultural response and the techno-economic considerations of the issue have not received the required importance in appropriate planning and application of waste management systems in our country. Waste management is an important requirement for ecologically sustainable development in many countries. Due to rapid urbanization and uncontrolled growth rate of population municipal solid waste management has become acute in India. As per the previous data in India per capital waste generation had increased by 1.3 percent annually with urban population increasing between 3-3.5 percent per annum. Yearly increase in waste generation is around 5 percent. In India the municipal agencies spend 5-25 percent of their budget on solid waste management[1]. Efficient sorting of waste is a major issue in today's society. Selective sorting is another approach, which is often implemented to improve recycling and reduce the environment. When the waste is segregated into simple stream such as plastic bottles, glass bottles, metal cans, tetra packs it becomes more easy to recycle them and reuse them .We aim in just doing that ,separating this recyclable solid waste and putting them into their compartments in a single bin so that they can be distinguished and used separately.

II. REVIEW ON LITERATURE

A. Normal Waste Segregation method: In India, rag pickers play an important role in the collecting, disposing of urban solid waste. This process has its limitation and it was time consuming as well .Rag pickers and conservancy staff have higher morbidity due to infections of skin, respiratory, gastrointestinal tract and multisystem allergic disorders, in addition to a high prevalence of bites of rodents, dogs and other vermin [1].this system is still at large in most parts of India .also there was no emphasis on waste segregation, so segregating recyclable items from amongst other became a tedious task.

B. RFID based Segregation System: In this system which applies radio frequency identification for on-line sorting of consumer waste groups can

satisfy very important requirement of an efficient waste management system. Not only is the system robust, it is also accurate , can handle vast quantities of plastic and e-waste. the drawback of this system is that the RFID is considered to be attached to each type of material during manufacturing only to resolve the problem of sorting during the disposal stage of the product[2]. Each waste material will have identical types of RFID tags that stores the information about the object along with which travels on conveyer belt. So whenever waste comes near the RFID reader it sends the vital information to the RFID reader. Commands and information are exchanged between n the RFID reader and RFID tags. This information is used to drop the each waste material in their respective beans. Later this information is conveyed to the arduino microcontroller for further processing. After interpreting the data received from the RFID reader it will be forwarded to remote master embedded system wirelessly. The zigbee receiver is interfaced with the personal computer which the corresponded Waste material having the RFID tag which contents the all information about the product to be coded during manufacturing in the passive tag placed as there are a variety of the tags available to be attached with the material. It is not viable as not all companies would add to their cost of applying RFID tags to their products thus implementation of such system is difficult and not economical. Also we are dealing with waste products so to use RFID scanner like devices in such harsh and non-suitable condition would only add to the difficulty.

C. PLC Based Automatic Waste Segregator: Every waste separation system can be used flexibly. Waste separation systems can be put in use for local communities, private investors, industry and commerce. The stress of competition forces companies to produce economically and rationally. A higher level of automation demands more and more programmable logic controllers (PLC). The advantage of PLC is the automation with a relatively small amount of cabling and a low error rate [3]. Productivity, flexibility and efficiency with only a few contactors (heavy duty relay) specify the controller. The system is completed by modifications and extensions of functions (without mechanical intervention) as well as by communication with other devices via analog, digital and serial interfaces. With programmable logic controllers, processes can be monitored and operated via a PC. The process of systematically modifying a well-known deterministic signal, called carrier, in accordance with an information signal is called modulation. This process needs to be reversible, so that the receiver may be able to recover the information signal, via a process called the demodulation. This two-step process of modulation-demodulation is necessary when we cannot transmit the signal directly in its original form through the channel, thus necessitating the translation of the information to another frequency band that suits the channel being used.

III. METHODOLOGY

A. Existing System Model: The system activates when the IR detects some sorts of material is being put on the system tray. Then at first the weight sensor activates and find out the weight of the trash, then the metal sensor and glass sensor starts their actions. If metal sensor detects the material as metal, then a servo motor will put that trash in the bin 3 (which is dedicated for metals). If the glass sensor detects glass then it will perform same action and put the trash in bin 4. If both sensors fail to detect then the LASER and LDR activates. If the LASER passes through the trash then it is decided as a transparent and moves to bin 2. If the LASER fails to pass then the material is decided as Paper and move to bin 1.

The sorting system consists of Light Dependent Resister (LDR), LASER, Infrared (IR) transmitter and receiver, Metal Sensor (Capacitive proximity sensor E2K-C) , glass sensor (Omron E3SCR67C), Weight Sensor (MLC900 micro weight sensor) [10] and a Liquid Crystal Display (Alpha-numeric 16*4 LCD). The whole program is run by a microcontroller (PIC 16f877A).

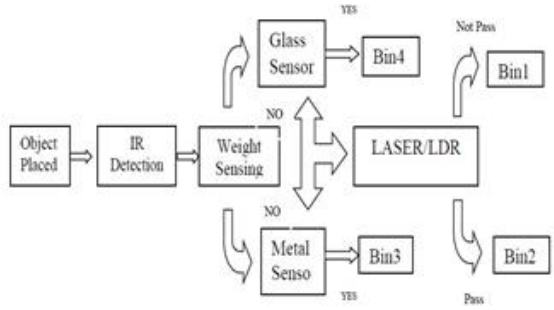

Figure 1. Existing System Block Diagram [1]

B. Proposed System Model: The system activates when the IR detects some sorts of material is being put on the system tray. If metal sensor detects the material as metal, then a stepper motor will put that trash in the bin1 (which is dedicated for metals).If the LASER passes through the trash then it is decided as a transparent and moves to bin2(glass)If the LASER fails to pass then the material is decided as Paper or plastic.

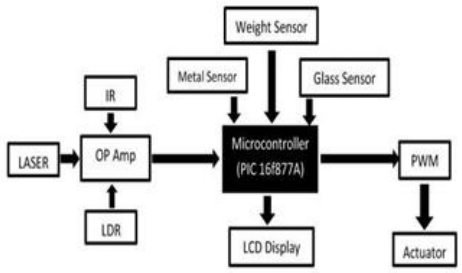

Figure 2. Proposed system Block Diagram

IV. CHALLENGES AND ADVANCES

Automatic Sorter Machine for Smart Waste Management System can be deployed to solve our existing problem as well as can bring about a change in our daily life meeting our own demand.

A. Sorting More Types of Materials: The developed Automatic Sorter Machine for Smart Waste Management System can sort only four types of waste materials. If more sensors are used then it will be possible to sort more types of materials (Such as: Transparent and non trans parent plastics, Thick and thin papers, Semi-conductor and Conductors, Rubber materials, Organic etc.).

B. Reduction of Cost: Companies those are manufacturing and distributing trash bin throughout the world, currently producing manual trash bins. If a large scale production of Automatic Sorter Machine for Smart Waste Management System is possible then the price of this product will be cheaper than present manufacturing cost. It will be cheaper because the mechanical structure is very simple and the sensors will be industrial grade.

C. Increasing Response Time: The response time of electromechanical system is relatively fast. But it can be made faster by using industrial grade servo motor. The microcontroller and servo motor used in presently developed Automatic Sorter Machine for Smart Waste Management System are properly synchronized. When the industrial grade servo motor will be used, then the system should be synchronized to perform smoothly and faster.

D. Health Service: Special type of sensor could be used to sort out the organic parts of the wastes. When the organic parts of the wastes are sorted out then they may be tested automatically to find out the food habit of the user and analyse it for the improvement of the user's diet. Another application of sorting out the organic parts of the wastes is, the organic parts may help to diagnosis several disease of the user. Thus the health issues of the user of Automatic Sorter Machine for Smart Waste Management System will be insured at some extent.

E. Primary Recycling and Reusing Unit: A primary recycling and reusing plant may be installed with the automatic sorter machine. This will ensure that a home user will practice recycling and reusing. The primary plant may consist of only paper or plastic recycling unit. This will ensure a healthier life style and guarantee cost minimization for the home or industrial users.

V. IMPLEMENTATION

A. Hardware Implementation: The system activates when the IR detects some sorts of material is being put on the system tray. If metal sensor detects the material as metal, then a stepper motor will put that trash in the compartment1 (which is dedicated for metals).If the LASER passes through the trash then it is decided as a transparent and moves to compartment2(glass).If the LASER fails to pass then the material is decided as Paper or plastic. Further depending on the

reflectivity of the material for IRrays it is decided as either paper or plastic and dropped into their respective compartments of the same bin.

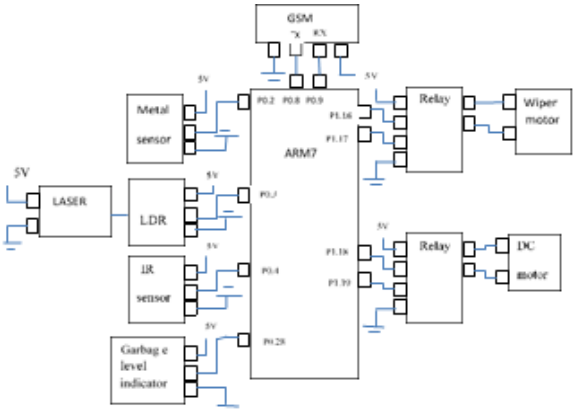

Figure 3. Data flow diagram

B. Software Implementation: To implement efficient and automatic material sorter based on ARM Microcontroller involves usage of software tools, programming language and mainly sensors. The software tools used are Keil uvision to acquire and process the data, Flash Magic for displaying the result on PC terminal. The programming language used is Embedded C language for processing and display. The software implementation involves sensor data processing.

Figure 4. Software Flowchart

VI. RESULTS AND SNAPSHOTS

All the components were found to be working in good condition and were responding perfectly for identification of materials.

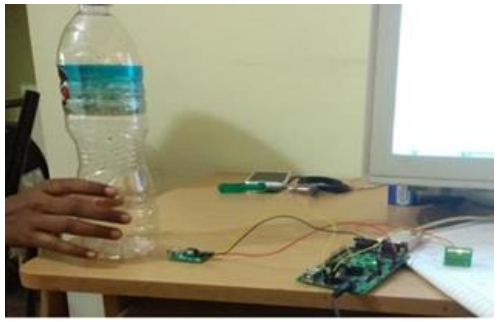

Figure 5. IR sensor detecting the presence of object

The figure 5 shows the presence and absence of object detected by IR sensor which is indicated by the glowing of LED.

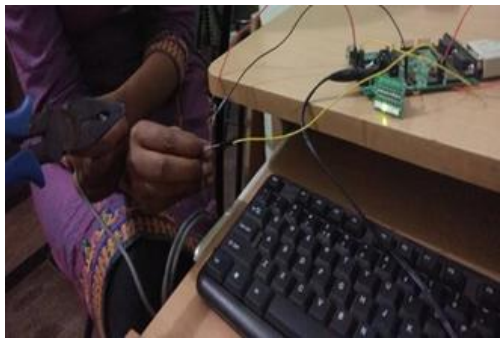

Figure 6. Detection of object by metal sensor

The above figure shows the identification of object being metal by metal sensor which is also indicated using LED glowing.

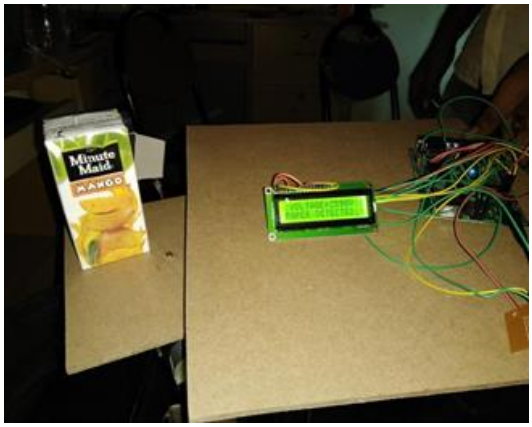

Figure 7.Paper detection

The above figure shows the detection of paper material by IR sensor based upon the reflectivity for IR rays which is converted in the voltage reading.

Figure 8. Plastic object identification

The above figure shows the detection of plastic by the same IR sensor where in the reflectivity is different which is in turn measured in terms of voltage.

Figure 9.Fabricated dustbin

The above figure shows the fabricated bin which has compartments within it for different materials.

VI. CONLUSION

In the paper we presented our work on developing an affordable and efficient method that can sort different materials like plastic bottles, glass bottles, metal cans and paper (tetrapacks) quickly and accurately using ARM-7 microcontroller. The entire sensing module can be placed along a single platform where the object is stable to ensure better result. Automated waste segregation can be largely implemented in various municipal corporations, food courts, malls. Taking into consideration various factors such as reduction in manpower, avoid risk at hazardous places, improve accuracy, increase speed of waste management & cost effective.

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REFERENCES

[1] Amrutha Chandramohan, Joyal Mendonca, Nikhil Ravi Shankar, Nikhil U Baheti, NitinKumar Krishnan Suma M S, "Automated Waste Segregator",Rashtreeya Vidyalaya College Of Engineering (R.V.C.E).

[2] M.K.Pushpa1, Aayushi Gupta2,Shariq Mohammed Shaikh3, Stuti Jha4, Suchitra V5, "Microcontroller Based Automatic Waste Segregator",International Journal Of Innovative Research In Electrical, Electronics, Instrumentation And Control Engineering vol. 3, Issue 5, May 2015.

[3] Prof. Mr. P. Balramdu, Prof. Mr. Manoj Kumar, Mr. Chape Laxman Murlidhar, Mr.Wankhade Sachin Sudamrao, Mr.Phalke Ulhas,Mr.Kotkar Narhari Ramkrushna, " Remote Monitoring and Sorting System for Waste Material Management Using RFID",International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 10, October 2014.

[4] S.J. Ojolo, 2 J.I. Orisaleye, 1Adelaja, A.O., 3Kilanko,O,Design and Development of Waste Sorting Machine,Journal of Emerging Trends in Engineering and Applied Sciences (JETEAS) 2 (4): 576-580 © Scholarlink Research Institute Journals, 2011 (ISSN: 2141-7016)

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CHARGING BATTERIES WITH SOLAR POWER USING MPPT CONTROLLER

SANDEEP KUMAR S; VENKATESH S GIRIRADDI; SUNIL P YADACHI; SIDDALINGACHARI; VENKATESHAPPA

Bachelor of Engineering; Electronics and Communication; M S Engineering College Bangalore
Sandeepshivakumar77@gmail.com:
sunil.yadachi@gmail.com;vsgsurya4@gmail.com;venkat_harishith@rediffmail.com

ABSTRACT

Now-a-days the wastes are dumped as landfill waste and the major problem in solid waste disposal is plastic The use of the solar energy is rapidly increasing as an essential method for renewable energy resources, more energy can be obtained by tracking the solar panel rather than static one. By placing the panel remain related to sun at a right edge to the beam of light. Photovoltaic cells are used for recognition of sunlight. The control circuit for the sun powered tracks depends on a PIC16F877A microcontroller (MCU). This is modified to recognize the sunlight through the photocells and afterwards trigger the motor position the solar panel where it can get most extreme sunlight, the control circuit trigger the sensors to sense and display the temperature

Keywords: MPPT, Solar Tracking Method, Inverse SEPIC Converter, LDR.

INTRODUCTION

Introduction to Inverse SEPIC converter in MPPT allow us to use of new possibilities in efficient software controlled power supplies. In several markets, demand is increasing for well-organized non-inverting dc/dc converters that can control the operation either in buck or boost mode, decreasing or increasing the input voltage to a desired synchronized voltage with minimum cost and component count. The purpose we are using has covered 100W inverse SEPIC (single ended primary inductor converter) are also called as zeta translator. The inverse SEPIC is a charge controller. The uniqueness consists of driving the topology synchronously using microchip components, approaching the efficiency over 95% at 6A. The zeta converter has several advantages like input to output DC insulation, buck boost capacity and produce the constant output current (Iout), but it is not easy to control. The compensation of the new inverse SEPIC translator is one and the same as buck boost functionality as the SEPIC, but the continuous output current provided a clean, low ripple output voltage. This low-distortion output translator can be used to control certain types of load such as LEDs which are receptive to the ripple voltage. The zeta translator offers the identical DC isolation between the Input and Output as the SEPIC translator and can be used in high reliability system.

Solar Tracking Method

The Sun Monitoring System (SMS) was able to programmed and place the panel perpendicular to the direction of sun as far as the intensity of light is visible. The selective component of the system is that it must supposed to choose the sun as controlling source rather than the earth as its reference. Their dynamic sensors continuously observe the light intensity and tilt the panel almost near the path where the intensity of light is at its peak level. In the event that the sun gets undetectable e.g. in shady climate, then without tracking the sun, the SMS continues to rotate the panel exactly in opposite way to the rotation of earth, until its rate of rotation is similar to that of earth's rotation. Due to this property while after some time e.g. 30 minutes when the sun again gets

visible, the PV panel is accurately in front of the sun.

2.1 **Need for Solar Tracking Method**

Comprehensively temperature alteration has expanded the interest and asks for environmentally friendly, essentiality of power energy acquired by the renewable energy sources like solar power. The end user would incline towards the tracking system rather than a fixed ground system. Since:

- The proficiency increments by 30 to 60%.
- The space essential for a sun oriented recreational zone is diminished, and they keep the same amount of productivity.
- The event of return venture is decreased.

Checking the direction of sun from east to west will resolve the proficiency of the solar power by 30 to 60% depending upon whom you ask and where you are in the world. Near the equator, you could have the maximum advantage from monitoring the sun.

2.2 **Working of Solar Tracking method**

First we have to arrange photo conductors at right angles to the posture of sunbeams. So photo conductors just grab the immediate radiation from the sun.

- Because of the immediate radiation more photon produces EMF due to photoelectric impact. • Location of the photo conductors is shown in below figure.

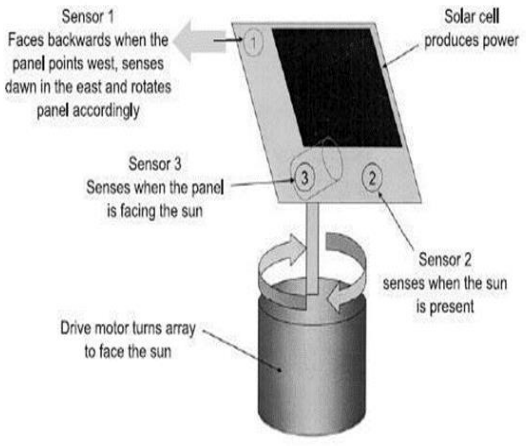
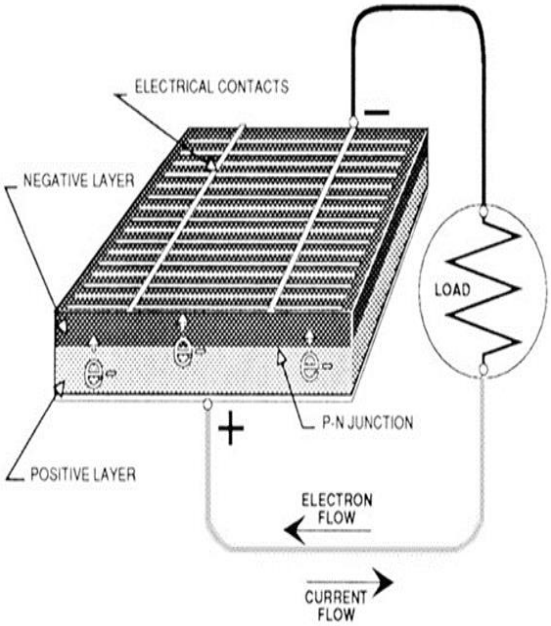


Figure1. Position of the sensor

When the sun gets the immediate radiation then the circuit is in off condition.

- But when sun moves from its place, Photo conductors don't get any light emission and circuit comes in ON condition.
- Solar beams conferred on the PV cell straightforwardly wrapping its most extreme Area.
- Due to the PV impact the current produced in the circuit and this current is sparing in the battery.



Sunlight is the method of the response.

- The output current of this response is DC and the measure of vitality created is straightforwardly relative to the measure of sunlight.
- Cells just have a normal efficiency of 30%

2.2 Advantages of Solar Tracking

The preservation of non-renewable vitality sources: Power from the sunrays makes the use of decreasing common sources like coal, oil and gas. Nowadays, we are living in a specially challenging atmosphere everywhere usage of energy is increasing at a shocking rate. It is very important to conserve the fossil fuels from the earth's surface and other usual resource, not only for better environment but also for capability of upcoming generation to gather their individual needs.

Low-grade Rates of waste and toxic substances: Sun oriented force system minimizes the measure of

abundance creation. For an instance, complete procedure of changing over coal to electrical energy gives a part of dust, unnecessary garbage, leakages of pollutant, dangerous flue gas, and wasteful vitality, thermal vitality, water and land. Toxic substances from fossil fuels are unpreventable. Flue gas like carbon dioxide (co2), Nitrogen Oxide (NO), sulphur dioxide (Sio2), each of the substances can have a harmful cause on cultivation, needs of human being's. Hazard's of ecosystem is also being demolished. In addition to this, the polluted substances from kerosene are meant for illumination point of view is condensed with the utilization of sun oriented force systems, furthermore the reduction in usage of diesel generator makes the generation of power.

Offsetting the Green House effect : Sun oriented force system generates electrical vitality without charitable means off Carbon Dioxide (CO2). One solar array system can compensate approximately 6 loads of Carbon Dioxide emissions directed from 20 years of existence.

Reducing the usage of power : Sun radiation system enhances the vitality skill, so it is extremely valuable for 3rd world countries. Vitality from sun radiation system reduced the expenses of Non-nuclear power resources for developed zone, it is less cheap for commercial and industrial purpose to running their performance. It leaves the usage of solar energy systems to produce the more power mainly for the future generation in distant zone.

Reduction in Discarding of Dry Cell Batteries : Tiny dehydrated battery cells are used for appliance like transferable radios and flashlights, although they are frequently used in remote area wherever there is absence of electrical energy. Hence, the effect from these dehydrated battery cells can have harmful effect on water and soil. Solar power decreases the need for using dehydrated battery cells and therefore limits the hazard of contamination.

II. Need For Mppt

MPPT stands for maximum power point tracker. An MPPT will raise the current while lowering the voltage such a process is nothing but dc-dc conversion. It takes the dc input from the PV panel converting into ac and again converting it back into different dc voltage/current to exactly match with the battery voltage/current.

MPPT will exchange the current and voltage but still can have the same power. For an example:

1amps at 100volts = 100watts;

10amps at 10 volts = 100watts;

1volt at 100amps = 100watts;

Note that voltage is lower as the current is raised but still has the same power. MPPT uses this technique to check the output voltage of panel and compares it to the battery voltage while increasing the current, subsequently fix the best power that solar panel can generate to charge the battery and converts it into better voltage to get maximum current into battery, most commonly used in off grid and RV(recreational vehicles) solar system.

MPPT is an enhancement of charge controller, it is a battery charger and load controller integrated with LED driver which signifies the efficient tracking method that increases the energy from the PV module. MPPT accomplish more function to develop the system efficiency.

Maximum power can be produced by placing the DC-DC converter b/n the PV panel and the battery. The duty cycle of this converter is varied until to get the peak power point so that we can match the source impedance from PV module to that of Load impedance.

3.1 VOLTAGE BASED MPPT

It has estimated that the Peak power point of a specific PV module is exactly 0.75 times that of open circuit voltage of the module. Subsequently the reference voltage can be obtained by measuring the open circuit voltage which provides an advance control voltage scheme to convey the panel voltage to the peak power point. But there is a problem in this method is that open circuit voltage of the module may vary with the temperature. As a result if the temperature value changes, then the module open circuit voltage also changed so we need to check the open circuit voltage of the module all the time. Therefore the load should be disconnected from the module to measure the open circuit

voltage. Because of which the power at this moment won't be used.

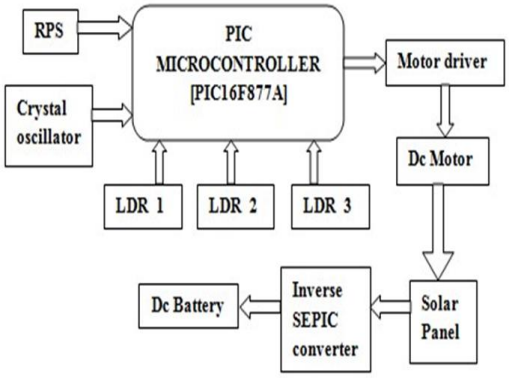


Fig 2. Proposed Block diagram

III. Inverse Sepic Converter

The purpose of inverse SEPIC contains the necessary information regarding the application is to build a 100W battery charger. It is also known as zeta converter. The uniqueness of driving this topology synchronously by using Microchip components, basically approaching the efficiency greater than 95% at 6A. There insist is increasing the well-organized non-inverting DC/DC converters to work either in buck or boost mode with component count and minimal cost. The principal of inverse SEPIC converter is suitable for this function. The whole execution of a regulator and charge library uses only 1k words of program space along with 55 bytes of RAM.

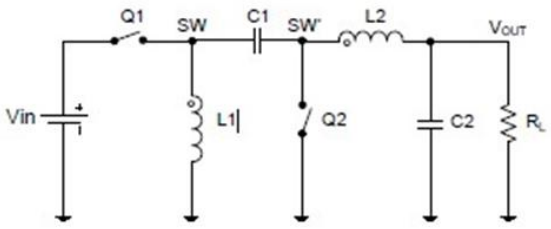


Figure 3. (a) Inverse SEPIC Converter Power train

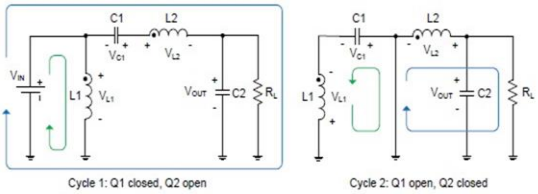


Figure 3. (b) Switching cycle of Inverse SEPIC Converter

In the first cycle, Q1 is closed and the current begins to flow in the primary inductor L1 and through the load via the coupling capacitor C1 and inductor L2. In the second cycle, Q2 is closed and the energy stored in the L2 inductor is delivered to the load. The energy stored in the main inductor L1 will be reset to its initial value through the coupling capacitor C1.

IV. Proposed Hardware Circuit

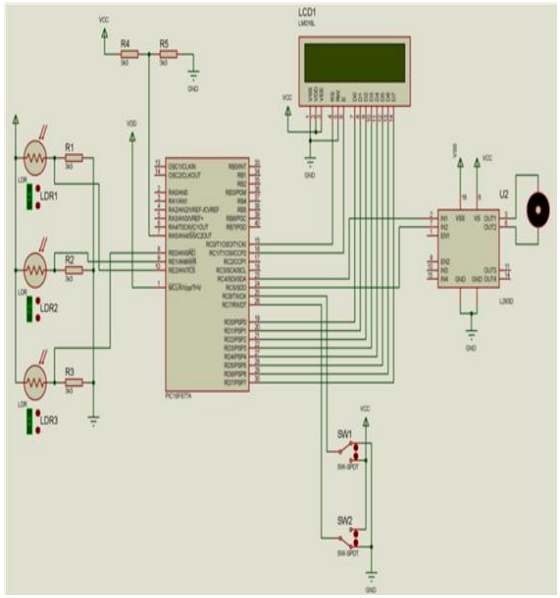


Fig 4: Proposed hardware circuit

V. Experimental Setup

VI. Conclusion

DC/DC boost translator is designed using PIC microcontroller and a Single axis solar monitoring model is developed. The hardware model is designed and constructed. The results of the

hardware model are compared with simulation results using MPlab software. The panel output voltage and the Boost translator output voltage of the hardware circuit is compared with the simulation result of PV cell and the Boost translator. So we can conclude that system is capable to observe and follow the light intensity in order to obtain maximum out This voltage can be applied to any appliance load. In this project output is applied to the inductive load (CFL).

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References

[1]. Syafrudin Masri; Pui- Wengchan "Development of a microcontroller based boost translator for photovoltaic system" European journal of scientific Research ISSN 1450-216X Vol.41 No.1 (2010), pp.39-47.

[2]. Janvarle L. Santos; Fernando Antunes; Amis Chehab; Cicero Cruz "A peak power point monitorer for PV using a high performance Boost translator" Solar energy, 80 (2006) 772-778, 29 august 2005.

[3]. K. H. Hussein; I. Muta, T. Hoshino; and M. Osakada; "Peak power point monitoring: An algorithm for rapidly chancing atmospheric conditions" IEE proc.-Gener. Transm. Distrib., Vol. 142, pp. 59-64, 1995.

[4]. C. Jaen, J. Pou, G. Capella, A. Arias, and M. Lamich, M, "On the use of sun monitorers to improve peak power point monitoring controllers applied to photovoltaic systems", The IEEE conference on Compatibility and Power Electronics, pp. 67-72, 2009.

[5]. Fang linluo; Hong Ye (2004), "Advance DC/DC translators", CRC press LLC, 2000 N.W. Corporate Blvd, Boca Raton, Florida 33431. pp – 1, 2 and 38.

[6]. Kais I. Abdul-lateef: A low cost single-axis sun monitored system using PIC microcontroller.

[7]. TOMASZUK_ and A. KRUPA :High efficiency high step-up DC/DC translators – a review

[8]. S.DaisonStallon*, K.Vinoth Kumar*, S.Suresh Kumar**: High Efficient Module of Boost Translator in PV Module

[9]. Okan BİNGÖL*, Ahmet ALTINTAŞ**, YusufÖNER***Microcontroller Based Solar-Monitoring System and Its Implementation

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A Novel Approach to Discover Exudates with Morphological Framework

MIRANDA SURYA PRAKASH[1], MANOHAR P[2]

[1,2] Department of Electronics and Instrumentation,Visvesvaraya Technological University
RNSIT,Bangalore, India

[1]mirandasuryaprakash@gmail.com; [2]manoharasp@gmail.com

ABSTRACT

Diabetic retinopathy (DR) is the most frequent microvascular complication of diabetes and can lead to several retinal abnormalities including microaneurysms, exudates, dot and blot hemorrhages, and cotton wool spots. Automated early detection of these abnormalities could limit the severity of the disease and assist ophthalmologists in investigating and treating the disease more efficiently. Segmentation of retinal image features provides the basis for automated assessment. In this study, exudates lesion on retinopathy retinal images was segmented by morphological processing technique. The objective of this study is detection of the exudates region on retinal images of retinopathy patients by Morphological Level Set Framework.The Sensitivity and Predictive values of the algorithm is 81.55% and 86.29% respectively. The accuracy level is 95.50%.

I. INTRODUCTION

Diabetic retinopathy (DR) is the most frequent microvascular complication of diabetes and the most common cause of blindness in the working population of the world. Early detection of DR is critical for successful treatment.[1] The common way for diagnosis is the evaluation of retinal images by ophthalmologists. In addition, there are many signs of retinopathy on retinal images to help the early detection of disease. One of these signs is exudates that appear differently in a yellowish or white color with varying sizes, shape, and locations. Exudates are the protein deposits. The size and location of exudates are important information for an ophthalmologist to show the severity of disease.[2] An automatic exudate detection system would be useful to detect and distinguish DR in retinal images of screening programs.[3]

II. PROPOSED METHOD

The initial stage of the project is to acquire the fundus images. There are many online databases, which provide the fundus images for the purpose of research. The database used in this project is DIARETDB1.The fundus images are captured with the help of Fundus camera.

The second stage of this project is pre-processing. The acquired Fundus images are processed with the image processing techniques in order to process further and for the accurate analysis. The main objective here is to modify, enhance the contrast and to reduce noise of the image selected.

The third stage is the process of extraction of blood vessels and masking optic disc present in the fundus image. This stage mainly called Candidate extraction stage.

The immediate next step is feature extraction. Our interest is to detect the exudates. The detected exudates are compared with the ground truth images provided in the database.

The final stage is the calculation of Sensitivity of selected 30 images from the database and the overall program accuracy.

A. Pre-processing: The most essential stride is the pre-processing stage. An abnormal state of commotion must be expelled from the obtained picture before performing larger amount of

preparing steps. The image of the fundus is at first changed to a grey scale picture. The difference upgrade is finished utilizing histogram evening out.

The benefit of complexity upgrade is that it builds the worldwide difference of image exceptionally by evacuating noise. It additionally open up the exudates present in image of fundus. The motivation behind pre-processing is to alter the force levels of the picture predominantly to get uniform enlightenment. If not, in view of the bended surface of the retina, this will prompt the expanded shine level close to the optic plate and alternate surfaces far from the retina will have less brightness.

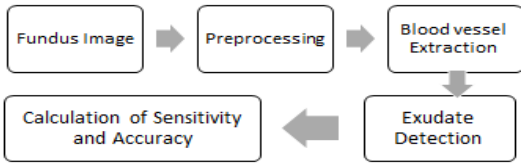


Figure 1: Block diagram of proposed method of Exudate detection

The differentiation improvement utilizing histogram evening out is utilized after dim scale transformation. The differentiation upgraded picture is then made to handle further to highlight the edges utilizing Canny edge detection. This is expressed to be the best in edge location however the computation is perplexing. This can be specifically executed utilizing MATLAB functions .The external round circular borders of the fundus picture is later recognized and masked individually. The images is then changed over to binary image by the perfect threshold values. The green channel extracted image for our venture is shown in figure 2(a).

B. Blood Vessel Extraction: The vascular tree of retina must be recognized. The blood vessels of retinal images consists of varying thicknesses (36 micron to 180 micron) and also a change in foreground illumination. In accordance with this the contrast of the blood vessels also varies. It can be stated as contrast varies higher for thick vessels and lower for thin vessels. Morphological operations are performed in order to identify the blood vessel path. The green channel image is thresholded by a low an incentive keeping in mind the end goal to get the edge pixels. In any case, the significant disadvantage is that a portion of the subsequent edge pixels from the past step so not identify the edges of exudates. This is on the grounds that a portion of the acquired outcomes contain vessel edges. These are not our region of interest and hence it has to be eliminated before proceeding for further analysis. Morphological approach is done to extract the blood vessels. The closing operation is performed which is followed by the dilation method.

Here the threshold is done for the longest thick and thin lines of the vessel. The algorithm is written such a way that, it can indicate the normal vector and the Eigen vector. The threshold is applied to the longest vessel and is called normal vector. Apart from longest detected vessel, it had got few other vessel structures which are small and are placed away.

In order to identify these missing structures, Eigen vectors are used. The Eigen vector is then added with the normal vector in order to make sure that none of the structures are left out. The FrangiFilter2D is applied here so that the eigenvectors of Hessian are used. It is used to compute the likeliness of image region to vessels. Figure 2(b) shows the blood vessel extracted in our work. The optic disc is suppressed.

C. Exudate Detection : Several approaches and algorithms are introduced in literature specially to identify the exudates. Our work has a simplified new approach, which automatically detects the exudates using the region properties method. The initial step considered here is the dilation of the green channel image. The reverse segmentation process is applied. The edge detection is performed by Canny Method. This method help to detect edges by looking into local maxima. It uses two thresholds. This is to detect the strong and weak edges.

The contrast enhancement is done using Contrast limited adaptive histogram equalization (CLAHE). This permits the regions with non-exudate to appear clear from the closer view. The information loss can be averted. CLAHE does not remove clipped sort of pixels which surpass the point of clip. At that point they are made to be redistributed among the retained and held pixels. Few sensible logical

operations are additionally used to identify and distinguish the exudates effectively.

Few dark features may appear along with bright ones. This can be avoided using the fragile filtration process. Figure 2(c), (d), (e) explains about the different procedures of exudate detection

The obtained image is compared with the ground truth image. The exudates detected according to our algorithm is depicted in figure 2 (f). For a selected few images, the Sensitivity and Accuracy is calculated.

The Frangifilter2D is used so as to point out the exact location of exudates. Here the beta values indicates the position of exudates. The filtration is carried out from right to left.

III. RESULTS

In our work, we have dissected the fundus images by automated technique to distinguish the indications of Diabetic retinopathy. By morphological approach, we have identified the Exudates. The resultant image outputs are compared and ground truth images of the public database we have considered in the project. The respective Sensitivity and Accuracy of the chosen pictures are later computed.

The Sensitivity and predictive values can be characterized as

Sensitivity is determined as $\frac{TP}{TP+FN}$ predictive value as $\frac{TP}{TP+FP}$

The Accuracy can be characterized as

Accuracy is determined as $\frac{TP+TN}{TP+TN+FP+FN}$

Where,

True Positive(TP)- The actual number of exudates accurately identified as exudates

False Positive(FP)- The actual number Non-exudates wrongly identified as Exudates

True Negative(TN)- The actual number Non-exudates accurately identified as non-exudates

False Negative(FN)- The actual number of Exudates wrongly recognized as Non-exudates

Terms used to calculate accuracy

Table 1 Procedure to identify the outcome with respect to ground truth image

Ground Truth Image	Outcome of algorithm	
	Classified as Exudate pixel	Classified as Non-exudate pixel
Exudate Pixel	TP(True Positive)	FN(False Negative)
Non-exudate Pixel	FP(False Positive)	TN(True Negative)

The detection of exudates –results obtained.

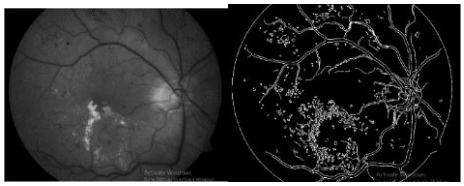
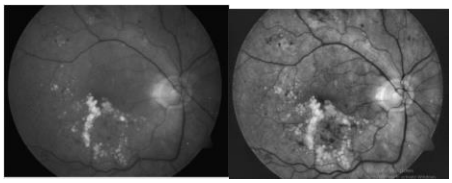


Figure 2 (a) Green Channel Image (b) Blood vessel Extraction



(c) Dilated image (d) Applied CLAHE

(e) Contrast enhancement (f) Detected Exudates

The Sensitivity is detected for the correctly identified exudate images. We included a count of 30 images to calculate Sensitivity and Predictive value.

Level of accuracy for the proposed method. The accuracy is calculated for identifying all the 89 normal and abnormal images of DIARETDB1 database.

Type of image	Number of images	Images correctly indicated	Accuracy in %
Normal	43	42	97.67
Abnormal	46	43	93.47
Total	89	85	**95.50**

Table 2 .Calculation of Sensitivity for 30 images.

Sl.No	DIARETDB1 Images	TP	FN	FP	Sensitivity in %	Predictive value in %
1	Image 1	9	4	3	69.23	75
2	Image 2	4	3	3	57.14	57.14
3	Image 3	5	3	0	62.5	100
4	Image 4	8	4	2	66.66	80
5	Image 5	25	2	3	92.59	89.28
6	Image 6	8	1	1	88.88	88.88
7	Image 7	16	4	0	80	100
8	Image 8	8	1	4	88.88	66.66
9	Image 11	10	4	3	71.42	76.92
10	Image 13	14	3	3	82.35	82.35
11	Image 14	9	1	0	90	100
12	Image 15	16	1	1	94.11	94.15
13	Image 16	26	1	1	96.29	96.29
14	Image 17	15	2	0	88.23	100
15	Image 18	13	2	0	86.66	100
16	Image 19	25	1	0	96.15	100
17	Image 20	28	0	16	100	63.63
18	Image 21	14	2	5	87.5	73.68
19	Image 22	7	3	1	70	87.5
20	Image 24	7	0	1	100	87.5
21	Image 25	20	3	3	86.95	86.95
22	Image 35	1	1	0	50	100
23	Image 38	3	0	1	100	75
24	Image 44	3	1	0	75	100
25	Image 52	2	2	0	50	100
26	Image 53	13	2	1	86.66	92.85
27	Image 66	7	1	0	87.5	100
28	Image 67	9	2	1	81.81	90
29	Image 71	1	0	1	100	50
30	Image 85	3	2	1	60	75
		Average			**81.55**	**86.29**

Our presented algorithm was successful in identifying Sensitivity and Predictive values of individual images. The overall accuracy is also calculated. The Sensitivity and Predictive values of the algorithm is 81.55% and 86.29% respectively. The accuracy level is 95.50%.

The detected exudates are compared with the Ground truth of the database DIARETDB1.

IV. DISCUSSION OF RESULTS

It can be inferred from the project that Exudates are the bright lesions which can be detected automatically by an approach called Morphological Framework. Our next work is to enhance the results using different approaches using Hierarchical Morphological process and Level Set Theory.

V. CONCLUSIONS

With this process we were able to present a work with accuracy of 95.50 to detect the Exudates. The sensitivity and the Predictive values are also calculated. This helps in the automatic detection of the Bright lesions which are the symptoms

REFERENCES

[1] Akara Sopharak, Bunyarit Uyyanonvar and Sarah Barman, "Automatic Exudate Detection from Non-dilated Diabetic Retinopathy Retinal Images Using Fuzzy C-means Clustering", sensors, ISSN 1424-8220

[2] Meindert Niemeijer, Bram van Ginneken, Stephen R. Russell, Maria S. A. Suttorp - Schulten, Michael D. Abràmoff, "Automated Detection and Differentiation of Drusen, Exudates, and Cotton-Wool Spots in Digital Color Fundus Photographs for Diabetic Retinopathy Diagnosis", Investigative Ophthalmology and Visual Science, Vol.48, pp.2260-2267, 2007.

[3] A. Osareh , M. Mirmehdi, B. Thomas, and R. Markham, "Automated identification of diabetic retinal exudates in digital colour ima*ges,"* Br. J. Ophthalmol., 2003

[4] Syna Sreng et al., "Feature Extraction from Retinal Fundus Image for Early Detection of Diabetic Retinopathy," IEEE R10-HTC2013, Sendai, Japan, August 26-29, 2013.

[5] Y. Hatanaka et al., "CAD Scheme for Detection of Hemorrhages and Exudates in Ocular Fundus Images," Medical Imaging 2007: Computeraided Diagnosis, 2007, vol. 6514, pp. 65142M-1-65142M-8.

[6] W. Sae-Tang, W. Chiracharit, and W. Kumwilaisak, "Exudates detection in fundus image using non-uniform illumination background subtraction", Proc. TENCON 2010, pp. 204-209.

[7] Sinthanayothin, Boyce, Williamson and Cook, " Automated Detection of DiabeticRetinopathy on Digital Fundus Image" , Diabet. Med. 2002, 19, pp. 105-112.

[8] Phillips, Forrester, and Sharp, " Automated detection and quantification of retinal exudates", Graefe Arch Clin. Exp. Ophthalmol. 1993, 231, 90-94.

[9] Khin Yadanar Win et al., "Detection of Optic Disc and Exudates in Retinal Images," AUN/SEED-Net Regional Conference for Computer and Information Engineering, Yangon, Myanmar, October 3-4, 2016.

AUTHOR PHOTOS AND BIOGRAPHY

Miranda Surya Prakash received the BE degree in Electronics and Communication engineering. She is currently pursuing her M.Tech degree in Industrial Electronics in the Department of Electronics and Instrumentation from Visvesvaraya Technological University, Karnataka, India. She had been working as Technical Engineer for two years at HP and IBM in the year 2014 and 2015 respectively.

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DESIGN OF A CONTROLLER FOR A DYNAMICAL SYSTEM BY DEVELOPING A TRANSFER FUNCTION

Dr. T.C.MANJUNATH[1], PAVITHRA G.[2], Prof. RASHMI JAGADISHA[3]

[1]Ph.D. (IIT Bombay), Sr. Member IEEE, Fellow IE, Fellow IETE, Chartered Engineer
Prof. & HOD, ECE, DSCE, Bangalore, Karnataka
Email : dr.manjunath.phd@ieee.org
[2] VTU RRC Research Scholar, Belagavi, Karnataka
[3] Asst. Prof., EEE Dept., SJBIT, Bangalore & VTU Research Scholar, Belagavi, Karnataka
dr.manjunath.phd@ieee.org pavitthra84.pc@gmail.com rashmi.jagadisha@gmail.com

ABSTRACT

In this paper, we present the moment of inertia modelling of a dynamical system, when the system is moving from the source to the destination by developing a mathematical model in the form of a transfer function.

Keywords-Robot, MI, Controller.

I. INTRODUCTION

The property by virtue of which it resists any change in its state of rest or of uniform motion is called as inertia. Two types of inertia exist, viz., Translatory inertia and the rotary inertia. Translatory inertia is defined as the inertia that is offered by the translation of a body due to the application of a force and depends on the mass and acceleration ; i.e., F = ma. Translatory inertia is due to the mass. Translatory inertia is called as Mass. Rotational inertia is defined as the inertia that is offered by the rotation of a body due to the application of torque and depends on moment of inertia and angular acceleration ; i.e., T = . Rotational inertia is due to the MI. Rotational inertia is called as Moment of Inertia.

Three important concepts of any body or matter are the concepts of relative distribution of area, mass and the weight. Quantitative estimates of the relative distribution of the area and the mass over the regions of interest are made by the concept of Moments of Inertia [MI] of the object. The concept of inertia is provided by the Newton's laws of motion. Moment of inertia plays a very important role in the dynamics and kinematics of robot mechanisms. A robot arm is made of links + joints and these joints are driven by actuators (motors / pistons).

The arm dynamics of the robot is the spatial displacement or the movement of the robot in the 3D space with a particular velocity and acceleration. It mainly depends on the mass and MI. Moment of inertia depends on the positioning, velocity, acceleration, moments, torques, stresses, strains in links deflection effect, bending effect, buckling effect, bending stresses, vibrations of the links, shear stresses, torsional stresses & torsional strains related to the links of the robot arm.

MI of a part of a robot, say a link gives the information about the mass distribution of the part at a particular distance w.r.t. a particular axis. When the mass of the link increases, its weight increases, thereby MI increases, thereby increasing the torque rating and size of the motors. More power is required to drive the joints. The drive power amplifier required to drive the actuators would be of higher rating. To overcome this, joint - link movement motors are to be light in weight and the link weight has to be reduced (links should

be light in weight, but robust, sturdy, should not bend). Hence, robots are designed in such a way that MI of the links is reduced, so that less torque is sufficient to move the links.

Note that MI is responsible for the creation of torque. The MI also depends on the axis. Say, for example, if the area of the link is more, then MI is more (link horizontal) and it will bend due to application of a force at the other end (Fbending more), if the area of link is less (vertically placed), then, MI is less and it will not bend due to application of weight at the other end (Fbending less). MI ↑, the T requirement to activate a joint increases in order to manipulate physical objects. The robot manipulation depends on the MI and the mass, weight of its components such as links, motors, grippers, tools, payload weight etc., in addition, the torque developed by the motor depends on the load which in turn depends on the MI which in turn also depends on the column effect / buckling effect in the links, bending stresses and shear stresses that are developed in the links when they are loaded at one end. All these factors have to be considered for robot stability, i.e., the link design totally depends on the MI.

The spatial displacement of the links should be according to the speed profile curve. So, links should be as light as possible and made up of high grade aluminum, the joint motors should be light or instead of mounting the heavy parts at the joints, mount it at the base and transmit the power from the base to the joint by making use of chains, ropes and pulleys. The joint-link pair mechanism should be designed with less weight so that the robot control will become easy and effect of MI on the links is reduced and less torque is required by the motors to displace the load. The heavy objects such as the motors and the gear mechanisms have to be mounted at the base and power should be transmitted from the base to the respective joints via the transmission devices (the chains, gears, ropes, pulleys, etc.) like in Rhino XR-3 robot arm. This will increase the positional accuracy of the robot and reduce the overall MI of the robot.

The length of the arm should go on reducing as one moves radially away from the robot base, i.e., the deflection ratio should be maintained (Ex. SCARA robot, a1 = 425 mm, a2 = 375 mm). If a third link would have been, then the length of that link would be < a2. The main factors which are affecting the control problems and the MI are the Positioning, Velocity, Acceleration, Moments, Torques, Stresses, Strains in links, Deflection effect, Bending effect, Buckling effect, Bending stresses, Vibrations of the links, Shear stresses, Torsional stresses and strains related to the links of the robot arm and the controller rating.

All these factors have to be considered while designing the robot and its control strategy for its successful robotic manipulation.

II. INTRODUCTION TO THE ROBOT DESIGN

The designed robot for which we developed the control model is a 3 DOF stationary robot arm having base, elbow, vertical extension and consisting of both rotary and prismatic joints. There is no tool yaw and tool pitch (only tool roll) [1]. There are 3 joints, 3 axis (2 major axes - base, elbow, and one minor axis vertical extension). The 3 DOF's are given by Base, Elbow, Vertical Extension as shown in the Fig. 2, i.e., there are 3 rotary joints and 1 prismatic joint [8]. Since n = 3 ; 12 KP's are to be obtained and 4 RHOCF's are to be attached to the various joints [2] as shown in the LCD in Fig. 3 [8].

III. CONTROLLER CONCEPTS

A controller is a device which controls each and every operation that is taken place inside the robotic system making decisions. The functions of a robot controller are : The robot is a mechanical system that must be controlled in order to accomplish a useful task (say , a PNP operation). The task involves the movement of the manipulator arm from the source to the destination, so that the primary function of the robot control system is to position and orient the wrist with a specific speed, precision, accuracy. The controller serves as a interface

between the robot and the computer. It controls each and every operation of the robot making decisions.

The controller consists of a driver unit, sometimes a power supply unit, electronic logic circuits, feedback circuitry, sensing circuitry, few amplifiers, IC chips and the actuators. The task of the control system is to execute the movements and actions of the manipulator according to the robot program and to coordinate the interaction with the environment. Controllers can operate either in open loop or in closed loop. Each axis of motion of the robot arm is separately actuated by a control circuitry which contains a driver unit which converts the electrical command signals of the computer to mechanical motions. Drives for computerized robotic systems designed are of electric type.

The purpose of the controller is to compare the actual output of the plant with the input command and to provide a control signal which will reduce the error to zero or as close to zero as possible. The controller generally consists of a summing junction where the input and the output signals are compared, a control device which determines the control action, the necessary power amplifiers and the associated hardware devices to accomplish the control action in the plant.

Robot control problem means how to control it to do a particular task effectively in its work space. Robot control problem is taken care of by a controller which is used to interface between the robot and the computing system. Various types of controllers such as P, PI, PD, PID, FOS, POF, H_2, H_∞, Sliding mode controller, programmable logic controllers, microcontrollers can be designed to overcome the MI & to do a correct task.

The designed controller is shown in the form of a block diagram in the Fig. 1.

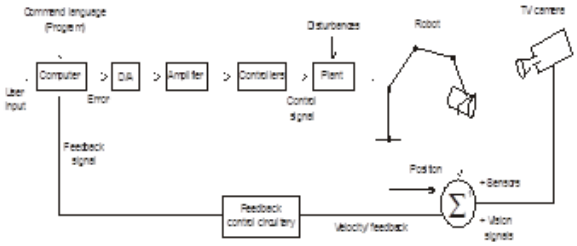

Fig. 1 : Block diagram of the controller

IV. CONTROLLER DESIGN

Consider an electromechanical servo system in the designed robot, where the mechanical drive unit consists of an arm controlled DC servomotor and a gear train of high gear reduction ratio 'n'. The block diagram is in the Fig. 2. It gives the position and velocity feedback of the servo system. The position input signal θ_p radians acting on the system (electrical input to actuator - voltage, v) results in an output signal θ_0 radians (mechanical output : - angular displacement, θ). Take the Laplace Transform (LT) of the above second order linear differential equation and get the transfer function of the controller as

$$J'\frac{d^2\theta_0}{dt^2}+\left(\frac{D+AK_m nK_v}{n^2 J''}\right)\frac{d\theta_0}{dt}+\left(\frac{AK_m nK_p}{n^2 J''}\right)\theta_0 = \left(\frac{AK_m nK_p}{n^2 J''}\right)\theta_p \quad (1)$$

$$\left(\frac{D+AK_m nK_v}{n^2 J''}\right)s^2\theta_0(s)+\left(\frac{AK_m nK_p}{n^2 J''}\right)\theta_0(s)=\left(\frac{AK_m nK_p}{n^2 J''}\right)\theta_p(s) \quad (2)$$

The Transfer Function [TF] of the robot control servo system is given by Eq. (2) and is shown in the form of a block-diagram in the Fig. 2.

$$G(s) = \frac{\theta_0(s)}{\theta_p(s)} = \frac{A\,K_m\,nK_p}{S^2 n^2 J'' + (D + AK_m\,nK_v)\,S + A\,nK_m\,K_p} \quad (3)$$

This TF of the robot control system developed is of the second order form given by Eq. (4) as

$$= \frac{\omega_n^2}{S^2 + 2\,\delta\omega_n\,S + \omega_n^2} \quad \text{where} \quad G(s) \quad (4)$$

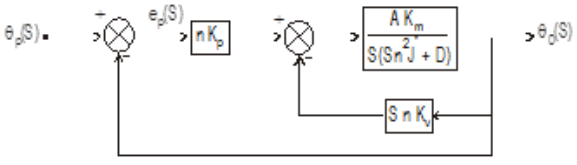

Fig. 2 : Block diagram and transfer function model of the servo-controlled joint-link arm segment of the robot arm

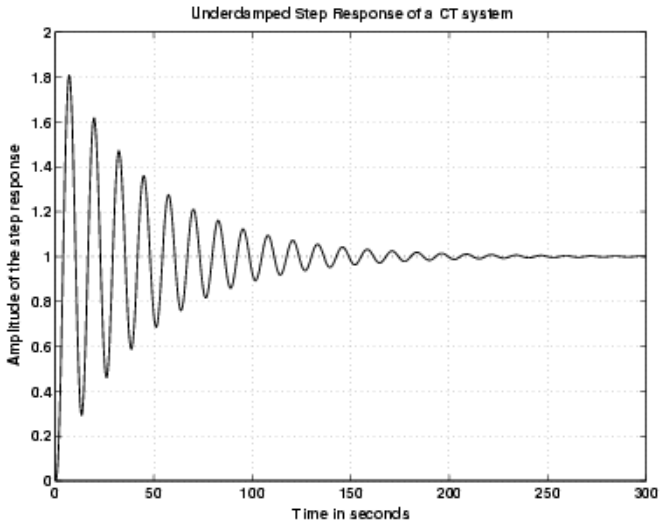

Fig. 3 : Experimental result of a joint of the robot system

Comparing Eqns. (3) and (4), we get

(5) $$\sqrt{\frac{A\,k_m\,n\,k_p}{n^2\,J''}} = \omega_n$$

(6) $$\frac{D + A\,k_m\,n\,k_v}{2\sqrt{A\,k_m\,n\,k_p\,n^2\,J''}} = \delta$$

The robot control system is designed for damping factor in the range $0.4 < \delta < 0.9$, as a result of which the output always exhibits damped oscillations (under damped response) and hence, system will be stable. The problem regarding oscillation is that the structural natural frequencies of the joint-link arm segments vary inversely with the square root of the effective inertias between their minimum and maximum values. The experimental result of one of the joint of the robot arm when a particular value of torque given is shown below in Fig. 3.

V. CONCLUSIONS

A controller is designed for the movement of the robot by developing a transfer function model & is tested for its dynamicity using the Matlab software, the results show the authenticity of the methodology developed.

REFERENCES

Craig J, "Introduction to Robotics : Mechanics", Dynamics & Control, Addison Wessely, USA, 1986.

Robert J.S., "Fundamentals of Robotics - Analysis and Control", PHI, New Delhi.

Klafter, Thomas and Negin, "Robotic Engineering", PHI, New Delhi.

Fu, Gonzalez and Lee, "Robotics: Control, Sensing, Vision and Intelligence", McGraw Hill, Singapore.

Groover, Weiss, Nagel and Odrey, "Industrial Robotics", McGraw Hill.

Ranky P.G., C.Y. Ho, "Robot Modeling, Control & Applications", IFS Publishers, Springer, UK.

Crane, Joseph Duffy, "Kinematic Analysis of Robotic Manipulators", Cambridge Press, UK.

Manjunath, T.C., "Fundamentals of Robotics", Fifth edn., Nandu Publishers, Mumbai, 2007.

Pavithra G. was born in Bangalore, Karnataka, India on Sep. 8, 1984 & received the B.E. Degree (Bachelor of Engg.) in Electronics & Communication Engineering stream from Basava Academy of Engg. (VTU, Belgaum) in the year 2006, M.Tech. Degree in ECE branch with specialization in RF Communications from the prestigious Jain University in the year 2012 in First Class with Distinction & First Rank (gold medalist) and is pursuing her Ph.D. in the field of bio-medical image processing from the prestigious Visvesvaraya Technological University (VTU Belgaum) since 2015 respectively under the supervision of Dr. T.C.Manjunath. She did her entire schooling (from 1st standard to 10th standard) in New Public School in Vijayanagar in Bangalore and her college (1st PUC & 2nd PUC) in the reputed KLE Institutions in Bangalore. She has got a teaching (academic), research experience of more than 9+ years in various engineering

colleges in the Karnataka state. She has worked in the levels of Lecturer-Asst. Prof. (> 4^{+}) in the colleges where she has worked in the ECE department apart from having industrial experience (> 4^{+} yrs). Currently, she is doing her Ph.D. in VTU as a research scholar on the topic "Design & development of novel algorithms for diagnosis of glaucoma in different types of images using advanced image analysis techniques". She has published more than 60^{+} papers in various National, International journals and Conferences in India & abroad. She is a member of IEEE since 3 years.

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A Non-Invasive Remote Health Monitoring System Using Visible Light Communication Li-Fi

DEEPIKA P[1], MEENA G[2], POOJA M[3], RANJITHA J[4], Prof. AZRA JEELANI[5]

[1-4]Department of Electronics and Communication Engineering
M S Engineering College, Bangalore, India

[5]Associate Professor in Department of Electronics and Communication Engineering
M S Engineering College, Bangalore, India
azrajeelani@gmail.com

ABSTRACT

Health must be given utmost importance the above paper elaborates the patient monitoring system in the clinics and hospitals using visible light communication technology Li-Fi (Light Fidelity). Li-Fi technology is not the end of Wi-Fi technology but instead is an advancement of it; where in the human body is kept away from the frequency interface. The sensors used is in this model are tilt sensor, photo interrupter sensor, glucose level sensor, temperature sensor, heart beat sensor. The information collected by these sensors is uploaded to the microcontroller with help of Arduino board. The microcontroller used in this model is ATmega328p, whose output is fed to the LED light module at the transmitting side. The photo detector at the receiver side collects the data produced by LED light and displays it on the PC.

Keywords— patient's body, Li-Fi, LED light , Visible Light Communication, ATmega328p, PC

INTRODUCTION

In today's world the healthcare industry is trying their best to give the upmost service to the patients who come for the treatment of their illness in a more economic and patient friendly manner. If in case there is more number of patients admitting to the hospitals then there arises a need to improve the patient monitoring devices and their medium of technology. Many devices at present works on Wi-Fi such as lung ventilators, anesthesia machine, defibrillators, infusion pumps [6]. Since there is more number of medical devices which work on Wi-Fi technology creates huge demand for bandwidth and radio spectrum, which in turn causes harm to the human. To overcome the above problems this model helps us by using visible light communication technology for better performance. Li-Fi transmits information through optical wireless medium which will not affect the human body unlike Wi-Fi which is slower and has lesser bandwidth compared to Li-Fi. The main criteria of this project are to provide a safer and faster communication system for healthcare applications.

Implementation

Model Design

The model is divided into blocks namely transmitting side and receiving side.

Transmitting side: In the transmitting side we have tilt sensor (ADXL335), glucose level sensor, heart beat sensor, photo interrupter sensor, and temperature sensor. These sensors are used to collect data from the patient's body and sent to the microcontroller ATmega328p that is placed on arduino board. UART (universal asynchronous receiver and transmitter) forms a bit stream of the data collected without the use of clock signals only the input data is required for the transmission of information. Thus the data collected is sent to the

LED light module. The information obtained is converted into digital values because LED light transmits the data through 1's and 0's in fraction of second which is not visible to human naked eyes which is faster and safer way to communicate.

Receiving side: In the receiving side there is a photo detector (IR sensor) that captures the blinking of the light produced by LED light bulb. For every instant of time the data is captured (which cannot be seen through naked eyes) and sent to PC where the information collected is displayed on the screen.

Softwares Used

The Software's used for this design is Arduino IDE. The main coding part has been done using Arduino 1.6.13 and hyper terminal software. The data values are sent to PC through Li-Fi module.

Methods and Methodologies

- Li-Fi (light fidelity) transmits data through illumination by sending the data collected by the sensors through a LED light bulb.
- Visible light communication technology is the method used in this model for the transmission of data at higher speed and accuracy.
- The intensity of an LED is more that a human cannot see it through the naked eyes.
- The data transmitted through light is in form of digital values (1's and 0's).
- The digital values (1) indicate on state and the digital values (0) indicate off state of the device.
- Sensors collect the analog information and send it the microcontroller that encodes the data and sends to the transmitting LED light module.
- Photo detector on receiver side observes the light source emitted by the LED light and sends the data to the PC.

Flow Chart

The Fig 1 show the flow diagram of the flow chart of the entire process. The first step that we start up with is the literature survey, the information are collected by referring journals, videos and books. After referring we designed the block diagram required for the model for transmitting and receiving the data collected.

The sensors namely heart beat sensor, tilt sensor photo interrupter sensor, glucose level sensor and temperature sensor collect the data in analog form and send it to the microcontroller which encodes the information by converting it into bit stream.

The encoded data is fed to the LED light module which transmit the information in the form of 0's and 1's. The transmission takes place at a very high speed that a human eye cannot detect. The LED light module consumes less power and produces faster bit transmission compared to other transmission medium.

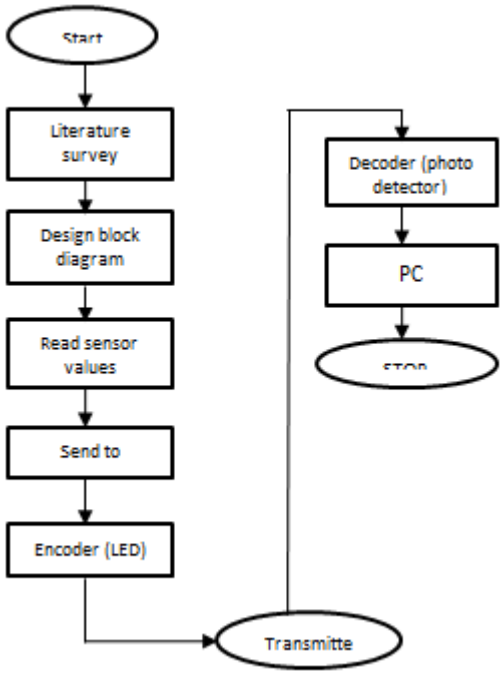

Fig 1: Flow diagram of Process

The receiver consists of a photo detector and a PC. The photo detector that we are using here is a IR sensor. At the receiving side the data is observed by the IR sensor and sent to the PC which displays the information sent by the LED light module and display it on screen of the PC. To find pulse rate mathematically the following equation is used

X= 1023*5/ (Aout)

Aout = Analog output.

The doctor can view the results sitting in the room and analyze the patient health. The information transmitted and received is accurate and secure because Li-Fi cannot be transmitted through the opaque medium. If any interruption occurred the notification will be sent immediately to the PC. This

process is constantly done until all the desired values are obtained.

Block Diagram

The Block Diagram consists of a Transmitter part and the Receiver part.

The transmitter part consists of controlling board that is Arduino ATmega328p. Arduino board is connected to the components such as Pulse sensor, Temperature sensor, Tilt sensor, Glucose Level sensor and Photo interrupter sensor and LED module. The microcontroller is connected to the LED transmitter.

The receiver part consists of a Photo detector and PC to receive the data values from the transmitter.

Both the sides that is the transmitter and the receiver together makes a complete block diagram along with the software's used that is Arduino IDE and hyper terminal software.

The below figure named as Fig 2 show the complete picture of the block diagram of the transmitting and receiving side.

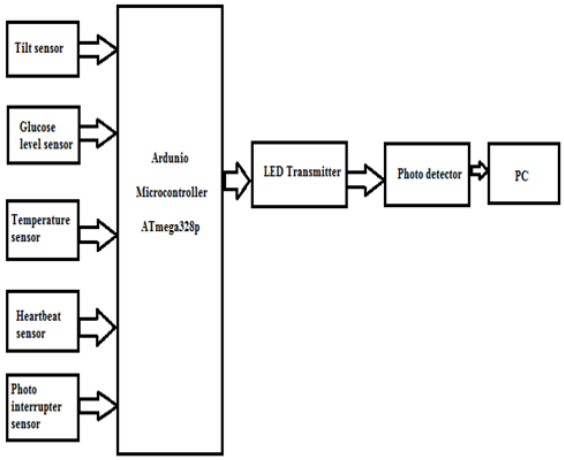

Fig 2: Block diagram of transmitter and receiver side

Expected Outcome:

- Time consumption is less.
- Loss in power is comparatively reduced.
- Strong connectivity.
- Accuracy and very high speed communication.
- Reliable and quick response.
- Safe and secure network.

Disadvantages by existing device:

- Wireless patient monitoring system requires an internet connection.
- Slight disturbance can cause the interruption in transmitting and receiving side.
- The receiver at the other end cannot receive the information if the client is not in line of sight.
- It cannot be used for long distance transmission because it cannot pass through opaque objects.
- Other sources of light may interfere with the signal while transmitting and receiving the information.

Advantages:

- The patient is monitored constantly.
- The doctor can view the information in his PC
- False reading of pulse rate and temperature of the patient is reduced
- Provides high security and privacy.
- Reducing electricity bill because it works on less power.
- And maintenance is comparatively less compared to other devices.

Applications:

- Other than hospital and healthcare field the Li-Fi technology can be used in schools, aviation and underwater communication wherever Wi-Fi is prohibited.
- In the automation field by using them in headlights and tail lamps of the vehicles.
- It is used in nuclear power plants since the communication is through light only unless like Wi-Fi which uses RF.
- It is used in location based services (LBS) for navigation and route mapping.
- It is also used in mobile connectivity for giving high data rates and also providing security.

Conclusion

Li-Fi is emerging as more suitable networks in next generation healthcare services in the hospital. Li-Fi network can be used as a high-speed, secure, and safe to human body. Using this technology in

medical field makes diagnosis faster and it could be a milestone in medical field.

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References

[1] Dr. S. Sudha, MS. Indumathy D, LAVANYA. A, Nishanti M, "patient monitoring in the hospital management using li-fi" 2016 IEEE International conference on Technological Innovation in ICT For Agriculture and Rural development (TIAR2016).

[2] Shivkumar. C, Rajeshwari, "Li-fi based Advanced Patient monitoring system" ISSN 2321-3361 2016 IJESC, DOI 10.4010/2016.1916

[3] Bharath B,Yaswant Digumarthi, Ravi T. and G. Jegan, "Bidirctional communication in li-fi technology" ARPN Journal of Engineering and applied sciences VOL. 11,NO.13,JULY 2016 ISSN 1819-6608

[4] M. Divya Reddy, Dr. Savita Sonoli, "Li-Fi based patientmonitoring system" ISSN 2319-8885 Vol.04, Issue.37, September-2015, Pages:7972-7975.

[5] Ankit Navalakha, Neelu Maheshwari, "Data Service of Li-Fi in Hospital Management" International journal of Science and Research (IJSR) ISSN (Online): 2319- 7064, Volume 3 Issue 8, August2014.

[6] "Li-Fi Technology" by Rahul R. Sharma, Raunak, Akshay Sanganal Department of Computer Engineering 2014.

[7] "Visible light communiction " by Rajan sagotra, Reena Agrawal Department of Electronics Engineering 2013.

[8] M. Kavehrad, "Sustainable Energy Efficient Wireless Applications Using Light, "IEEE Commom. Mag., vol.48, no.12, Dec. 2010, pp.66-73.

[9] D. C. O'Brien, "Indoor optical wireless communictions; recent develpoment and future challenges." In Free-Space Laser Communications IX, San Diego, CA, USA,2009, pp. 74640B12.

[10] https://en.wikipedia.org/wiki/Embedded_C.

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"Design of Multi Operation Robot for Precision Farming of Dicotyledones Crops"

Sahana.S[1], Sathvik Kashyap.C[2], Gururaja achar ayi[3], Tejaswini.C.J[4], Dr.Rehna V.J[5]

BE [ECE], M S Engineering College , Visvesvaraya Technological University(VTU), Bengaluru, Karnataka, India [1,2,3,4]

Professor & HoD , Dept of ECE, M S Engineering College , Visvesvaraya Technological University(VTU),
Bengaluru, Karnataka, India[5]

sahanas356@gmail.com,1, sathvikkashyap36@gmail.com,2, gururajaachar30@gmail.com3,
tejucj6313@gmail.com,4, rehnavj09@gmail.com5

ABSTRACT

This paper presents a system which operates for advanced agricultural process which includes cultivation based on the area defined for different dimensions of land scape on robotic platform. The multiple operation robot for dicotyledones crops such as groundnuts, corn, peas, beans etc…The farm is cultivated by the robotic system considering a particular rows and column specification. The multiple functions are operated in an single robotic platform such as ploughing, seed sowing, liquid fertilizing and water sprinkling. The obstacle detection in the path of the robot is detected by infrared sensors. The movement of the machine is predefined as per the dimensions of land. The renewable source of energy such as solar energy is used as our major source for the robot, solar pannels are used to charge the battery, the power supply is used as backup source. The microcontroller is Arduino mega 2560 which is programmed by the embedded C language is used in programing the microcontroller. The microcontroller will control and update the work processed by the agriculture robot which is performed by the system.

I. INTRODUCTION

Over population has been a major problem across the world. Especially in countries like india and china over population resulting drastic situations. In India, near about 70% peoples are dependent upon agriculture. The innovative idea of our project is to automate the process of sowing crops such as peas, beans, corn, groundnuts etc and To reduce the human effort and Increase the yield. As the population increases the demand for food materials also increases. Mainly countries like india, where Agriculture is backbone of country, will face many problems in producing food for total population.

II. PROCEDURE

The wastage of seeds are possible. Also the chances of falling of unnecessary seeds during sowing are possible. Hence in the nursery by maintaining proper environment required for growing of plants care is taken. After growing of plants those plants are taken and then they are used to plant in farm. For this the plants are produced by using a tray which has number of holes as per the requirements in those whole the coco-peat powder is used to fill half of the hole and is followed by the seeds in those holes. The seed feeding activity takes more time which results in less plantations of the seeds.

Proposed system requires IR sensors, Motor drivers, robotic arm and controller as main blocks for the design. Selection of Controller will be done on the basis of number required memory size, number of analog and digital input/output pins. Hence for system design ATMEGA 2560 (Arduino mega) microcontroller will be considered. Depending upon

number of peripheral used and memory size required for system design.

Fig1. Manual Seeding Technique

Proposed Block Diagram : Farming is done by an agricultural based robot system to perform multiple tasks as per the predefined commands. It also proper utilizes the resources available like seeds, fertilizers, there should be less wastage of things and complete the task in as minimum time as possible. By developing this robotic system with its multi-tasking agricultural features, it overcomes the difficulty of farmers in farming their land.

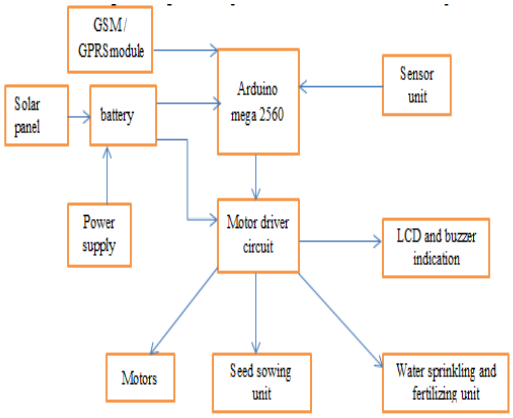

Fig 2. Basic Block diagram

The technique of seed preparation in ploughed land is based on row per column depending on the types of cultivation. The main part of the robot technique is sensor part. The sensor perform to identifying obstacles.

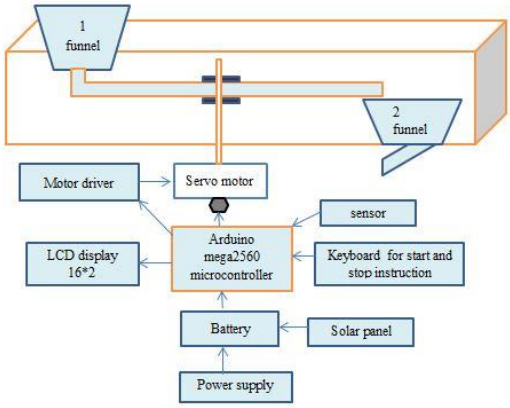

Fig 3. Seed Sowing Block Diagram

Table 1. Comparision between previous methods

SI.NO	PARAMETER	MANUAL	TRACTOR	ROBOTIC SYSTEM
1.	Operations performed	Single	single	Multiple
2.	Seeding technique	Manually	manually	automatically
3.	Man power	More	moderate	No
4.	Energy required	High	Very high	Less
5.	Time required	More	moderate	Less
6.	Labour cost	High	high	Initial cost only
7.	Pollution	No	more	No
8.	Distance between the seeds	Not fixed	Not fixed	Fixed
9.	Wastage of seeds	Moderate	more	Very less
10.	Buzzer and display	No	no	Yes

Need: The main requirement of automation is to save a lot of tedious manual work and speeds up the production process.The manual operation is becoming hard due to the lack of man power in agricultural field, the energy required for the tractors are more compared to the robotic system.By the tractors used in agricultural farm there is an pollution(sound,air pollution etc) are also becoming a big problem which is reduced to the maximum level by the automated systems.

III. RESULTS

The seed sowing operation is performed for the selected crops such as groundnuts, peas, corn, beans, green grambeans.(diecotyledon seeds). The land is ploughed and the seed is droped one by one to the farm fields then it is closed simultaneously.

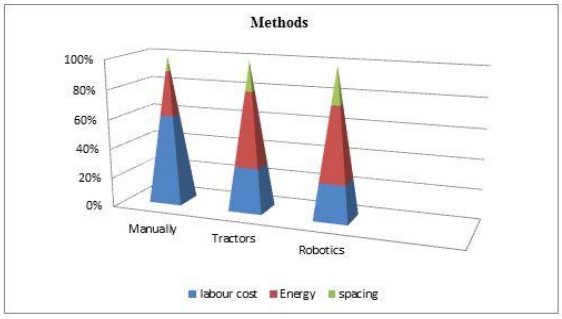

Fig. chart for advance method

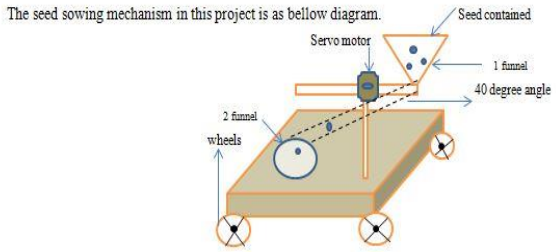

Fig.seed sowing operation

Sprinkling operation: This mechanism is used for two operation such as water sprinkling and liquid fertilizing to the improvement of crop production and supply the required amount of nutrition by the fertilizer.

The wastage of water can be prevented by this robotics based farming system.This system uses renewable source of energy for the movement of the complete system. There is a motor drive unit to run the DC motors attached to the nozzel where it is connected to the 2 different containers with a small DC water pump. DC motor used in this sprinkling unit is predefined to rotate it upto 180 degree .(-90, 0, +90) for both right and left movement.

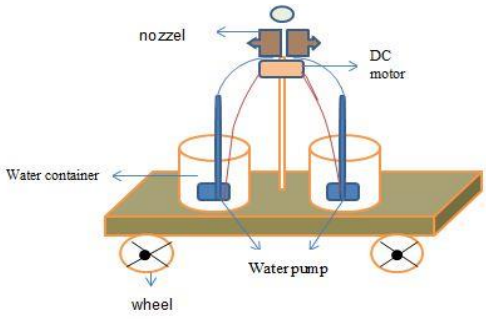

Fig. Sprinkling Mechanism

Sensors

The sensors is used to detect the obstacles on the path of the robot where it has to perform the seed sowing operation, then the robotic system takes a devation and start with the next predefined loop of the land.robotic system takes a devation and start with the next predefined loop of the land.

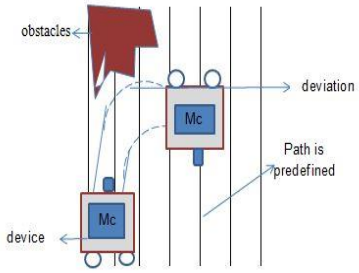

Fig. Path followed by the device

IV.SCOPE OF RESEARCH

The Present project aims at design and development of a robot based farming system for seed sowing, fertilizing and water sprinkling. A robotic system can be controlled by the microcontroller. The main aim for our project has been to develop a multifunctional agriculture based robot system operated by solar energy as a main source. In this system we used a solar panel to capture and convert solar energy into electrical energy which in turn is used to charge a battery, which then gives the necessary power required to the system. The seed sowing operation performed with the help of servo motors and the water sprinkling, liquid fertilizing operations are performed with the help of DC water pump and it is sprinkled to the farm.The single mechanism is used for both water sprinkling and liquid fertilizing operations.The solar robotic system is often used for many years.however,when there is scarcity of sunlight the batteries can be recharged with the help of powersupply. This power is then transmitted to the wheels through gear drives. In this project an attempt is made to make the electric and mechanical systems share their powers in an efficient way. The environmental pollution is prevented by the new technologies introduced into the agricultural stream. since the fossil fuels are depleting, probably may last within the decades to come or earlier, and to reduce the running cost of

the machine, we are in an attempt to incorporate the above mentioned features in our Multi Purpose Agricultural robot. The objective of this paper is to develop a microcontroller based system that helps in on farm activities like seed sowing, spraying the fertilizer and watering the plants at designated the autonomous robot. The process of seeding is done by using the servo motor. The aim of the paper is reducing the man power and increases the productivity rates.

V.CONCLUSIONS

The project aimed at developing "SEED SOWING, WATER SPRINKLING AND LIQUID FERTILIZING USING AN ROBOTIC BASED FARMING SYSTEM". A machine assembled using the above-mentioned idea successfully seedling, watering and fertilizing to the large areas of land without human intervention.The technology deployed in this work is an interface between aspects of robotics and mechnical operations. India, being a nation with an agriculturist economy, would be greatly helped by such an invention that takes off an extra burden from the shoulders of small and large-scale farmers, who are not able to afford the agricultural instruments like tractors they can easily invest on the automated robotioc systems.

The system performs more than one operation is very useful for the farmers who are having a small land areas.

REFERENCES

[1]. A. R. Kyada & D. B Patel,DEC 2014 "Design And Development Of Manually Operated Seed Planter Machine" of Lecture 5th International & 26th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2014) ,IIT Guwahati, Assam, India. Vol 2.

[2]. D. Ramesh , H.P. Girishkumar,JULY 2014" Agriculture Seed Sowing Equipments: A Review" , ISSN N0.:2278-7798,Volume3.

[3]. A.Kannan , K. Esakkiraja , S. Thimmarayan, JAN 5014 "Design And Modification Of Multipurpose Sowing Machine" VOL:2 ,ISSN (ONLINE): 2321-3051.

[4]. Roshan V. Marode, P.Gajanan, and K.Swapnil ,OCT 2013 "Design & Implementation of Multiseed Sowing Machine", Vol: 2,No. 4, ISSN No.: 2278-0149, patented

[5]. A. Rohokale , 2004 "International journal of advanced agriculture system with proper seed spacing"

[6]. B.Shivprasad, M. Ravishankara, B.Shoba.,2010 "Design And Implementation Of Seeding And Fertilizing Agriculture Robot", Volume 1(3)190-213

[7]. P. Bhargavi, Dr.S.Jyothi.,2011 "Soil Classification Using Data Mining Techniques : A Comparative Study", Vol:2,ISSN:2231-5381(IJETT).

[8]. Prof.C.H.Chavan, Mr.P.V.Karande., "Wireless Monitoring of\ Soil Moisture, Temperature & Humidity Using Zigbee in Agriculture", Vol:11,ISSN:2231:5381(IJETT).

[9]. Sahana.S,Sathvik Kashyap.C,Gururaja Achar Ayi,Tejaswini.C J "Design and Development of a Robot Based System for Precision Farming" SSRG IJEEE- Volume 4 Issue 3-March 2017.

AUTHOR PHOTOS AND BIOGRAPHY

Sahana.s Email –id: sahanas356@gmail.com , 8th sem Electronics and communication department M.S Engineering College, Banglore,Karnataka,India.

Sathvik kashyap.c Email –id: sathvikkashyap36@gmail.com, 8th sem Electronics and communication department M.S Engineering College, Banglore, Karnataka, India.

Tejaswini .c.j Email –id: tejucj6313@gmail.com, 8th sem Electronics and communication department M.S Engineering College, Banglore, Karnataka, India.

Gururaja achar ayi Email –id: gururajaachar30@gmail.com , 8th sem Electronics andcommunication department M.S Engineering College, Banglore, Karnataka, India.

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Design and Implementation of a Smart Automated System for Plant Phenotyping

G T Ramesh[#1], Shwetha R[*2], Hari Krishna K S[#3], Manoj Varama S[*4], Sunitha P H[#5]

Department of Electronics and Communication Engineering, M S Engineering College, VTU Navarathna Agrahara, Sadahalli Post, International Airport Road, Bangalore-562110, Karnataka, India

sushreeanju@gmail.com

ABSTRACT

The present paper describes the Low-Cost Electronic Automation Unit for Plant Data Acquisition in Plant Phenotyping in which the whole system is made automatic controllable through the sensors. The image capturing of the plant that is the Plant Phenotyping process is done at different angles using a camera and a servo motor. The regular watering system is done automated by obtaining two different results of the water content of the soil present in that particular pot where the plant is present that is through Image Processing, and the Load of the Pot . Automated watering system to the Pot is done through the Solenoid water valve comparing with the results of the water content present in soil.

I. INTRODUCTION

In the Smart Electronic Automation Unit for Plant Data Acquisition in Plant Phenotyping shows that the number of plants are placed in individual tray and are mounted on the belt of a DC Motor. To make this system automated, the prototype to take images of the plant at different angles without the presence of human being and to water the plant automatically when the humidity is less than the desired value is developed. In the Electronic Automation Unit for Plant Data Acquisition in Plant Phenotyping shows that the number of plants are placed in a tray and are mounted on the belt of a DC Motor. The Automation Unit required to sense the presence of plant or the pot requires IR Sensor. For the continuous motion to make all the plants move uniformly, we require DC Motor and for angle rotation of the plant to capture the pictures of the plant at different angles we use Servo Motor. And for capturing of the pictures of the plant we use Camera. Initially, the DC Motor moves the tray of plants on the belt for the process of Plant Phenotyping. The IR Sensor detects the presence of the plant in the system and this is used because there are certain cases where the plant may be present or may not be present in the pot, in this case if the IR Sensor does not detect the plant, the DC Motor will never stop that particular tray at that instant of time and moves forward to the next plant and hence saving the time and power.

The Automation Unit requires an Inductive Proximity Sensor to sense the individual metal tray and an IR Sensor to detect the object that is the Pot. For continuous motion to make all the plants move uniformly, we require a DC Motor and for angle rotation of the Pot to capture the pictures of the plant at different angles we use Servo Motor. Once the DC Motor shaft switches ON, the number of pots placed on that tray starts moving and the IR Sensor and Proximity Sensor gets activated. Once the IR Sensor and Proximity Sensor become high, the DC Motor stops rotating and the Servo motor switches ON. The Pot is rotated at required angles using Servo motor and the image of the plant is captured by the camera and is sent to the receiver either Mobile or PC through WiFi or Bluetooth. At the same time the Load sensor checks for the weight of the Pot and determines the amount of water absorbed by the plant. Later the image of the soil in the pot is taken by the camera to find out the water content in the

soil through Image Processing. Once the water content is found to be low compared to the default value, automated watering system is done using Solenoid water valve and this process repeats for the remaining number of pots on the belt.

II. PROCEDURE

Initially the model is set up consisting of a Servo and DC Motors, Conveyor Belt, IR Sensor, Arduino Controller, Camera, Load Sensor, Soil Sensor, Solenoid Water Valve, WiFi or Bluetooth Module.

For the process of Plant Phenotyping, it is required that the images of the plant at different angles have to be taken by the camera and hence we use Servo Motor and is automated at the angles required for the Plant Phenotyping. Camera is used to capture the images of the plant at different angles. Once the pictures are captured from the Camera, the captured image is sent to the cloud using an android application. The images from the cloud can be accessed through Mobile Device at any instant of time. Here, the Electronic Automation Unit for Plant Data Acquisition in Plant Phenotyping method solves the issue of time consumption and replaces the work of the scientist. The captured image signals from camera to cloud and from cloud to the mobile device is to make sure that even if the scientist is not at the lab at that particular instant of time, the scientist ensures that the operation is normal by receiving the signals. The present automation in the industry which is going on is economically costlier as it requires around 30crores for installing in a lab and is time and power consumption and effectively requires man power in the process of capturing the pictures. In this Plant Phenotyping process, the load of the pot is weighed using load sensor and by using certain mathematical calculations the humidity of the soil is found and will be watered through the water solenoid respectively. Once it finds the humidity content of the soil it matches with the default measurements of humidity. If the humidity is less compared to the default readings, the Solenoid Water Valve opens and the particular pot is watered with certain measurements.

A. Model

In the Smart System Automation Unit for Plant Data Acquisition in Plant Phenotyping shows that the number of plants are placed in individual tray and are mounted on the belt of a DC Motor. The Automation Unit requires an IR Sensor to detect the object that is the Pot. For continuous motion to make all the plants move uniformly, we require a DC Motor and for angle rotation of the Pot to capture the pictures of the plant at different angles we use Servo Motor. Once the DC Motor shaft switches ON, the number of pots placed on that tray starts moving and the IR Sensor gets activated. Once the IR Sensor becomes high, the DC Motor stops rotating and the Servo motor switches ON. The Pot is rotated at required angles using Servo motor and the image of the plant is captured by the camera and is sent to the receiver through the android mobile application. At the same time the Load sensor checks for the weight of the Pot and determines the amount of water absorbed by the plant. Once the water content is found to be low compared to the default value, automated watering system is done using Solenoid water valve and this process repeats for the remaining number of pots on the belt.

B. Software Used

The Software's used for this Design is Arduino 1.6.13, Matlab, and a Camera Application for Mobile Phone or PC. The main coding part has been done using Arduino 1.6.13 and the Image Processing has been done using Matlab and the images of the plant has been transferred to the Mobile or PC through WiFi or Bluetooth through a Camera application.

III. DESIGN

The Block Diagram consists of a Transmitter part and the receiver part. The transmitter part consists of two controlling boards that is Arduino Diecimilia or Arduino Mega 2560 and Raspberry-Pi. Arduino board is connected to the components such as DC and Servo motors, IR sensor, Proximity sensor, Load sensor, and Solenoid water valve and WiFi module or Bluetooth module. The Raspberry-Pi board is connected to the camera. The receiver part consists of a mobile phone or a PC to receive the images from the transmitter either through WiFi or Bluetooth. Both the sides that is the transmitter and

the receiver together makes a complete block diagram along with the software's used that is Arduino 1.6.13 and Matlab and the self created camera application. The below figure named as Fig 3 shows the complete picture of the block diagram of the Smart Electronic Automation Unit with all the components. The Block Diagram consists of a Transmitter part and the receiver part. The transmitter part consists of a controlling board that is Arduino Diecimilia or Arduino Mega 2560. Arduino board is connected to the components such as DC motor, Servo motor, IR sensor, Load sensor, and Solenoid water valve. The receiver part consists of a mobile phone or a PC to receive the images from the cloud. Both the sides that is the transmitter and the receiver together makes a complete block diagram along with the software's used that is Arduino 1.6.13 and an android camera application. The below figure named as Fig 1.1 shows the complete picture of the block diagram of the Smart System Automation Unit with all the components.

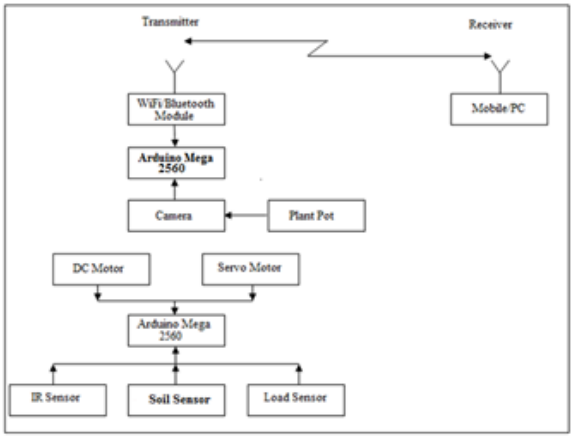

Fig 1: Block Diagram of Smart Automation Unit

IV. RESULTS

The Smart Automated System measures the load of the pot automatically and waters the plant measuring the humidity in the soil and hence replaces the scientist for a major work in less time. The image of the plant is taken by the camera and is image processed to find out the size such as height and width of the plant or stem.

Output Graph:

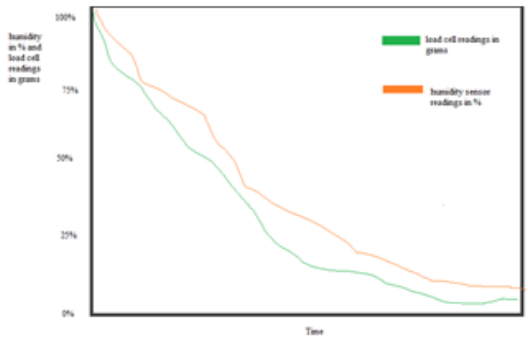

Fig 2: Graph plot of Load cell readings and humidity sensor readings vs Time

Equations:

Below equation shows the image processed where the size of the plant such as height and width is found out. X shows the size in millimeter and Y shows the value in pixels.

To convert pixels to Millimeter(mm)

X=Y*0.264583

X= value in Millimeter(mm)

Y= value in pixel.

A. Expected Outcome:

- Reduction in Time Consumption.
- Reduction in Power Loss.
- Increase in Speed and Accuracy.
- Replacing the scientist along with fast work.
- Automated watering system through solenoid
- Self-developed application for image transfer.
- Processing of image to find the water content in the soil.

B. Disadvantages by existing device:

- The cost of multispectral or hyper-spectral cameras is relatively expensive.
- The system cannot work under normal conditions without the help of the scientist.
- Time consumption is very high for the entire process.
- Economically complex methods to find humidity of the soil.
- No procedures or process to find the water content of the soil through the image.
- There is no automated watering system with the existing device.

C. Advantages:

- Reduction in Time Consumption of the system using Electronic Automation Unit.
- Replacing or simplifying the work of the Scientist.
- Economically simple methods to find the moisture content of the soil.
- Images of the plant at different angles.
- Live images of the Process from the system to the scientist.
- Automated watering system through the measurements of the humidity of the soil.

D. Problem Statement:

- Since the number of plants are more, it is necessary to develop a system which captures the images of the plant in a required way in a short time span.
- There is a requirement to design a system to overcome the problems such as power consumption, time consumption and high cost.
- A smart system is required where the desired pot is bought to capture the images and process it and water it automatically.
- Work of the scientist to be simplified or replaced by the smart system.

E. Applications:

- Can be widely used in the field of Agriculture.
- Can be used in the field of Horticulture.
- Can be used in Plant Research Centers across the world which is cheaper.
- The system idea can be implemented in Traffic system.
- Cheaper way of determining the water content and the same procedure can be implemented in different fields.
- Concept is best suited for industrial applications and hence can be widely used in machineries.
- Can be successfully applied to all the Plant Phenotyping Labs at any place.

Conclusion:

The problems solved by our system is, it is cheaper compared to present system, the plant is watered when the humidity is less than the desired value, the system can be controlled by the scientist without being present in the lab, the pot can be rotated at different angles and the images are transferred through the self developed camera application either through Bluetooth or WiFi.

Acknowledgment:

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in ushering in a great deal of effort, time and valuable guidance. I would like to thank our Dean and Head R&D at MSEC, Dr. Cyril Prasanna Raj P, for providing valuable suggestions, relentless support, help and guidance during this project. I would also like to thank our guide, Prof. SUNITHA P H, Associate Professor, Department of Electronics & Communication Engineering for providing valuable suggestions and for guiding throughout the course of our project.

References:

[1] C. Granier, L. Aguirrezabal, K. Chenu, S. J.Cookson, M. Dauzat, P. Hamard, J.-J. Thioux, G.Rolland, S. Bouchier-Combaud, A. Lebaudy, B. Muller,T.Simonneau, and F. Tardieu, "PHENOPSIS, anautomated platform for reproducible phenotyping ofplant responses to soil water deficit in Arabidopsisthaliana permitted the identification of an accessionwith low sensitivity to soil water deficit.," New Phytol.,vol. 169, no. 3, pp. 623–35, Jan. 2006.

[2] M. Bylesjö, V. Segura, R. Y. Soolanayakanahally, A. M. Rae, J. Trygg, P. Gustafsson,S. Jansson, and N. R. Street, "LAMINA: a tool for rapid quantification of leaf size and shape parameters.," BMC Plant Biol., vol. 8, no. 1, p. 82, Jan. 2008.

[3] A. Hartmann, T. Czauderna, R. Hoffmann, N.Stein, and F. Schreiber, "HTPheno: an image analysis pipeline for high-throughput plant phenotyping.," BMC Bioinformatics, vol. 12, no. 1, p. 148, Jan. 2011.

[4] D. Houle, D. R. Govindaraju, and S. Omholt, "Phenomics: the next challenge.," Nat. Rev. Genet., vol. 11, no. 12, pp. 855–66, Dec. 2010.

[5] R. T. Furbank and M. Tester, "Phenomics--technologies to relieve the phenotyping bottleneck." Trends Plant Sci., vol. 16, no. 12, pp. 635– 44, Dec. 2011.

[6] M. Yamasaki and G. Arturo, "FieldBook : development of the bar-coded phenotyping system and the integration into plant breeding and genetics(Proceedings of the 40th Symposium),. Crop Res., no. 57, pp. 55–59, 2012.

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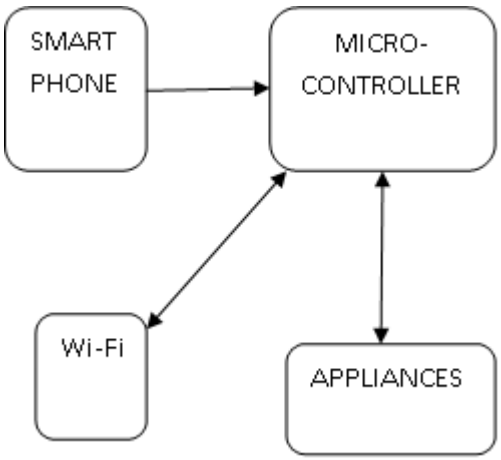
INGENIOUS HOMES

SWETHA T N[1], GIRIDHAR P S[2], HARISHANKAR S R[3], PRAMOD K P[4]
[1]Asst. Professor, Department Of ECE, S.J.C.I.T
Swethareddy.t.n@gmail.com
Department Of ECE, S.J.C.I.T
[2]ps.giridhar@gmail.com,[3]hariharry1997@gmail.com,[4]pramodkp2244@gmail.com

ABSTRACT
In today's world scenario internet has a major control of electronic devices that are connected to one another leading to development of automation technology, embedded systems and Internet of Things which is high above the sky limit. Every minute more number of devices is being connected to another device via internet forming a massive network. As IOT is broadly based on four components embedded system, Cloud, Network, Mobile. Most of the devices have the capability of self-generating Wi-Fi hotspot facility, which can be used for connectivity. The devices/appliances come with another interesting facility GPRS/GSM connectivity, which provides easy accessibility in control of devices within the specific range. This paper provides information on smarter, safer and automated home infrastructure and control of appliances through a smart phone or any smart devices. The paper also aims to propose smarter appliances with the effectiveness of Internet of Things (IOT).

I. Introduction:

Internet of Things has a massive network in the growing technology, where almost every electronic device is connected to internet for its functioning. Through internet an individual can communicate any individual across the globe, provided there is an internet facility available with them. The IOT is also called as The Internet of Objects, refers to a wireless network between objects, usually the network will be wireless and self configuring, such as household appliances. Internet has lead to emerging of smarter technology in everyday life. With growing demand in automation also, it has lead to utilization of internet. Intelligent systems provide less work to humans as they are being controlled by smart device that make the decisions accordingly. IOT has vast application in robotics and automation. A automation system is a means that allow users to control electric appliances of varying kind. In contrast, wireless systems can be off great help for automation systems. with the advancement wireless technologies such as Wi-Fi, Cloud networks in the recent past, wireless systems are used every day and everywhere.

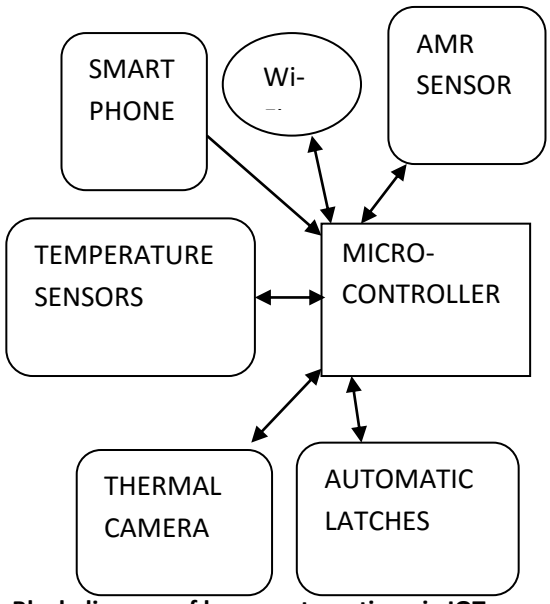


Block diagram for control of appliances using IOT

These devices work via cloud computing and Fog networking that utilize internet for its working. The devices are connected to one common Wi-Fi network, the signal from an application in smart phone gives the command to the specified

automatic appliance, it is reached via cloud computing.[3]

II. Methodology:



Block diagram of home automation via IOT

The existing automated devices are controlled using IR Systems such as Television, AC, Set-up box etc. Internet of Things on home automation [1] [2] works on the basis of providing remote access using smart devices utilizing GPRS/GSM connectivity. The command from smart phone is sent to the respective microcontroller for its operation. The microcontroller has access to Wi-Fi facility; the micro controller can control any appliances that are accessible through the microcontroller. The smart phone can control the appliances and controllers from anywhere. The automatic latches are equipped with intelligent infrared detectors, this sensor detects the presence of human near the door and the door opens automatically, the door can be locked when not in use. The door can either be locked or unlocked through a smart phone or any other smart device. The presence of thermal infrared cameras makes the home even safer, the camera can detect the presence of any unauthorised person breaking into the house and can send a signal to the owner. Temperature sensors are used in intelligent cooling systems like air conditioners, temperature sensor senses the temperature in both inner and outer surrounding environment. The gate of the house is equipped with Anisotropic Magneto-Resistive (AMR) sensor; these sensors are capable of detecting vehicles near them. When a vehicle approaches, the gate opens automatically; these sensors are also controlled by the smart phone, when not in use the gate can be locked. The purpose of a smart phone or any other smart device is that it can be used to control and monitor the sensors and appliances in the network. These smart devices provide security over the house, an individual can be more secured through it. The application is developed to serve the individual and is accessible through internet only, it is programmed in the smart devices to control the appliances and the sensors connected to it.

- **Smart phone:** Any smart phone with latest android software installed, the application for the management is developed using Java or C++ in Linux Software.[5]
- **Micro-controller:** The micro-controllers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, power tools and other embedded systems. By reducing the size and cost compared to a design that uses a separate microprocessor, memory and input/output devices, microcontrollers make it economical to digitally control even more devices and processes. Micro controller TM4C123G is used.[3]

Figure 1: TM4C123G Microcontroller

- **Sensors:** The sensors that are used in this project are thermal sensors, magnetic field sensors, temperature detection sensors. These sensors are programmed to benefit the person. The person when entering a room the temperature sensor detects and adjusts the environment according to person body temperature and the environment present around the house.
- **Thermal Camera:** The thermal camera used is DM60 as shown in the figure below, this camera can detect any individual is present in its visual range. The individual can be viewed through the camera as a warm body against cooler backgrounds. By this an individual can be easily detected under any climatic conditions. By the movement of an individual the door sensors, lighting of the room can be switched ON or OFF, depending on the availability of the person. This camera can be controlled and monitored through internet.

Figure 2: Thermal Infrared Camera

- **Temperature Sensors:** The temperature sensor used is LM35 as shown in the figure below is an intelligent sensor that senses the outer environment and maintains the inner environment in a cool environment. It is used in air conditioner as an intelligent temperature sensor.[3]

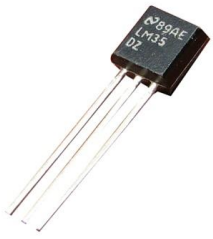


Figure 3: LM35 temperature sensor

- **Anisotropic Magneto-Resistive sensor:** Anisotropic Magneto-Resistive sensor as shown in the figure below is popularly known as AMR sensors. These sensors can be used not only in the automatic opening of gate but also in parking lot detection, rail road control, traffic monitoring also. These sensors detect the presence of vehicle by 3-2 axis magnetic field sensing. As the vehicle approaches near to the gate, the sensor detects and opens the gate. The sensor can be controlled through the smart device when not in use.[4]

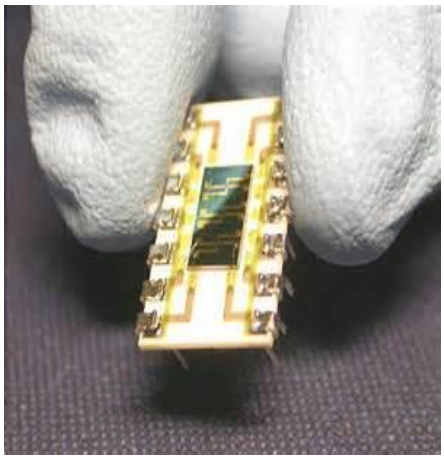


Figure 4: Magneto-resistive sensor

III. Result:

Automation along with robotics has reached its certain advancement it can be controlled using any controlling system. Internet is so advance that any person can access it anywhere. The home automation is developed for its easy accessibility, time, and energy conservation purpose. This paper mainly focuses on power and data management. The micro-controllers and other controlling devices consume minimum power and deliver maximum efficiency in its operation. An individual can control his home from anywhere through the application developed in the smart phone.

The technology is improving day by day for a secure environment to the people. An individual need not worry about his house being robbed, he/she can monitor the house anywhere and know regarding the safety aspects of the house and their belongings.

IV. References

[1]. P. Gaikwad, J. Gabhane, and S. Golait, "A survey based on smart homes system using internet-of-things," in Computation of Power, Energy Information and Communication (ICCPEIC), 2015 International Conference on, April 2015, pp. 0330–0335.

[2]. V. Sagar K N and K. S. M, "Home automation using internet of things," International Research Journal of Engineering and Technology, vol. 2, no. 3, June 2015.

[3]. B.R.Pavithra, "Iot based monitoring and control system for automation," pp.169-173, April 2015.

[4]. *De Ranieri, E.; Rushforth, A. W.; Výborný, K.; Rana, U.; Ahmed, E.; Campion, R. P.; Foxon, C. T.; Gallagher, B. L.; Irvine, A. C.; Wunderlich, J.; Jungwirth, T. (10 June 2008), "Lithographically and electrically controlled strain effects on anisotropic magnetoresistance in (Ga,Mn)As"*.

[5]. D. Wang, D. Lo, J. Bhimani, and K. Sugiura, "Anycontrol – iot based home appliances monitoring and controlling," in Computer Software and Applications Conference (COMPSAC), 2015 IEEE 39th Annual, vol. 3, July 2015, pp. 487–492.

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INTELLIGENT OROPHARYNX EXAMINER FOR INFANTS

Giridhar V B[1], Sahana R S[2], Sherly T S[3] , Steve F Solomon[4] , Natya[5]

[1-5]Department of Electronics and Communication,M S Engineering College, Bangalore, India

ABSTRACT

Wheeling through the process of finding a device to examine the oropharynx (throat) which consists of the trachea and portion of oesophagus as the infants are prone to infections concerned with the throat mostly due to seasonal changes and also due to lack of immunity in them. Over the last few years, the doctors across the globe have noticed a graphical increase in infections related to the throat, and have estimated that a little over 2 million people have been subjected to the throat related problems, mainly involving women and children. A recent study shows that every alternate patient who visit paediatricians suffer from throat related problems. In this paper we are developing a device wherein the transmitter module is interfaced with the camera which is used for monitoring the oropharynx, this device consists of light emitting diodes which acts as a source of light to scan the area required. In addition to this we develop an app on the users(doctor) phone in which the control unit is present functioning the camera to screen the image on the phone , and to control the switching action of the Led together recording the entire session.

Keywords- Oropharynx, Oesophagus, WIFI Module, Throat

I. INTRODUCTION

Over the last few years, the doctors across the globe have noticed a graphical increase in infections related to the throat, and have estimated that a little over 2 million people have been subjected to the throat related problems, mainly involving women and children. A recent study shows that every alternate patient who visit paediatricians suffer from throat related problems.The throat infection is frequent in children generally aged below five (years) due to factors such as lack of immunity to adjust to seasonal changes, deficiency of Iodine content in their food. Amidst various reasons that lead to throat infection like scarcity of thyroid hormone (Thyroid Hormone is produced by Iodine), the other major contributor is the cold environment (i.e., winter and rainy seasons).

However, the present measures to treat throat infections, in case of infants include the usage of Tongue depressors, Spatulas of various shapes and sizes and torch (light source) by the doctors to view the inner mouth a little beyond Uvula. On the other hand for adults various assessment tools such as Flexible fibre optic laryngoscope, Flexible fibre optic bronchoscope etc., are utilized to examine larynx and beyond.Considering infants, doctors have a tough time pacifying the child to access its mouth by the means of spatula or tongue depressors; it becomes more cumbersome when the child fails to cooperateThis type of assessment has several limitations such as inability to view the area beyond Uvula. Considering several research reviews, we can clearly understand that there is a necessity of a handy device or gadget that can capture visuals starting from interior of the mouth (which includes the oral cavity that can also help in dealing with teeth related issues such as cavities and vitamin deficiency) all the way down till larynx. This device will be recommendable as a better approach to deal with the oral examination pertaining to the child

II. BLOCK DIAGRAM

The block diagram depicts the image processing of the captured image. Initially an image that is captured by the camera is to be processed so as to detect the abnormality in the interior region of the throat. A pre-processing is performed on the

captured image using matlab, the pre-processing procedure includes the reading of the image from the folder, resizing the same, converting it into gray scale and finding its pixel intensity. The pre-processed image is then segmented to reduce the computational time. The total pixel intensity of the 1st row in the image is found and it is divided by the number of pixels in that row, the same procedure is carried out for all the rows. Similarly the total pixel intensity of the columns are also found using the exact method. This procedure is applied on both normal and abnormal images and their respective stem plots are compared to find the approximate values of the affected areas. Based on these approximate values, a threshold is applied to the image which displays only the affected areas(Region of Interest) in the throat while the rest of the region is blackened out. The entire computation is performed on different types of images such as RGB, Gray scale, Indexed image, bitmap image.

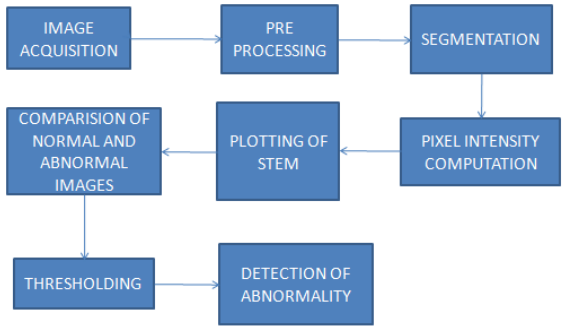

Fig: Block diagram of image processing

III METHODS AND METHODOLOGIES

- The major principle of this project is to find out the affected portion of the interior region of the throat
- The project consists of an endoscopic camera that captures the image of the interior region of the throat.
- It also consists of an android application that uploads the image to the cloud, where the matlab code is run. Thus, performing the image processing on the uploaded picture.
- The image processed picture is retrieved to the phone by the same mobile application that uploaded the captured picture.
- The stem of the Region Of Interest (ROI) is plotted of both normal and abnormal image.
- The comparison between the plots help detect the abnormality in the interior region of the throat

A. Disadvantages by existing device:

- If there is any damage to the camera, the entire system must be replaced.

B. Advantages:

- Cost-effective, weight less, no delay in capturing images.
- Portable and safe .
- Live streaming of video can also be carried out.

C. Problem Statement:

- Project module can be used for recording and capturing images of the interior region of the throat with high clarity
- Image processing is computed and performed on the cloud and its results are retrieved by the android application .
- Being a paediatrician is rewarding and challenging work, but how do they overcome the unique challenges that come with the job?
- When treating young kids and developmentally delayed patients who can't explain their symptoms, paediatricians must also be good detectives
- In order to overcome these problems, this design acts as a supplement to the existing instruments as we design the device in the shape of a lollipop which is a better approach to treat the infants thus making the work easier and for better examination of the inaccessible areas

D. Conclusion

In this paper, we presented the intelligent oropharynx throat examiner for infants by using the image acquisition and processing system. We set a combination of the image processing and thresh holding to detect the abnormality of the interior throat region. As a result, we are focussing in detecting the abnormality in the inner throat area. Future prospect of this system is to make the larger

work space of throat examiner and to build more interactive system for remote operation which can control the camera position and orientation.

E. Acknowledgment

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in ushering in a great deal of effort, time and valuable guidance. I would like to thank our guide and Associate Professor Ms.Natya S of M S Engineering College for providing vital suggestions, relentless support, imperative help and guidance throughout the course of our project.

REFERENCES

[1]. Kritchanon Jirawanitcharoen, Supaporn Kiattisin, Adisorn Leelasantitham, Prawat Chaiprapa, "A method of detecting tonsillitis images based on medical knowledge and neural network",IEEE transaction 2009.

[2]. Brian H. Hahn, Daniel T. Valentine " Essential Matlab for Engineer and Scientists", sixth edition, Elsevier

[3]. Mueller, John Paul, Sizemore, Jim "MATLAB For Dummies" , fourth edition, Wiley publications

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Design of Zig Bee Based Multi-Sensor Mobile Robot

Pavithra S[#1], Balasubramanya S[#1], Sunitha P H[#2]

[#1]Dept. of Elect. & Comm. Engg., MSEC, Banaluru, Karnataka, India
[#2]Associate Professor , Department of ECE,MSEC
NavarathnaAgrahara,SadahalliPost, InternationalAirport
Road Bangalore, Karnataka, India
1pavithras1895@gmail.com;1balasubramanyas7@gmail.com;2sushreeanju@gmail.com

ABSTRACT

Robotics is one of the fastest growing engineering fields of today. Robots are designed to remove the human factor from labour intensive or dangerous work and also to act in inaccessible environment. Mobile robots are routinely deployed to support fire brigades in search and rescue missions. To help the robot evaluate situations involving fires, a novel multi-sensor module has been designed and implemented. Ambient air is drawn into inner chambers by a micro air pump and then parameters including temperature, humidity, airflow rate, particle (smoke) density, critical toxic, hazardous and explosive gases levels are recorded. Three different kinds of sensors have been used they are temperature sensor, pressure sensor gas sensor. Wireless technology named ZigBee is used to control the mobile robot. Arduino board is used along with four DC motors for monitoring the robot.

Keywords—gas sensor; temperature sensor; pressure sensor; Mobile robot ; ZigBee; Arduino

I. INTRODUCTION

Mobile robots are currently used to support the emergency services that manage first response to disaster and fire scenarios. These situations are associated with harsh environments, which represent severe risks for the deployment of human beigns. This project is mainly implemented for industrial applications. mainly for detecting the damages inside the oil pipe that cannot be detected by human beings. Kroto is the Greek word meaning to crack. Inside the pipe, there is very heavy temperature, pressure and toxic gases. So we are implementing a robot that have a camera, temperature sensor, pressure sensor etc which is used to detect the crack and conditions inside the pipe. This data from all the high precision sensors will be transmitted using ZigBee module from the robot to the controlling android device. The robot incorporates a wireless camera and the data from the cam is transmitted to the TV monitor. We are controlling the robot through an android application in which camera rotation and robot movements are controlled. A multi-sensor platform has been designed and implemented The current state-of-the-art is that the most common commercial types of sensors, which are electro-chemical, optical, catalytic and semiconducting, suffer from major deficiencies that make them difficult to use in this scenarios. They are also generally expensive, bulky, poor selectivity and slow response/recovery times.

II. DESIGN OF THE MODULE

A. Diagram

1.ZigBee CC2500

CC2500 is a FSK /MSK Transceiver module. It provide extensive hardware support for packet handling ,data buffering ,burst transmissions ,clear channel assessment, link quality indication and wake on radio . Its data stream can be Manchester coded by the modulator and decoded by the demodulator .It has a high performance and easily

to design your product. It can be used in 2400-2483.5MHz ISM/SRD band systems, Consumer Electronics, Active RFID, Wireless game controllers, wireless KB/Mouse and others wireless systems.

Fig 1: zigbee cc2500

Features

- Low current consumption.
- Easy for application.
- Efficient SPI interface.
- Operating voltage :1.8~ 3.6 Volts.
- Available frequency at : 2.4-2.483GHz.
- Programmable output power and hghi sensitivity.

2.Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Fig 2:Arduino Board

The Arduino board exposes most of the microcontroller's I/O pins.. The Diecimila, Duemilanove andcurrent Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.1-inch (2.54 mm) headers. Several plug-in application shields are also commercially available. The Arduino Nano, and Arduino-compatible Bare Bones Board and Boarduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.

Many Arduino-compatible and Arduino-derived boards exist. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education, to simplify making buggies and small robots. Others are electrically equivalent but change the form factor, sometimes retaining compatibility with shields, sometimes not. Some variants use different processors, of varying compatibility.

III. CRITICAL DEVICES AND MEASUREMENT

A. Temperature sensors

An analog temperature sensor is pretty easy to explain, it's a chip that tells you what the ambient temperature is.

These sensors use a solid-state technique to determine the temperature. That is to say, they don't use mercury (like old thermometers), bimetallic strips (like in some home thermometers or stoves), nor do they use thermistors (temperature sensitive resistors). Instead, they use the fact as temperature increases, the voltage across a diode increases at a known rate. (Technically, this is actually the voltage drop between the base and emitter - the Vbe - of a transistor. There are two temperature sensing methods they are contact and non-contact. Contact types of temperature sensor are required to be inphysical contact with the object being sensed and use conduction to monitor changes in temperature. They can be used to detect solids, liquids or gases over a wide range of temperatures..Non-contacttypes of temperature

sensor use convectionand radiation to monitor changes in temperature. They can be used to detect liquids and gases that emit radiant energy as heat rises and cold settles to the bottom in convection currents or detect the radiant energy being transmitted from an object in the form of infra-red radiation .

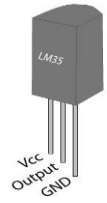

Fig 3: LM35 Temperature sensor

The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 sensor thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 sensor does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D sensor is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

B. Pressure sensors

A pressure sensor is a device which senses pressure and converts it into an analog electric signal whose magnitude depends upon the pressure applied. Since they convert pressure into an electrical signal, they are also termed as pressure transducers.

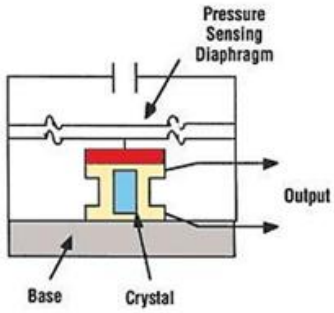

Fig 4:Piezoelectric pressure sensor

Piezoelectric crystals develop a potential difference (i.e. voltage is induced across the surfaces) whenever they are subjected to any mechanical pressure. These sensors have the crystal mounted on a dielectric base so that there is no current leakage. Attached to the crystal is a horizontal shaft to which a diaphragm is connected. Whenever the diaphragm senses pressure, it pushes the shaft down which pressurizes the crystal and voltage is produced.

C. Gas sensors

Gas sensors are available in wide specifications depending on the sensitivity levels, type of gas to be sensed, physical dimensions and numerous other factors. This Insight covers a methane gas sensor that can sense gases such as ammonia which might get produced from methane. When a gas interacts with this sensor, it is first ionized into its constituents and is then adsorbed by the sensing element. This adsorption creates a potential difference on the element which is conveyed to the processor unit through output pins in form of current.

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-3 can detect gas concentrations anywhere from 200 to 10000ppm.This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Fig 5: Gas sensor

IV RESULTS

We believe that this multi-sensor module can be deployed on mobile robots and help in the assessment and fighting of hazardous fires and chemical leaks.

V CONCLUSION

Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans. Yet robots cannot perform every job; today robots roles include assisting research and industry surveying the harsh environments for the industry people. Helping them survey pipes in industries in gaseous and harmfull places. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials.

VI FUTURE WORK

Workers have long confronted dangerous and dirty jobs. They've had to dig to the bottom of mines, or put themselves in harm's way to decommission ageing nuclear sites. It's time to make these jobs safer and more efficient, robots are just starting to provide the necessary tools.

Robots are a way to modernise an industry that is constantly under pressure with the fall in prices of commodities and the lack of safe access to hard-to-reach resources.

- Gas leakage: identify and locate, stop dangerous operations (welding, cutting, …) and secure area and stop leakage and monitor concentration drop.
- Fire: identify and locate fire.
- Valve and lever operation: change pressure, change flow rate and start or stop equipment operation.
- Inspection: gauge readings and valve and lever position readings.
- Monitoring: gas level, check for leakage, acoustic anomalies, surface condition and check for intruders.
- Maintenance: gas and fire detector test, sampling, pigging, cleaning, refilling and pipelines.

VII REFERENCES

[1] Liu, X. Luo, W. Yao, et al, "Aspirating fire detection system with high sensitivity and multi-parameter," in Information Science, Electronics and Electrical Engineering (ISEEE), 2014 International Conference on, 2014, pp. 400–404.

[2] M. A. Arain, M. Trincavelli, M. Cirillo, E. Schaffernicht, and A. J. Lilienthal, "Global coverage measurement planning strategies for mobile robots equipped with a remote gas sensor," Sensors (Switzerland), vol. 15, no. 3, pp. 6845–6871, 2015

[3] P. Li, S. Ma, B. Li, and Y. Wang, "Design of a mobile mechanism possessing driving ability and detecting function for in-pipe inspection," in Robotics and Automation, 2008. ICRA 2008. IEEE International Conference on. IEEE, 2008, pp. 3992–3997.

[4] S.-W. Tien, W.-T. Hwang, and C.-H. Tsai, "Study of a risk-based piping inspection guideline system," ISA transactions, vol. 46, no. 1, pp. 119–126, 2007.

[5] J. Hertzberg and F. Kirchner, "Landmark-based autonomous navigation in sewerage pipes," in Advanced Mobile Robot, 1996., Proceedings of the First Euromicro Workshop on. IEEE, 1996, pp. 68–73.

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MICRO AIR VEHICLE FOR PHOTOGRAPHY

NIRANJAN R[1], GANA SPANDHANA L[2], SNEHA S[3], CHAMPAKA K M[4], VENKATESHAPPA[5]

[1-4]Department of Electronics and Communication Engineering, M S Engineering College Bangalore, India

[5]Associate. Professor, Department of Electronics and Communication Engineering, M S Engineering College Bangalore, India

ABSTRACT

The design, implementation and evaluation of a lightweight portable multispectral imaging system for deployment on drones is presented in this paper. The dual cameras used enable concurrent capture of red, green, blue (RGB) and near-infrared (NIR) images using simultaneous triggering. The images are stored in native file generated format. A global positioning system (GPS) connected to the camera's controllers enables geo-tagging of the images via exchangeable image file format (EXIF) metadata. A second order polynomial has been utilized in order to align and test the RGB and NIR images to attain subpixel accuracy. The system was implemented in the matrix laboratory (MATLAB) and the developed algorithm is very simple.

Keywords—Micro Air Vehicle for Photography; Schematic of mission in 2015 AHS MAV.

I. INTRODUCTION

Various different techniques are being used in imaging systems for improving camera pixel accuracy. For technology-oriented multispectral imaging systems, the red-green-blue (RGB) and near infrared (NIR) scanners were initially developed specifically for space-based explorations and subsequently for aerial imaging. With remarkable advances in the field of digital camera technology, there has been a rapid return to simple camera systems in various applications such as environmental observations, agriculture, security, defense systems and so on. This is particularly driven by recent progress in small drone technology. The traditional spectral imaging techniques involve time-sequential scanning of either a spatial or a spectral dimension combined with snapshot imaging of the other two dimensions. These methods are exemplified through the push-broom scan by one-dimensional spectral imager across the required field of view, use of tunable spectral filtering or of imaging Fourier transform spectrometry. The applications of these traditional time-sequential methodologies are restricted to domains where an extended recording time is acceptable, viz. in microscopy, remote sensing and in biomedical imaging. Recently several snapshot multispectral imaging approaches have been developed. Some of these snapshot procedures use fibber optics to reformat a two dimensional image into a one-dimensional array and then, employ a conventional one-dimensional imaging spectrometer to obtain spectral information. The computed topographic imaging spectrometer (CTIS) utilizes a diffractive optical element to disperse the image at the detector and finally reconstructs the spectral data cube. The image-replicating imaging spectrometer (IRIS) applies a Lyot filter to spectrally de-multiplex an image onto a single conventional detector array. The snapshot hyper spectral imaging Fourier transform (SHIFT) spectrometer makes use of bi-refrigerant polarization optics to obtain images at different spectrum. Another newly developed snapshot hyper spectral imaging method uses an image slicer to spectrally redirect the image to different locations in the detector. The multispectral imaging system itself used to be complex because it includes significant details regarding the spectral

information. For many applications, however, only few spectral images could be sufficient. These types of arrangements used monochromatic cameras with filter wheel and di-choric beam splitters. For instance, the JAI Corporation has developed a prism-based four charged coupled device (CCD) line scan camera which can simultaneously capture the RGB and NIR images. Others have investigated statistical relationships between the RGB and NIR images and ways of extracting the NIR images from the RGB cameras without cut-off filters. A new direction being explored is to develop custom sensors with non-conventional color filter array Eventually, for optimal radiometric resolution, it is desirable to use an array of cameras, each coupled with a specific light filter, to collect data at particular wavelengths of interest.

II. BLOCK DIAGRAM

Illustrates the elements in the MAV flight-control system. Because the MAV airframe dynamic modes, such as Dutch roll and the short-period longitudinal mode, will occur at higher frequencies compared with larger vehicles, the MAV will need some means of augmenting the natural stability of the airframe. In addition, the MAV should have the capability to fly itself to preprogrammed waypoints selected by the operator. To capture the image with the HD clarity.

Practical limitations are although there are currently no true MAVs (i.e., truly micro scaled flyers) in existence, DARPA has attempted a program to develop even smaller Nano Air Vehicles (NAVs) with a wingspan of 7.5 centimeters. However, no NAVs meeting DARPA's original program specification were forthcoming until 2009 when AeroVironment demonstrated a controlled hovering of DARPA's flapping-wing NAV. Beyond the difficulties in developing MAVs, few designs adequately address control issues. The MAVs' small size makes teleoperation impractical because a ground station pilot cannot see it beyond 100 meters. An onboard camera allowing the ground pilot to stabilize and navigate the craft was first demonstrated in the Aerovironment Black Widow, but truly micro air vehicles cannot carry onboard transmitters powerful enough to allow for teleoperation. For this reason, some researchers have focused on fully autonomous MAV flight. One such device, which has been designed from its inception as a fully autonomous MAV, is the biologically-inspired Entomopter originally developed at the Georgia Institute of Technology under a DARPA contract by Robert C. Michelson. Given that MAVs can be controlled by autonomous means, significant test and evaluation issues continue to exist.

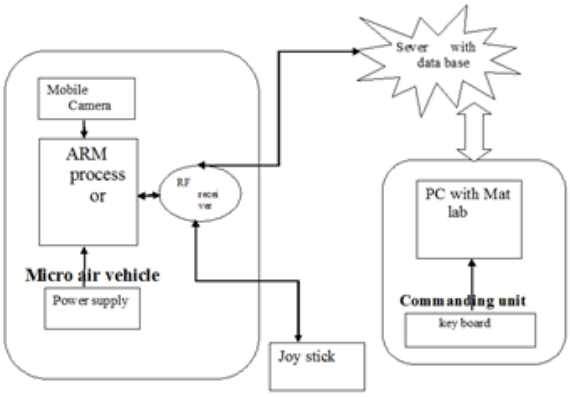

Fig.1: block diagram of Micro air vehicle for photography

III. METHODS AND METHODOLOGIES

- Basically the project is an aerial drone to capture the image requested by the admin and send it back to the PC.
- The project mainly consists of a Flying drone controlled by RF enabled Joystick fitted with RF mobile camera to capture the Images.
- The PC is installed with Mat lab and Image Processing Code to send the instruction for
- drone to capture the image and receive the image captured by drone.
- The joystick is used to control the drone in any manner. The instruction to capture the image will be sent by a wireless PC enabled with Wi-Fi or Hotspot.
- The system is a closed loop to send and receive the data using RF Technology.

A. Disadvantages by existing device:

- Capturing of images at higher altitudes is difficult.
- If damage occurs in flapping wings, it can't be detected.

B. Advantages:

- Economically Low Cost, Less Weight, no delay of the capturing images.
- Easy to carry out the device for landscape photography.
- Since RF cameras are replaced by mobile camera therefore cost can be reduced.

C. Problem Statement:

- Project module can be used for recording and capturing images with high clarity
  The PC is installed with Mat lab and Image Processing Code to send the instruction for drone to capture the image and receive the image captured by drone.
- Image Acquisition and transmission through wireless PC Enabled with Wi-Fi or Hotspot.

Conclusion

As per the design specifications, the quad copter self stabilizes using the array of sensors integrated on it. It attains an appropriate lift and provides surveillance of the terrain through the camera mounted on it. Its purpose is to take picture, audio or video transmission from areas which are physically in-accessible by humans, henceforth being beneficial towards military applications.

Acknowledgment

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in ushering in a great deal of effort, time and valuable guidance. I would like to thank our guide and Associate Professor Mr. Venkateshappa at M S Engineering College, for providing valuable suggestions, relentless support, help and guidance throughout the course of our project.

References

[1] Mallesh Babu S, Jayant Kumar a Rathod, Veena S, Lokesh H "Design of speech based ground control station for controlling the micro air vehicle" 5th International conference on advance in computing and communications. (2015)

[2] K. Kurotsuchi, M. Tai and H. Takahashi "Vision based autonomous micro air vehicle control for odor source localization" Center for Exploratory Research, Hitachi.Ltd, I-280.

[3] Shinya Ueda, Hirokazu, Madakoro, Naruhito Sato and Nobuhiro Shimoi "Prototype Develpoment of on -board vision processing MAV for wide-range monocular SLAM" 16th International Conference on Control, Automation and Systems. (ICCAS 2016) october.16-19.2016.

[4] Andras L Majdik,Damimo Berdo,Yves Albers Schoenberg,Davide Scaramuzza "MAV Localization and Position Tracking from Textured 3D Cadastral Models" IEEE International Conference on Space Robotics and Automation(ICRA)[May.31-June.7,2014]

[5] Fabrication of a Flapping wing MAV" International Conference on Mechatronic Science, Electric Engineering and Computer(August.19-22.2011)

[6] Tao Zhang, Chaoying Zhou, Xingwei Zhang, Chao Wang "Design Analysis Optimization and Larry Matthies, Roland Brockers, Yoshiaki Kuwata and Stephan Weiss "Stereo Vision-Based Obstacle Avoidance for MAVs using Disparity Space" IEEE International Conference on Robotics and Automation(ICRA)(May.31-june.7.2014)

[7] Takuma Nakamura, Stephen Havilland, Dmitry Barshefsky, Daniel Magee, Eric N. Johnson "Vision-Based Closed-Loop Tracking Using Micro Air Vehicles" (2016)

[8] John C. Gallagher, Sanjay Boddhu, Eric Matson, Garrison Greenwood "Improvements to Evolutionary Model Consistency Checking for a Flapping-Wing Micro Air Vehicle" (2014)

[9] John C. Gallagher, Sanjay Boddhu, Eric Matson, Garrison Greenwood "Improvements to Evolutionary Model Consistency Checking for a Flapping-Wing Micro Air Vehicle" (2014)

[10] Colmenares1, R. Kania1, W. Zhang1, and M. Sitti2 "Compliant Wing Design for a Flapping Wing Micro Air Vehicle" IEEE/RSJ International Conference on Intelligent

Robots and Systems (IROS) Congress Center Hamburg. (Sept 28 - Oct 2, 2015

[11] Steven Huybrechts, Steven Griffin "Ultra Lightweight Structures for Deployed Optics" (March 21, 1998).

[12] Annie S. Wu,Alan C. Schultz,Arvin Agah "Evolving Control for Distributed Micro Air Vehicles'" (1999).

[13] Raymond G. Zenick, Jr, Kimberly Kohlhepp "GPS Micro Navigation and Communication System for Clusters of Micro and Nanosatellitesl" (2001).

[14] N.J.S Stacy, D.W. Craig, J. Staromlynska and R.B. Smith "The Global Hawk UAV Australian Deployment: Imaging Radar Sensor Modifications and Employment for Maritime Surveillance" (2002).

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Category: ECE

FERTILIZER AND PESTICIDE SPRAYING ROBOT

SHWETHA A[1], RABIYA TAJ[2],TEJASHWINI K S[3],SAHANA[4]

[1-4]Student, Department of ECE, SJCIT, Chickballapur

[1]shwetha.ashoka97@gmail.com

Guided By: **RAVI M V**

Assistant Professor , Dept. of ECE,SJCIT, Chickballapur

ABSTRACT

Our world getting digital day by day ,This paper is to educate our farmers to use technology in agriculture and presents an solution for the health hazards caused nowadays due to the harmful fertilizers and pesticides to the farmers. This is done by the mobile controlling robot to control pest and disease prevention in the crops of agriculture land. The robot is really effective in uniform spraying and with proper dose that need by crops. It result in the optimum control of the chemicals

Keywords: mobile controlling robot, Ultrasonic sensor , infrared sensor, microcontroller.

1. INTRODUCTION

The agriculture is used to grow the healthy food crops with well nutrient contained food crops, there are damages caused to the crops while producing by the pest, over spraying of the fertilizers and pesticides. This issue is overcome by this project of fertilizer and pesticides spraying robot. It used to spray the fertilizers and pesticide evenly through the crops, and with the correct ratio of chemicals required by the crops. This result the farmers to reduce work in yielding.

The prime goal of paper is to meliorate the efficiency of chemicals and also reduce the labor hazards and reduce the cost of production. This project make the farmers to learn how to use the harmful pesticides and fertilizers with proper proportions. Efficient and health conscious operation due to remote control. This reduce the additional praying of the pesticides and fertilizers which causes the crop damage .The yield loss of the crops can be reduced by 30% to 35%. This can reduce the work of human labor in yielding land .The mechanized system piddle the workout more effective ,precise ,uniform and in low cost.

It reduce the need of labor for employment. To get more profit with the less cost. It also advantages for the consumers to get well nutrient food with the cheaper cost. The farmers and consumers both should get benefit with the minimum cost, and maximum effective output food crops.

II.BLOCK DIARAM

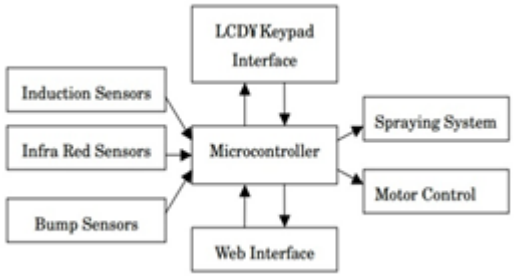

Figure 1:Control environment of the developed the system

WORKING:

The autonomous robot system[1.] consists of sprayer arm, storage tank, pump, motor, and a track system, sensors microcontroller. The robot

containing the ultrasonic sensor used to sense the crops.

The ultrasonic sensor and infrared sensor sense the pest affected and diseased crops.

Figure 2: ultrasonic sensor

During the early stages of yielding land, the track system are laid according to the required path of plants laid. Due to the sensor is not sensitive to any environment, it can work is smoke, moisture, dust, wet, vapor, irregular surface of the yielding land. This ultrasonic sensor predict the amount of crop affected, texture, measure the density of crop per feet, color , liquid content in the crops. Then the robot ready to spraying operation of the fertilizers and pesticides as per the required by the crops.

The operation performance is controlled the microcontroller.

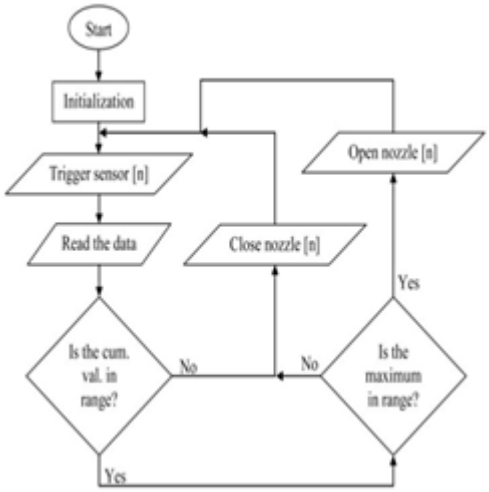

Figure 3: Flowchart

The camera present in the system predict and shows in the accurate way. Then the information transmitted to the controller. Then the receiver receives from the microcontroller that displayed in the monitor[2.].

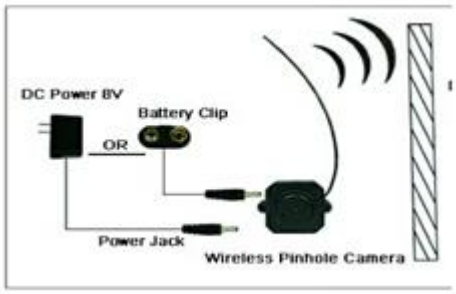

Figure4: wireless camera

Before the operation required mixture of fertilizers or fungicides are filled in the storage tank.During the early stages of operation the autonomous robot is placed on the track , and the system is switched on. The system now follows the tracks laid, and sprays the plants with required quantity of pesticides as pre-planned. The spraying can be watch through the screen.

Figure 5: Transmitter

The system after spraying the plants ,comes to rest in the desired position.

III. ADVENTAGES OF PROPOSED SYSTEM:

Wireless operation will eliminate the health issues and would even save them from tedious work.

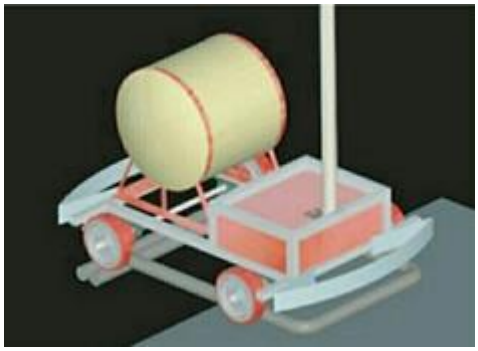

Figure 6: model robot

It will have less use of manpower. Efficient and health conscious operation due to remote sensing. With the help of active proximity ultrasonic sensor,

infrared sensors spraying the farmer is expected to control the robot wirelessly from a distant place. This robot can be used in multiple agriculture land.

IV. PESTICIDES AND FERTILIZER SPRYING ROBOT:

The spraying of the pesticide maintain the root moisture, and control the pest and fungus, and mainly the weeds growth[4.]. But the respiring of this pesticides and the harmful fertilizers, causes the permanent damage of the lungs tissues in the farmers. That may cause the allergies and infections, it result in diseases in the nostril of the nose, bronchitis of the lungs, and the sever skin diseases. If any damage in the spraying system it may cause the over spray, outflow of the pesticides and fertilizers this causes the damage of the crops. During spraying the farmers should wear the protective cloths, rubber gloves that may reduce the effect of exposure to the harmful chemicals, but it not stop. Manual spraying leads to time consuming process.

The sprayer cannot spray the chemicals to each plants and in accurate amount[5.]. The robot avoid the human to exposure to the chemical environment. and to perform accurate operation.

SCOPE:

The spraying mechanism can be closely observed by using a camera which would be mounted near the robotic arm giving the farmer live feedback of the spraying[3.]. The system can predict the minimum input of the chemicals-maximum output The operation can be absorbed by the monitor. Integrated GSM module which could control the start/stop and run operation of the robot. SMS based system to start and stop the service. Preprogrammed GUI based navigation system. Android interface to navigate the robot. Programming based on crop type and amount.

WORKING OUT PUT:

The robot built can fulfill the physical specifications outlined by The National Centre for agriculture so as to be able to function within any agriculture land. The system has the advantage of high speed , high quality and processing precision and low cost. The use of this more sophisticated micro-controller enables greater cost efficiency when reproducing a commercial product.

MODEL:

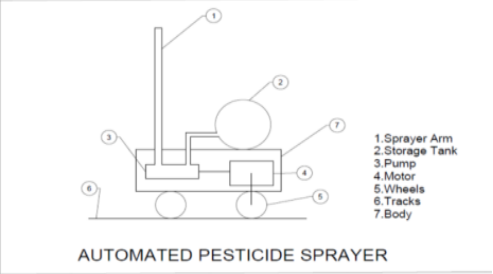

Figure 7: diagram of the robot

The system is controlled by the microcontroller 889C52

The system consist of five motors to control the direction to move front, reverse, left and right, one more to spray control.

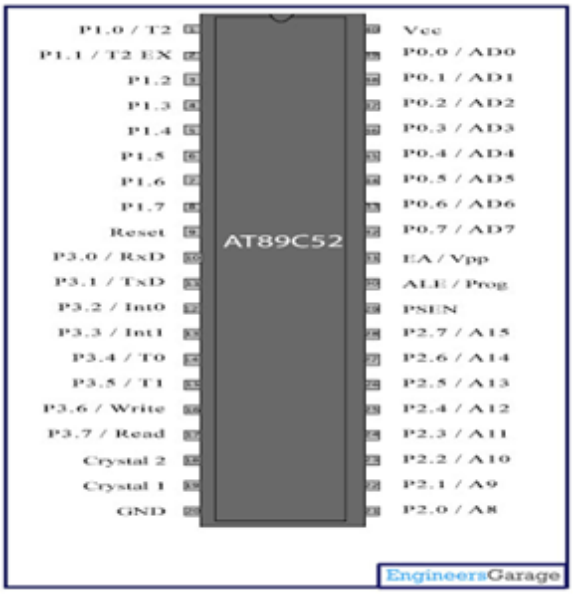

Figure 8: microcontroller 89C52

REFERENCE

[1.] P. J. Sammons, T. Furukawa, and A. Bulgin, "Autonomous Pesticide Spraying Robot for use in a Greenhouse", 2005.

[2] Alireza Rafiq1, Davood kalantari2*, Hamid Mashhadimeyghani3," Construction and development of an automatic sprayer for greenhouse", CIGR Journal, June 2014 .

[3] Gan-Mor S., Ronen B., Kazaz I., Josef S., Balinki Y. (1997), "guidance for automatic vehivle for greenhouse transportation", ACTA Horiculture, Vol 443, pp. 99-104

[4] Van Heten, E.J., Hemming J., Van Tuijl, B.A.J., Kornet, J.G. Melueman, J., Bontsema J. (2003). Biosystem Engineering, Vol 86 No.2 pp. 135-144.

[5] Sammos P J., "autonomus pesticide spraying robot for use in the greenhouse [A]",

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FEATURE EXTRACTION ALGORITHM FOR PARALYTIC PATIENT FROM EEG SIGNAL

TEJASWINI.C[1], SUNITHA P.H[2],VENKATESHAPPA[3]

Electronics and Communication Engineering, VTU, M.S.Engineering College Bangalore India
[1]tejuomshankar@gmail.com;[2]sushreeanju@gmail.com; [3]venkat_harshit@gmail.com

ABSTRACT

A brain–computer interface (BCI), sometimes called a direct neural interface or a brain–machine interface, detects and interprets brain signals and uses the results to communicate a user' s intent. This BCI system uses oscillatory electroencephalogram (EEG) signals, recorded during specific mental activity, as input and provides a control option by its output. The BCI is developed for the paralyzed patients to know their intention. The EEG signals are collected and the analysis is done on the type of signal acquired i.e. signal acquisition. Then the spectrum of the signal is obtained for a perfect analysis of the EEG signals to know the users intent.

Keywords—BCI, EEG, Signal Acquisition.

I. INTRODUCTION

Brain-computer interface (BCI) is an upcoming technology which aims to convey people's intentions to the outside world directly from their thoughts, enhancing cognitive capabilities. They are often directed at assisting, augmenting, or repairing human cognitive or sensory-motor functions. The BCI can be used for people who are unable to express through speech. The field of BCI research and development has been focused on neuroprosthetics applications. The user's intent is conveyed by brain signals (such as EEG) rather than by peripheral nerves and muscles, and these brain signals do not depend for their generation on neuromuscular activity[1]. Furthermore, as a communication and control system, a BCI establishes a real-time interaction between the user and the outside world. The user receives feedback reflecting the outcome of the BCI's operation, and that feedback can affect the user's subsequent intent and its expression in brain signals. The BCI system looks as shown in Fig.1

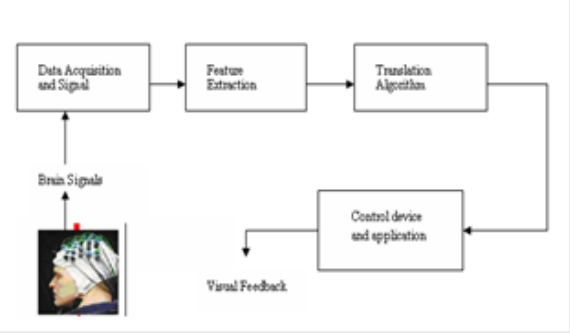

Fig1:- BCI System

The first step in developing an effective BCI paradigm is to determine suitable control signals from the EEG. A suitable control signal has the following attributes:

- It can be precisely characterised for every individual.
- It can be eadily modulated or translated to express the intention and
- It can be detected and tracked consistently and relaibly.

The three major components of BCI's are:

- Ways of measuring neural signals from the human brain.
- Methods and algorithms for decoding brain states / intensions from these signals.

- Methodology and Algorithms for mapping the decoded brain activity to intended behavior or action.

To recognize the behavior and patterns in the brain signal five consecutive stages are followed[2]:

- Signal Acquisition
- Preprocessing or Signal Enhancement
- Feature Extraction
- Classification and
- Control Interface.

The signal acquisition stage captures the signals of the brain and may also reduce the noise. The pre-processing stage prepares the signals in a suitable form for further processing. The feature extraction stage identifies discriminative information in the brain signals that have been recorded. The classification stage classifies the signals taking the feature vectors into account. The choice of good discriminative features is therefore essential to achieve effective pattern recognition, in order to decipher the user's intentions. Finally the control interface stage translates the classified signals into meaningful commands for any connected device, such as a wheelchair or a computer.

II. LITERATURE SURVEY

The major goal of BCI research[1] is to develop a system that allows disabled people to communicate with other persons and helps to interact with the external environments. The use of EEG signals as a vector of communication between man and machines represents one of the current challenges in signal theory research. The most commonly used signal that is identified and captured with EEG method is called the P300 wave. The P300 is an event related potential, a measurable electrical charge that is directly related with impulse. Therefore, by capturing the P300, a BCI can directly translate a persons' intent into electrical commands that control artificial devices.

Detailed exploration on Brain Computer Interface (BCI) and its recent trends has been done[3]. Work is being done to identify objects, images, videos and their color compositions. When humans watch the surrounding environment, visual data is processed by the brain, and it is possible to reconstruct the same on the screen with some appreciable accuracy by analyzing the physiological data. This data is acquired by using one of the non-invasive techniques like electroencephalography (EEG) in BCI. The acquired signal is to be translated to produce the image on to the screen. The Fig 2 shows the scenario.

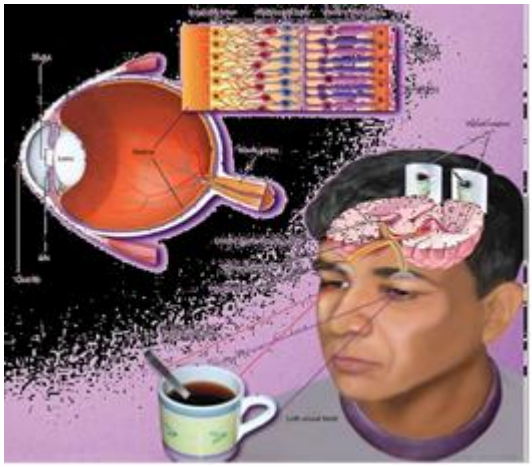

Fig2: Identification of objects and their colors by brain

Electroencephalography (EEG) equipment are becoming more available on the public market, which enables more diverse research in a currently narrow field. The Brain-Computer Interface (BCI) community recognizes the need for systems that makes BCI more user-friendly, real-time, manageable and suited for people that are not forced to use them, like clinical patients, and those who are disabled. Thus, there is an effort to seek such improvements, having a newly available market product to experiment with a single channel brain wave reader. It is important to stress that this shift in BCI, from patients to healthy and ordinary users, should ultimately be beneficial for those who really need it, indeed. The main focus have been building a system which enables usage of the available EEG device, and making a prototype that incorporates all parts of a functioning BCI system[4].

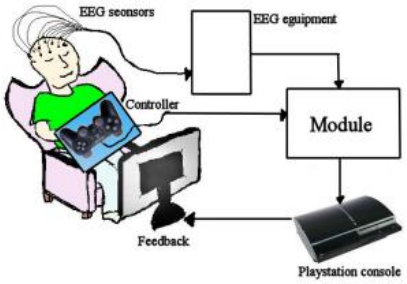

Fig 3:- Play station controlled by brain waves

Communication with patients suffering from locked-in syndrome and other forms of paralysis is an unsolved challenge[5]. Movement restoration for patients with chronic stroke or other brain damage also remains a therapeutic problem and available treatments do not offer significant improvements. Invasive and noninvasive BCIs using recordings from nerve cells, large neuronal pools such as electrocardiogram and electroencephalography, or blood flow based measures such as functional magnetic resonance imaging and near infrared spectroscopy show potential for communication in locked-in syndrome and movement restoration in chronic stroke.

III. EEG SIGNAL CLASSIFICATION

EEG comprises a set of signals which may be classified according to their frequency[6]. These frequency bands are referred to as delta (δ), theta (θ), alpha (α), beta (β), and gamma (γ) from low to high, respectively. The Fig4 shows the signal representation.

- Delta:- The delta band lies below 4 Hz, and the amplitude of delta signals detected in babies decreases as they age. Delta rhythms are usually only observed in adults in deep sleep state and are unusual in adults in an awake state.
- Theta:- Theta waves lie within the 4 to 7 Hz range. In a normal awake adult, only a small amount of theta frequencies can be recorded. A larger amount of theta frequencies can be seen in young children, older children, and adults in drowsy, meditative or sleep states.
- Alpha:- Alpha rhythms are found over the occipital region in the brain. These waves lie within the 8 to 12 Hz range. Their amplitude increases when the eyes close and the body relaxes and they attenuate when the eyes open and mental effort is made. These rhythms primarily reflect visual processing in the occipital brain region and may also be related to the memory brain function. There is also evidence that alpha activity may be associated with mental effort.

  Increasing mental effort causes a suppression of alpha activity, particularly from the frontal areas.
- Beta:- Beta rhythms, lie within the 12 to 30 Hz range, which are recorded in the frontal and central regions of the brain and are associated with motor activities. Beta rhythms are desynchronized during real movement or motor imagery. Beta waves are characterized by their symmetrical distribution when there is no motor activity.
- Gamma:- Gamma rhythms belong to the frequency range from 30 to 100 Hz. The presence of gamma waves in the brain activity of a healthy adult is related to certain motor functions or perceptions.

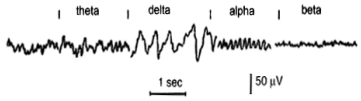

Fig 4. EEG signal Classification

IV. PROPOSED WORK

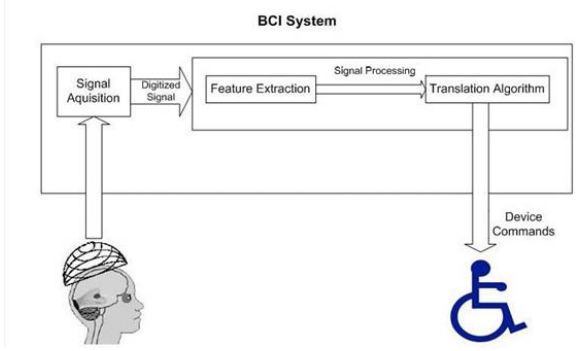

Fig 5. BCI model

The BCI model is as shown above. The signal acquisition part is taken place.

A. Signal Acquisition

The EEG signal is extracted and the noise will be reduced to make it suitable for next step in the processing. Then the spectrum of the signal is obtained. From the obtained frequency the signals are classified and the required feature which gives the intention of the patient is extracted. The signal is shown in Fig 6.

B. BCI Strength

Among the classified frequencies the signal with highest amplitude should be recognized to know the intention of the patient. The spectrum of the signal is shown in Fig. 7.

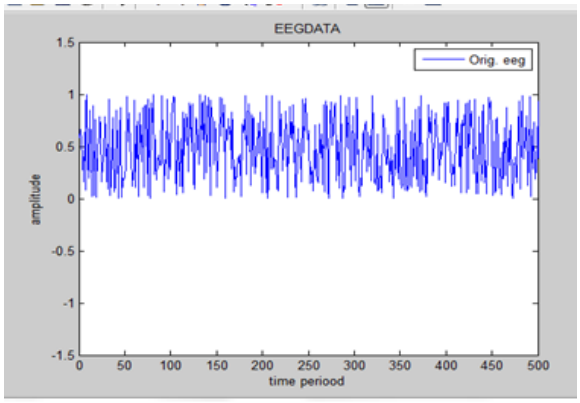

Fig 6:- EEG signal

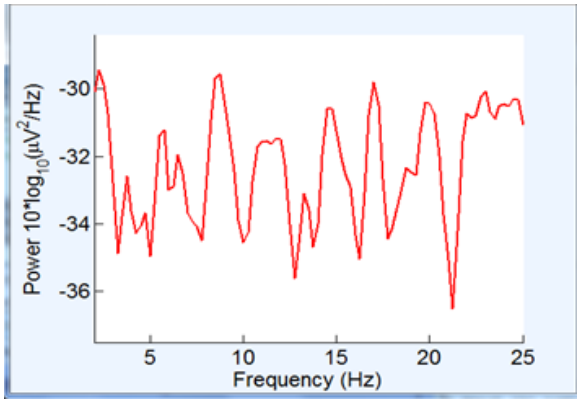

Fig 7:- Spectrum of the EEG signal

V. RESULTS

The input sample is taken and classified as alpha, beta,gamma, delta according to the frequency range. To get the frequency of the signal FFT [11] is performed and the spectrum is obtained as shown in below figures.

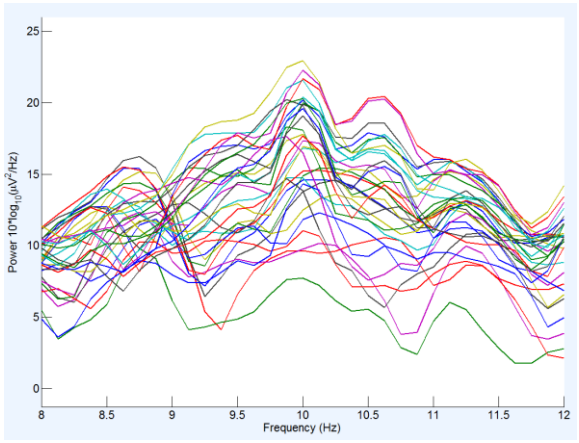

Fig. 8 Alpha Wave

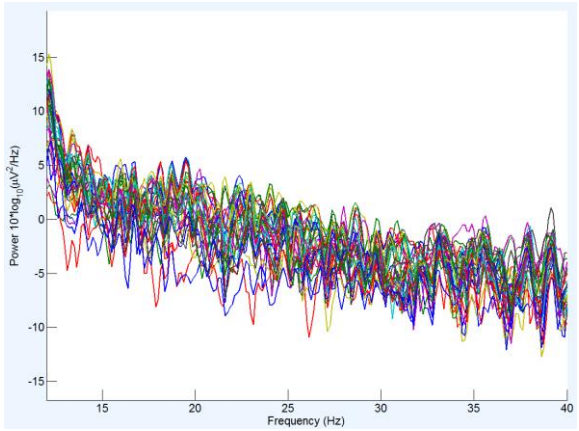

Fig. 9. Beta Wave

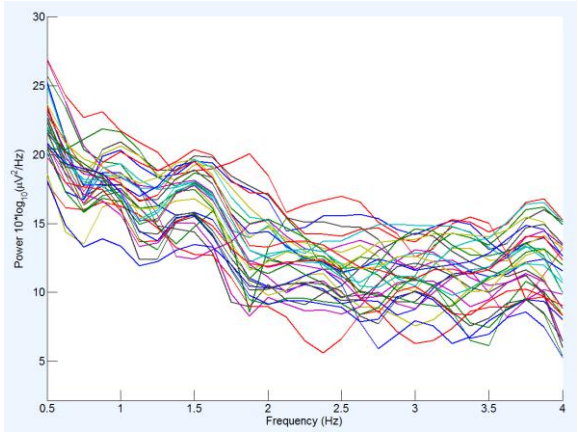

Fig. 10 Delta Wave

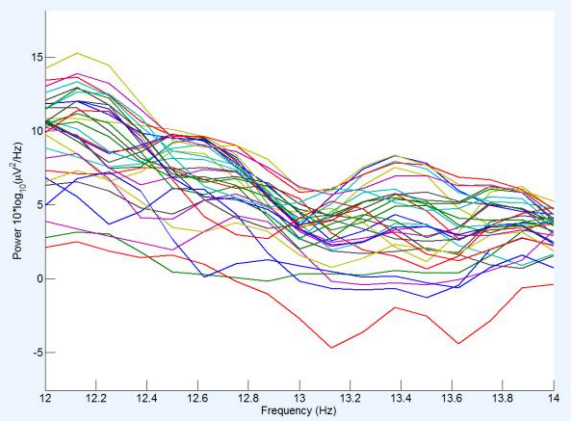

Fig.11 Sigma Wave

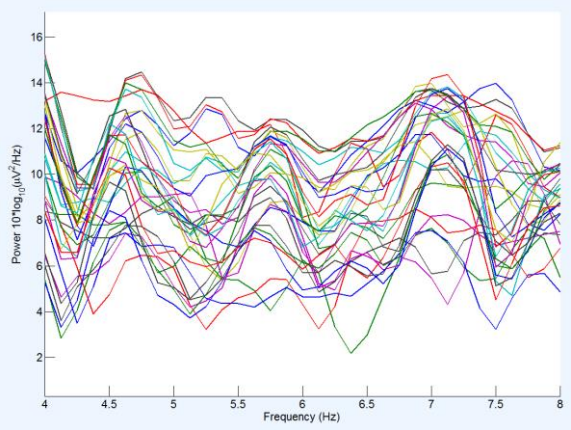

Fig. 12 Theta Wave

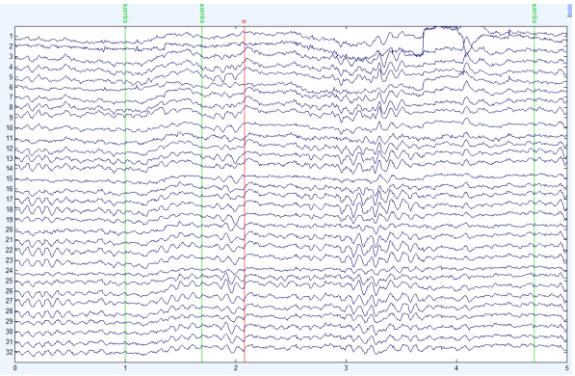

Fig 13. Input Sample

REFERENCES

[1] Anupama.H.S, N.K.Cauvery Lingaraju.G.M , Brain Computer Interface And Its Types - A Study

[2] MLA Kalaivani, M., V. Kalaivani, and V. Anusuya Devi, "Analysis of EEG Signal for the Detection of Brain Abnormalities,." IJCA Proceedings on International Conference on Simulations in Computing Nexus. No. 2. Foundation of Computer Science (FCS), 2014

[3] Rao, T. Kameswara, M. Rajya Lakshmi, and T. V. Prasad, "An exploration on brain computer interface and its recent trends," arXiv preprint arXiv:1211.2737 (2012).

[4] Larsen, Erik Andreas ,"Classification of EEG signals in a brain-computer interface system". (2011).

[5] Birbaumer, Niels, et al.,".Brain-computer-interface (BCI) in paralysis." The European Image of God and Man. Brill, 2010. 483-492.

[6] Taywade, S. A., and R. D. Raut , "A review: EEG signal analysis with different methodologies," Proceedings of the National Conference on Innovative Paradigms in Engineering and Technology (NCIPET'12). 2014.

[7] Niels Birbaumera,b, Ander Ramos Murguialdaya,c and Leonardo Cohen, "Brain – Computer interface in paralysis"

[8] Roman-Gonzalez, Avid. "Eeg signal processing for bci applications." Human–Computer Systems Interaction: Backgrounds and Applications Springer Berlin Heidelberg, 2012. 571-591.

[9] Nikhil R. Folane , R.M. Autee," EEG Based Brain Controlled Wheelchair for Physically Challenged People"

[10] Dr.T.V.U.Kiran Kumar ,"Generation and reconstruction of EEG signals using matlab," HOD, Dept Of ECE, Bharath University, Chennai-600073, India.

[11] C.Jaganathan, A.Amudhavalli,T.Janani, M.Dhanalakshmi," Automated Algorithm for extracting alpha, beta, gamma, delta of a human EEG," Nirmala Madian. Department of Electronics and Communication Engineering, K.S.Rangasamy College of Technology Tiruchengode-637215

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Monitoring and Estimation of Cascaded H-Bridge Multilevel Inverter using Renewable Sources & Digital Control Schemes

[1]AMIT KUMAR TIWARI, [2]PRIYANKA BHARDWAJ, [3]SUMAIR YASIN BAIG, [4]SUNIL KUMAR PASWAN, [5]Prof. SAVITHA S.C

ECE Department, M S Engineering College
Navarathna Agrahara, Sadahalli Post, International Airport Road Bengaluru, Karnataka, India
[1]amitkumartiwarinatu@gmail.com, [2]priyanka.explores@gmail.com [3] sumair.yaseen022@gmail.com

ABSTRACT

The objective of the present work is to obtain a three level ac output, which is obtained by a 4-stage, 3-level multilevel inverter. An inverter receives dc supply for its input and produces ac output. It stepped up to 220 V, 50 Hz single-phase ac supply with the help of a step up transformer with E/I core with a resulting given input of 12V. Using a simple L-C filter at the rectifier output terminals the obtained dc supply can be made ripple free. The circuit consists of 4 MOSFET's which requires more current and generate heat and to dissipate heat sink, which is fabricated in aluminium. The obtained dc from the renewable sources i.e., Solar Panel, Wind Mill and Hydro Mill is directly fed to the dc to dc converter which boost up the input power and this is fed to the battery with the capacity of 12V, 24 AHC. Simulation of the firing pulse generation circuit and multilevel inverter was done using MATLAB 13a and Simulink. Since we are using Hybrid inverter, to establish the communication, ARM Processor (LPC2148) and GSM (SIM900A) module is used to provide access of the user to the model i.e., controlling its mode of control of operation.

Keywords: Multi-Level Inverter, Matlab13a Simulink, PWM, Diode Clamping.

I. INTRODUCTION

The multilevel inverters have drawn tremendous interest in the power industry. They present a new set of features that are well suited for use in reactive power compensation. It may be easier to produce a high power high voltage inverter with the multilevel structure because of the way in which device voltage stresses are controlled in the structure. Increasing the number of voltage levels in the inverter without requiring higher rating on individual devices can increase the power rating of the overall circuit. As the no of voltage levels increases the harmonic content of the output voltage waveform decreases significantly here the dc input to the multilevel inverter is obtained by renewable sources of 12V input to 220 V, 50 Hz single-phase ac supply. Using a simple R-C filter at the rectifier output terminals the obtained dc supply can be made ripple free. The circuit consists of 4 MOSFET's which requires more current and generate heat and to dissipate heat sink, which is fabricated in aluminium.

To obtain a quality output voltage or a current waveform with a minimum amount of ripple content, they require various pulse width modulation (PWM) strategies, which increase the switching frequency of the power devices. In the case of multilevel inverters, as the number of voltage levels increases the harmonic content of the output voltage waveform decreases, even without using any pulse width modulation technique. As the switching frequency is reduced

the power losses are also minimized, and thereby increasing the efficiency of the system.

Since the early years high power line commutated thyristor in conjunction with capacitors and reactors have been employed in various circuit configurations to produce variable reactive output. Using appropriate switch control the VAR output can be controlled continuously from maximum capacity to maximum inductive output at a given bus voltage.

II. SIMULATION ANALYSIS

The switching states of the lookup table shown in table 1 can be obtained from the repeating sequence stair available in the sources block. Here the DC voltage of 12V has been into 12V battery sources. The output voltages are taken across the resister of 1000 ohms. For the switches S1, S2, S3 and S4 different modes of operation of three level cascaded H-Bridge multilevel inverter are explained below:

Mode 1:- In this mode of operation of three level cascaded H-Bridge inverter switches s1 & s2 are turned on & no source is connected to the load .Zero output voltage across the load is obtained.

Mode 2:-In this mode of operation of three level cascaded H-Bridge inverter switches s1 & s4 are turned on. Output voltage obtained across the load is +V dc.

Mode 3:- In this mode of operation of three level cascaded H-Bridge inverter switches s2 & s3 are turned on. Output voltage obtained across the load is –V dc.

Mode 4:- In this mode of operation of three level cascaded H-Bridge inverter switches s3 & s4 are turned on. Output voltage obtained across the load is zero. The

Same operation is shown in tabular form below in table 1.Table 1 Modes of operation of single phase three level cascaded H-Bridge Inverter

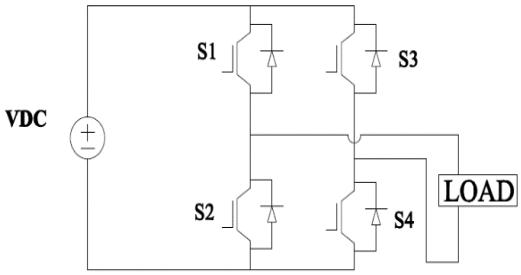


Fig 1: Block Diagram of 3 level multilevel Inverter using power semiconductors.

Table 1: Switching Sequence.

MODE	S1	S2	S3	S4
1	1	1	0	0
2	1	0	0	1
3	0	1	1	0
4	0	0	1	1

These switching pulses are drawn from a PWM Generating circuit which is according to the behaviour of the main circuit. The characteristics required are:

1. Frequency of voltage applied at the inverter terminals should be same as the frequency of the source voltage. For this to happen, PWM is generated taking reference from source voltage.
2. The switching pulses should be given such that the resultant waveform should have average values for each pulse resulting in a sinusoidal waveform.
3. One pair of switches has to give switching pulses while the other pair has to be in idle state or off state.

For PWM to have the first characteristic a sample has to be taken from the source itself for frequency. For the second characteristic to be satisfied we need to use a signal generator and the best source of sine wave that can be thought of is the source waveform itself. So the source voltage waveform is selected as reference.

The source voltage waveform is obtained by using a voltmeter at the source. A transport delay block is used for getting a delay between source voltage

and Inverter voltage. The output of the delay block is given to PWM sub circuit

In PWM sub circuit we used a block provided by MATLAB. This block will give the pulses with duty cycle proportional to the instantaneous value of the reference.

$$\text{Duty Cycle} = \frac{V+1}{2}$$

Where V is the instantaneous value

(i.e.) when V is negative, duty cycle <50% when V is positive, duty cycle>50%

When V is zero, duty cycle = 50%

But the voltage waveform of source starts from the instantaneous value zero. For instantaneous value '0' the duty cycle will be 50% which is undesirable. So a waveform has to be generated such that, for voltage waveform starting at 0 another waveform has to start at 1 corresponding to the original waveform. PWM input has to reach peak with the source waveform and has to reach -1 when source waveform reaches 0. This is followed by the source expression "-cos2θ". So we squared the source waveform by using the multiplication block. Then remove the DC offset half by subtracting the above result with half. Then we multiplied it with a gain two because the waveform is now which is having half the amplitude required. So when a gain of two is applied it becomes - cos2θ. Now this can be used as reference to the PWM block provided by the MATLAB.

Now we need to separate the switching pulses for the pair of switches S1, S4 and the other pair S2, S3 so as to follow the 3rd characteristic. For this, we developed a circuit where one output is a square waveform. This reaches +1 during the positive half cycle of source waveform and reaches 0 during the negative half cycle of the waveform. The other output is vice versa of the above i.e., it will reach 0 for the positive half cycle of the source waveform and reaches +1 for the negative cycle of the waveform.

The first output is multiplied with the PWM pulses and is given to the pair S1, S4 switches. The second output is multiplied with the PWM pulses and is given to the pair S2, S3 switches. This is how PWM is being generated.

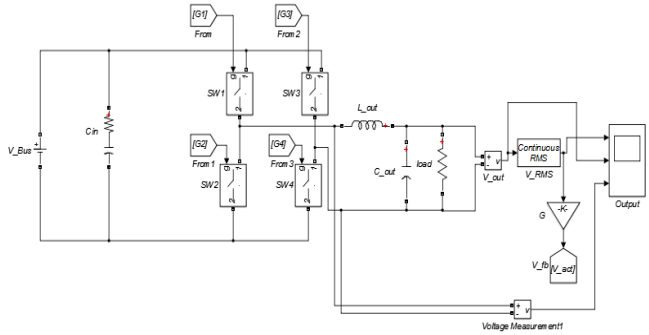


Fig 2: Simulink model for three leg operation of a 3 level Multilevel inverter

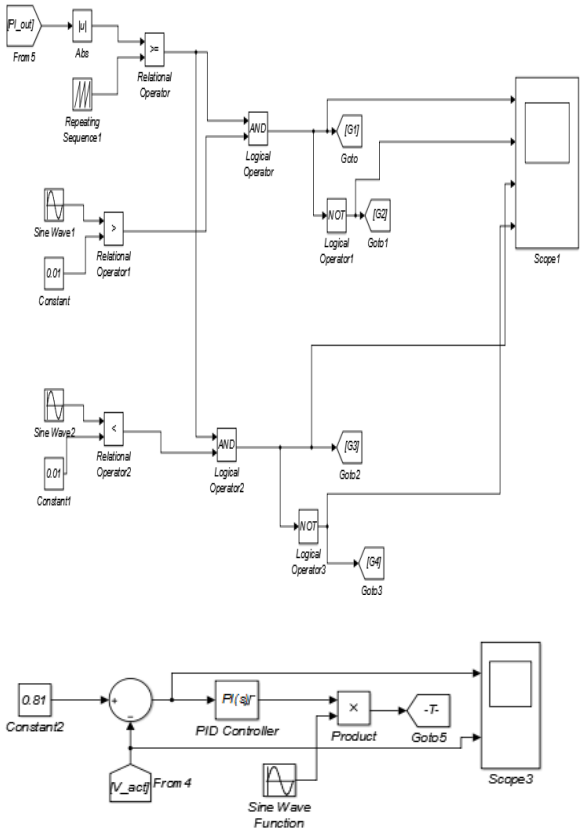
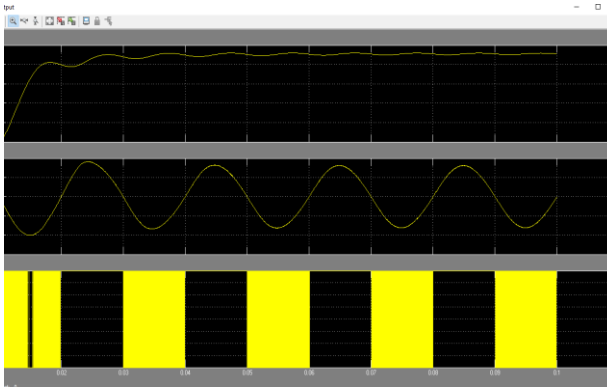


Fig 3: Simulink model of a 3 level multilevel inverter with Digital control scheme.



III. RESULTS

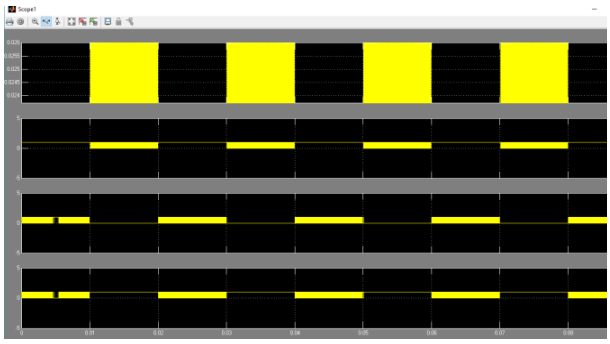


Fig 6: Simulink model for Reactive Power Compensation Using PWM Technique.

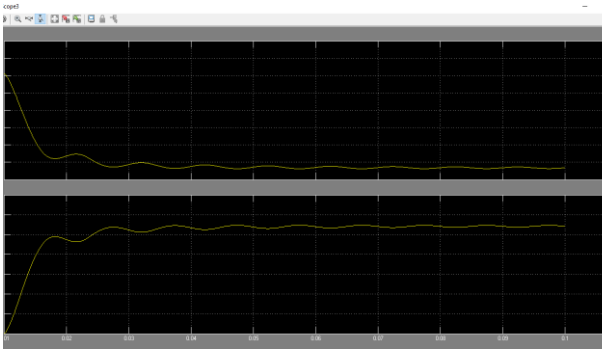


Fig 7: Active and reactive power graph for the reactive power compensation for 3 level multilevel inverter.

IV. CONCLUSIONS

The utilization of multilevel inverters has increased in the last decade eliminating the necessity of AC output filter devices such as inductors, capacitors etc. We will be designing a hybrid power system as everyone uses power from grid. Customers will be able to offset their power usage over an entire billing period as the power transmitted to them will be sourced from a supply of 800-1K watts of power generated using renewable sources of energy. The residual power available with us after our consumption will be supplied to the grid (government) in exchange for money. This project will be simulated using design analysis. Waveforms simulation would be done with the help of MATLAB. This topology reduces the output harmonics as well as the cost. The proposed multilevel inverter provides higher output quality with relatively minimal power loss as compared to the other conventional inverters.

REFERENCES

[1]. Mohammad Ahmad and B.H. Khan, Senior Member, IEEE "New Approaches for harmonic reduction in solar inverters".

[2]. J. Rodriguez. J.-S. Lai, and F.Z. Peng, "Multilevel inverters: A survey of topologies, controls and applications," IEEE Trans. Ind. Electron. vol. 49, No. 4, pp. 724-738, Aug.

[3]. Ebrahim Babaei, Member, IEEE, Sara Laali, Student Member, IEEE, and Zahra Bayat" A single phase cascaded multilevel inverter based on a new basic unit with reduced number of power swithes.

[4]. MariuszMalinowaski, Senior Member, IEEE, K.Gopakumar, Senior Member, IEEE, Jose Rodriguez, Senior Member, IEEE, and Marcelo A.Perez, Member IEEE "A Survey on Cascaded Multilevel Inverters".

[5]. Gobinath.K1, Mahendran.S2, Gnanambal.I3 "New cascaded H-bridge multilevel inverter with improved efficiency." International journal of advanced research in Electrical, Electronics and Instrumentation Engineering Vol.2, issue 4, April 2013.

[6]. Mithun Kuriakose, Anooja V S "Comparison of Performances of Switched DC Sources Inverter and Cascaded H-bridge Inverter",International Journal of Science, Engineering and Technology Research, Volume 3, Issue 9, September2014.

[7]. C. Govindaraju and K. Baskaran, Member, IEEE" Efficient Sequential Switching Hybrid-Modulation Techniques for Cascaded Multilevel Inverters" vol. 26, no. 6, June 2011.

AUTHOR'S PHOTOS AND BIOGRAPHY

Prof. Savitha S C.
Assistant Professor, ECE Department, M.S Engineering College

Priyanka Bhardwaj
Student (IV Year B.E) , ECE Department, M.S Engineering College

Amit Kumar Tiwari
Student (IV Year B.E), ECE Department, M.S Engineering College

Sumair Yasin Baig
Student (IV Year B.E), ECE Department, M.S Engineering College

Sunil Kumar Paswan
Student (IV Year B.E), ECE Department, M.S Engineering College

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GREENHOUSE MONITORING USING IOT

ABHINAV ANAND[1], NITIN KUMAR SINHA[2], ROHIT WRECKO[3]
ECE Department, MS engineering College
Navrathna Agrahara,Bangalore,India
anand.abhi94@gmail.com;nitinsinha123@hotmail.com
rohitwrecko@gmail.com

ABSTRACT

IOT deals with intricate systems that integrates multiple disperse components towards their synergetic use. In this paper a system of interconnected smart modules is developed where each and every parameter necessary for a green house is monitored and updated to the cloud. Emphasis is given on how sensing and communication technologies of IOT can effectively be used in smart greenhouse monitoring. Further this project also includes controlling of some parameters like water and light. The main concept of IOT is machine to machine communication. Internet-based sensor networks have recently been gaining attention. Sensors are connected to the Internet and the information from the sensors is gathered at a server through the Internet. Security and manageability of sensor information transmission and deployability of sensors connecting to the Internet wirelessly are the major issues though low cost and high scalability are expected.

INTRODUCTION

Monitoring the vital parameters of a greenhouse namely temperature and soil moisture through internet of things technology (IOT). Irrespective of wherever in the world you are through IOT technology we can monitor and control the greenhouse parameters. All the vital sensor data will be available to authorised users via internet. Even though the technology is yet to take off globally, this report analyses the possibility of integrating a greenhouse and the IOT. The project covers wide area of embedded system and networking. This paper presents a low cost and flexible greenhouse monitoring system using an embedded MCU and P.C with Wi-Fi connectivity to the internet. The proposed system does not require a dedicated server PC with respect to similar systems and offers a light weight communication protocol to monitor and control the environment. To demonstrate the feasibility and effectiveness of this system, devices such as soil moisture sensor and temperature sensor have been integrated with the proposed greenhouse control system.

In the present scenario were people are moving around the world, there is an increased demand for connectivity with our properties wherever we are on the planet. Here comes the role connecting every device to the internet so that it is accessible wherever we have an internet access. This interesting fact throws upon us the need to implement a solution integrating our present resources. This is where internet of things comes into the picture. This report focuses on implementing a smart greenhouse that can monitor using IOT technology.

PROCEDURE

Here we are using Aurdino board, on the input side of aurdino board we are connecting different types of sensors such as temperature sensor, humidity sensor, moisture sensor and light sensor to sense

the corresponding data. At the output side we are connecting a relay circuit which is connected to PC with WiFi connectivity to send the data in cloud.

Now from the input side different connected sensors sense the data of corresponding parameters and sends the value to the relay. The relay is then connected to a PC with WiFi connectivity which sends the data to the cloud. Then to get the data from wherever we are we will use our android phone and by programming BLYNK app such that we receive and take respective action when needed. The fig.shown below shows the connectivity block diagram of the system:

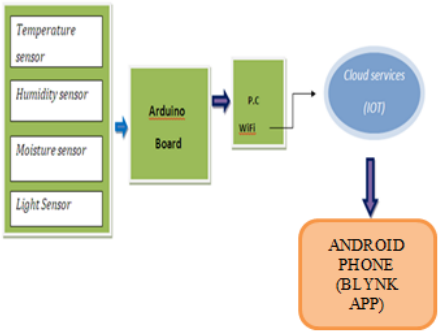


Fig1: Basic block diagram of the system

Now the below Fig show the basic flow diagram of the system

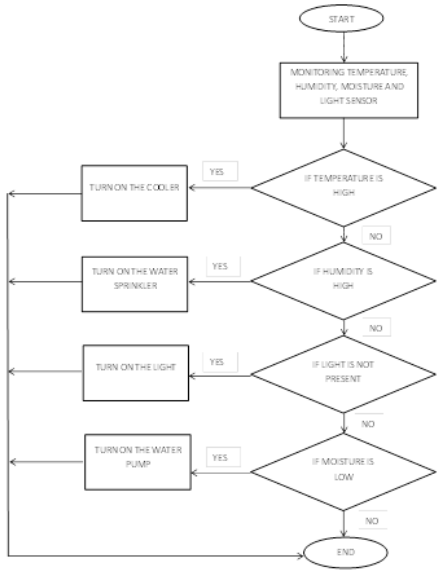


Fig.: data flow diagram/flow chart of the system

Flowchart explains the overall working of the project code.

Step 1: To check the temperature, humidity, moisture and light.

Step 2: The temperature is high or reaches the threshold value then DC motor turns on the cooler is started.

Step 3: The humidity is detected high or reaches the threshold value then the water sprinkler turns on.

Step 4: The amount of light supplied to the plants is less than the light is turned on

Step 5: The soil moisture is less in the plants then the water pump is turned on.

Step 6: The temperature, humidity, ligth and moisture is continuously monitored and it is displayed on the android app.

A CREATING A PROJECT IN BLYNK APP

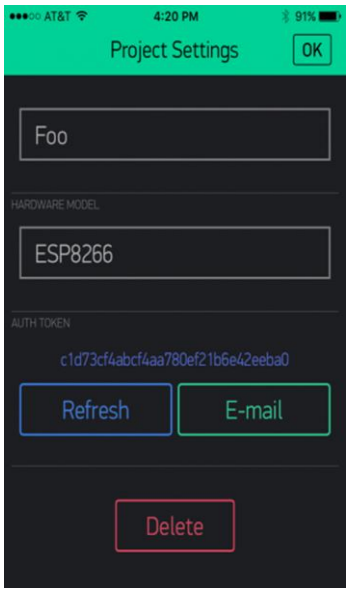
After downloading the app, create an account and log in. Welcome to Blynk!

You'll also need to install the Blynk Arduino Library, which helps generate the firmware running on your ESP8266. Download the latest release from Blynk's GitHub repo, and follow along with the directions there to install the required libraries.

Create a Blynk Project

Next, click the "Create New Project" in the app to create a new Blynk app. Give it any name you

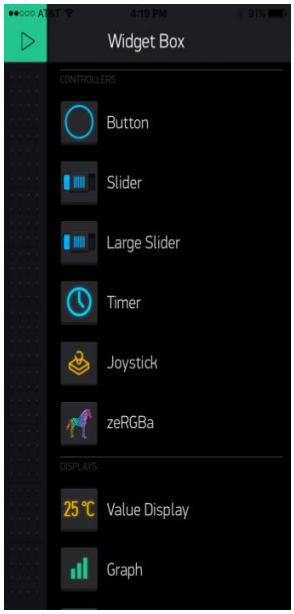
please, just make sure the "Hardware Model" is set to ESP8266.



The **Auth Token** is very important – you'll need to stick it into your ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to yourself.

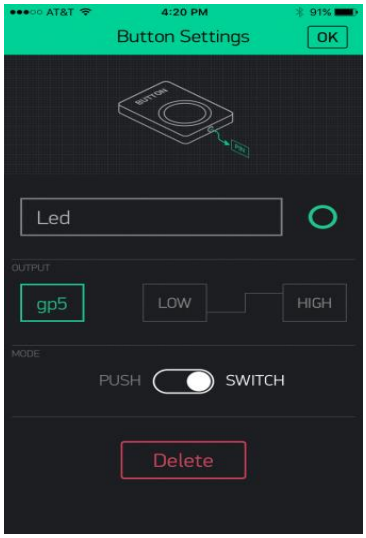
Add Widgets to the Project

Then you'll be presented with a blank new project. To open the widget box, click in the project window to open.



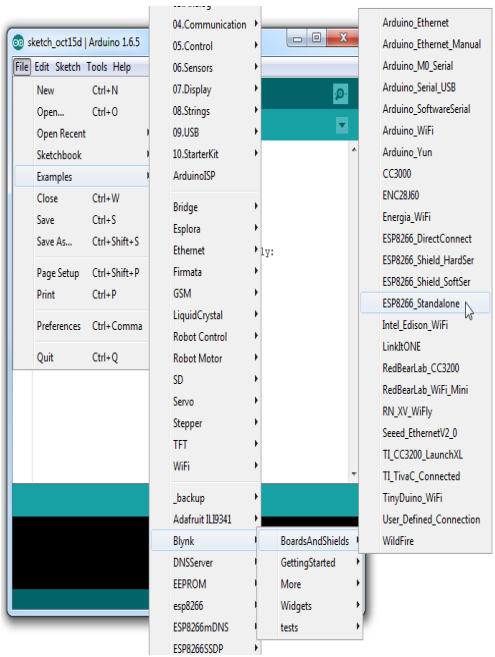
Add a **Button**, then click on it to change its settings. Buttons can toggle outputs on the ESP8266. Set the button's output to **gp5**, which is tied to an LED on the Thing Dev Board. You may also want to change the action to "Switch."

RESULTS



Upload the Blynk Firmware

Now that your Blynk project is set up, open Arduino and navigate to the **ESP8266_Standalone** example in the **File** > **Examples** > **Blynk** > **BoardsAndShields** menu.

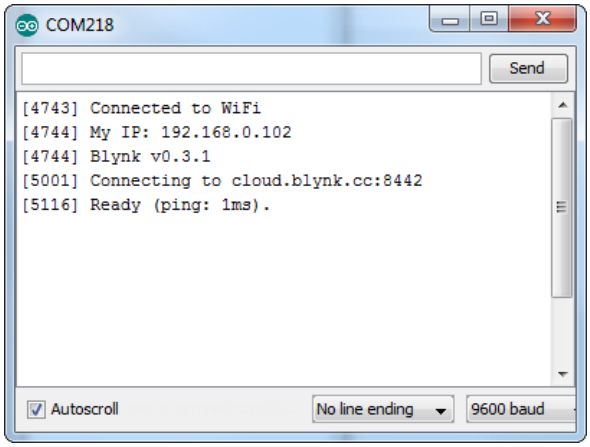


Before uploading, make sure to paste your **authoriazation token** into the auth[] variable. Also make sure to **load your WiFi network settings into the Blynk.begin(auth, "ssid", "pass")** function.

Then upload!

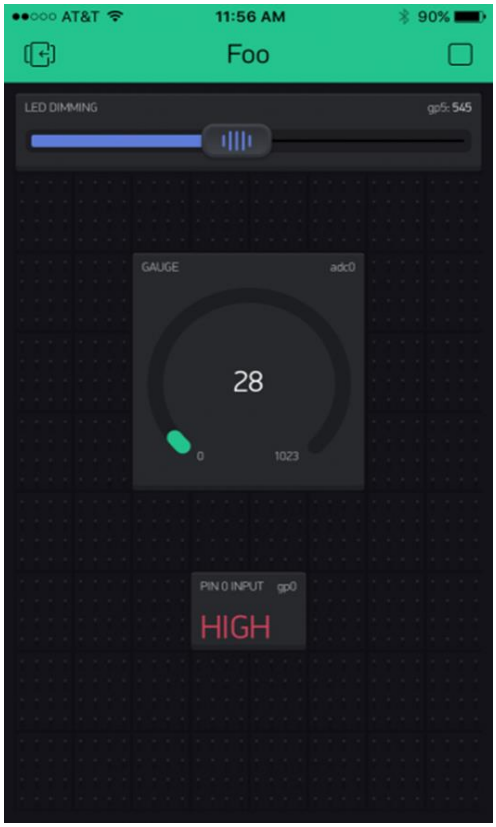
Run the Project

After the app has uploaded, open the serial monitor, setting the baud rate to 9600. Wait for the "Ready (ping: xms)." message.



Then click the "Run" button in the top right corner of the Blynk app. Press the button and watch the LED!

Then add more widgets to the project. They should immediately work on the ESP8266 without uploading any new firmware. You can add analog output sliders, digital input monitors, and analog input gauges.



Conclusions

In this work, a design and implementation of greenhouse parameter monitoring and control system has been proposed. This system is able to collect the information about the main environmental parameters such as; Temperature, Humidity, Light and soil moisture inside the greenhouse. And have the ability to keep these parameters smaller than the outside environment by using sensors and controlling the parameters by the android app. The analog signals of different sensors are converted into digital values utilizing the microcontrollers.

REFERENCES

[1]. Wei Ai Cifa Chen "Green House Environment Monitor Technology Implementation Based on Android Mobile Platform" 978-1-4577-0536-6/11/$26.00 ©2011 IEEE.

[2]. Guomin He, Xiaochan Wang, Guoxiang Sun "Design of a Greenhouse Humiture Monitoring System Based on ZigBee Wireless Sensor

Networks" 2010 Fifth International Conference on Frontier of Computer Science and Technology.

[3]. Akshay C, Nitin Karnwal, Abhfeeth K.A, Rohan Khandelwal, Tapas Govindraju, Ezhilarasi D, Sujan Y. "Wireless sensing and control for precision Green house management" 2012 Sixth International Conference on Sensing Technology (ICST)

[4]. Ajeetkumar Rai, Sarfarajahamadidrisi and Shahbaz Ahmad, "An Experimental Study of Forced Convection Green House Drying" International Journal of Advanced Research in Engineering & Technology (IJARET), Volume 4, Issue 5, 2013, pp. 10 - 16, ISSN Print: 0976-6480, ISSN Online: 0976-6499.

[5]. Zhou Jianjun, Wang Xiaofang, Wang Xiu, Zou Wei, Cai Jichen "Greenhouse Monitoring and Control System Based on Zigbee" Proceedings of the 2nd International Conference on Computer Science and Electronics Engineering (ICCSEE 2013)

[6]. Bouchikhi B., El Harzli M., 2005. Design and realization of acquisition system and climatic parameters control under the greenhouse. Phys & Chem. News, Vol. 22, pp. 45-54.

[7]. Dae-Heon P. and Jang-Woo P., 2011. Wireless sensor network-based greenhouse environment monitoring and automatic control system for dew condensation prevention. Journal of Sensors, Vol. 11, pp. 3640-3651.

[8]. Dussion M. F., 1989. Greenhouse and energy. French Agency for Energy Management, p. 96.

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Classification of EEG signals Using Deep Learning Method Machine and Implementation on FPGA

Divya Y S[1], Deepika T R[2], Jnanadevi R T[3], Shredevi Nagnur[4], Tejaswini C[5]
Department of Electronics and Communication Engineering
M S Engineering College
Bangalore, India

ABSTRACT

This paper presents the classification of EEG signal using the deep learning machine method and implementing the application on the FPGA. EEG signal analysis is such an important thing for disease analysis and brain–computer analysis. Electroencephalography (EEG) monitoring the state of the user's brain functioning and treatment for any psychological disorder. Using this way we will be able to find the accurate outputs of the expected results. This is achieved by training the artificial neural network in MATLAB application. This algorithm uses wavelet transform and neural network for training the artificial neurons. Deep learning machine algorithm will require massive data for feeding into our models.

Keywords— Brain comuting interface,Deep learning,wavelet transform,field programmable gated array, Electroencephalography,artifical neurons

I. INTRODUCTION

EEG signals involve a great deal of information about the function of the brain. But classification and evaluation of these signals are limited. Since there is no definite criterion evaluated by the experts, visual analysis of EEG signals is insufficient. Since routine clinical diagnosis needs to analysis of EEG signals, some automation and computer techniques have been used for this aim. Since the early days of automatic EEG processing, representations based on a Fourier transform have been most commonly applied. This approach is based on earlier observations that the EEG spectrum contains some characteristic waveforms that fall primarily within four frequency bands— delta (< 4 Hz), theta (4–8 Hz), alpha (8–14 Hz), and beta (14–30 Hz). Such methods have proved beneficial for various EEG characterizations, but fast Fourier transform (FFT), suffer from large noise sensitivity. Numerous other techniques from the theory of signal analysis have been used to obtain representations and extract the features of interest for classification purposes. Neural networks and deep learning methods have been applied to EEG analysis. Neural network detection systems have been proposed by a number of researchers. Various feature based on this model was classified with a multilayer, feedforward, neural network using the error back-propagation training algorithm. A Neural Network, or NN, is a generic architecture used in machine learning that can map different types of information. Given an input, a trained NN can give the desired output. However, NNs cannot learn from sequences. Recurrent Neural Networks, or RNNs, address this issue by adding feed-back to standard neural networks. Thus, previous outputs are taken into account for the prediction of the next output. RNNs has been shown to be successful in various applications, such as speech recognition , machine translation and scene analysis . A combination of a Convolutional Neural Network (CNN) with a RNN can lead to fascinating results such as image caption generation

II. PROCCESS FLOW

A. FEATURE EXRACTION

Wavelet Transform (WT) is mathematical technique extensively used for extracting information from various types of continuous data such as image and speech data. This approach is suitable for non-

stationary signals due to flexible method of representing the time-frequency domain of signal However, the disadvantage is lack of specific methodology for apply to the pervasive noise. Using this method we extract the features of the obtained EEG signals i.e Alpha, Beta, Gamma, Theta, Delta. After feature extraction we find the energy of each signal and compute it in a single data. This enables us to classify the EEG signals in the future steps.

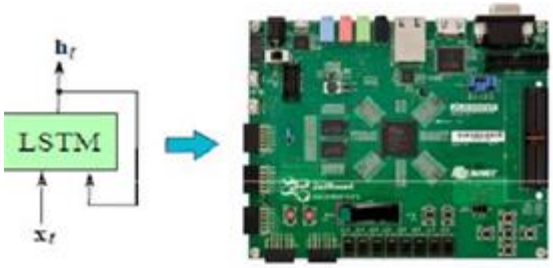
B. Classification of EEG signal

The design of the input and output layers in a network is often straightforward. Recurrent neural nets have been less influential than feedforward networks, in part

All the rest of the neurons are hidden from view. We will decide the number of neurons and the number of hidden layers. We train the neural network in MATLAB.So, train the network for the expected outcome. because the learning algorithms for recurrent nets are (at least to date) less powerful Other neurons provide the real world with the network's outputs. This output might be the particular character that the network thinks that it has scanned or the particular image it thinks is being viewed.

C. Implementation on FPGA

The implemented module uses Direct Memory Access (DMA) ports to stream data in and out. The DMA ports use valid and ready handshake. Because the DMA ports are independent, the input streams are not synchronized even when the module activates the ports at same the time. This ensures that vector and matrix row elements that goes to MAC units are aligned. It considers the control and testing software was implemented with C code. The software populates the main memory with weight values and input vectors, and it controls the hardware module with a set of configuration registers. The weight matrix has an extra element containing the bias value in the end of each row. The input vector contains an extra unity value so that the matrix-vector multiplication will only add the last element of the matrix row (bias addition)



III. BLOCK DIAGRAM

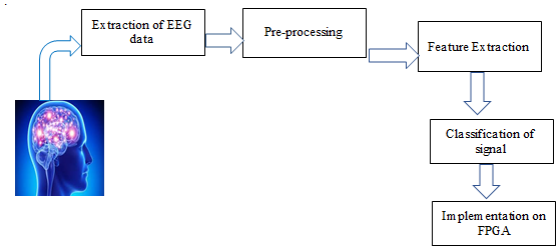


Fig 1: Block Diagram of Classification of signal

The flow of this project is shown in the figure 1.The signals are extracted and the preprocessing and the feature extraction using wavelet transform is performed in the MATLAB.Which is followed by the Classification of signals using the deep learning technique and implementing the same with the help of Xilinx on the FPGA

IV.FORMULAE

The set of wavelet functions is usually derived from the initial (mother) wavelet h(t) which is dilated by value a =2m, translated by constant b = k 2m and normalized so that

hm,k(t)= 1 √a h(t−b a)= 1 √2m h(2−m t−k) (1)

In case of a sequence {x(n)}N−1 n=0 having N =2 s values it is possible to evaluate its expansion

x(n)=a0 +s−1 m=0

2s−m−1−1 k=0

a2s−m−1+k h(2−m n−k)

The following are few equations we use to compute the hardware implementation on the FPGA board.

It=Wxi Xt+Whi Ht-1+ bi (2)

ft=Wxf xt+Whf h t-1+b f (3)

0t=wx oxt+wh oht-1+b0 (4)

ct=tanh(wxc xt+whc ht-1 +bc) (5)

ct=ft*ct-1+it*ct (6)

ht=ot-*tanh(ct) (7)

Disadvantages by existing device:

- EEG poorly measures neural activity that occurs below the upper layers of the brain

- Signal-to-noise ratio is poor
- EEG poorly measures neural activity that occurs below the upper layers of the brain

Advantages:

- Hardware costs are significantly lower than those of most other techniques
- EEG can detect covert processing
- EEG is silent, which allows for better study of the responses to auditory stimuli.
- EEG is a powerful tool for tracking brain changes during different phases of life

Applications:

- to monitor the depth of anesthesia
- to prognosticate, in certain instances, in patients with coma
- to determine whether to wean anti-epileptic medications
- to monitor for secondary brain damage in conditions such as subnormal analysis
- EEG, and the related study of ERP s are used extensively in neurosciences ,cognitive science, cognitive, neurolinguistics and psychological research.

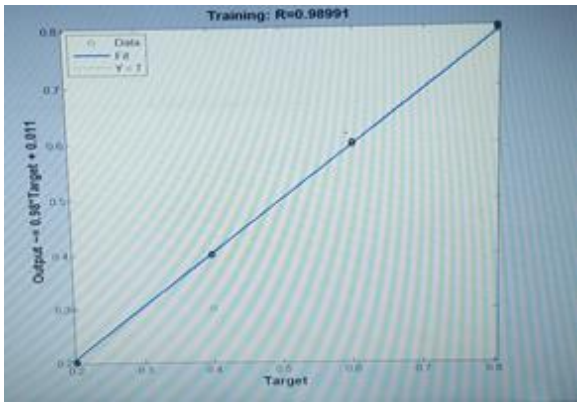
V.RESULT AND DISCUSSION

The following table shows the outcomes of the trials that were performed. The results are accurately obtained as the excepted from the code. Later this is implemented on the FPGA that is the final result of this paper.

Table 1: Outcomes of neural network

Input	Target	Output
Set 1	0.2	0.996
Set 2	0.6	0.6

The graph shows the graphical output of the trained neural network. This is the target to the output results after the network is trained to may layer that enables us to find the exact outputs since it is deep learning method. In the deep learning method the process is training the network for many layers and many neurons at a time. The accurate output is obtained for different sets of the input and this verified with formulae that is mentioned above



VI. CONCLUSION

This paper has addressed the appropriate technique applied for BCI at pre-processing, feature extraction and classification stage. This paper also discussed the advantages, disadvantages and current trends of BCI at every stage. Furthermore, the implemented hardware showed to be significantly faster than other mobile platforms. This work can potentially evolve to a RNN co-processor for future devices, although further work needs to be done. While EEG data is by nature sequences of vectors, as words are, the relationship from one element in the sequence to the next must be different, to some impactful degree, in EEG from Natural Language Processing. The main future work is to optimize the design to allow parallel computation of the gates. This involves designing a parallel MAC unit configuration to perform the matrix-vector multiplication.

Acknowledgment

This work is deemed incomplete without acknowledging the various individuals immensely instrumental in ushering in a great deal of effort, time and valuable guidance. The authors would like to thank the editor, mysterious reviewers for their valuable suggestions that appreciably improved the quality of this paper, especially our guide, Prof. TEJASWINI C, Associate Professor, Department of Electronics & Communication Engineering for providing us the overwhelming support and guidance to write this paper. Finally we are also thankful for our Teaching Faculties, and Non-Teaching Faculties of Department of ECE, M S Engineering College

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REFERENCES

[1]. Zheng Guo, Balasubramanian S, Zlatanovici Real-Time EEG Analysis with SubjectSpecific Spatial Patterns for a Brain–Computer Interface (BCI)

[2]. YI Fang, LI Hao and JIN Xiaojie. Improved Classification Methods for Brain Computer Interface System.

[3]. Soumava Kumar Roy, Chetan Relekar , Tapan K. Gandhi. Emotion classification from EEG signals.

[4]. Mohammad shakid moshfeghi, Aliye Tuke Bedasso,Jyoti Prasad Bartaula. Emotion recognition from EEG signals using machine learning.

[5]. Teodiano Freire Bastos-Filho and Sridhar Arjunan, "evaluation of feature extraction techniques in emotional state recognition",

[6]. Mohit srivatsa and anupama agarwal, Human Computer Interaction Indian Institute of Information Technology, Allahabad.

[7]. M. Rajya Lakshmi ,T. V. Prasad and V. Chandra Prakash "Survey on EEG Signal Processing Methods", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 1, ISSN: 2277 128X, Jan 2014.

[8]. F. Lotte, M. Congedo, Lecuyer, Lamarche and Arnaldi "A review of classification algorithms for EEG based BCI, http://dx.doi.org/10.55339.7n2

[9]. S. Haykin, Neural Networks, A Comprehensive Foundation, Macmillan College Publishing Company, New York, 1994.

[10]. D. I. Choi and S. H. Park, "Self-Creating and Organizing Neural Networks," IEEE Trans. Neural Networks, vol. 5, no. 4, pp. 561–575, July 1994.

[11]. Saeid Sanei and J. A. Chambers, EEG Signal Processing, Wiley Interscience, 2007.

[12]. M. Nixon and A. Aguado, Feature Extraction & Image Processing, Elsevier, Amsterdam, 2004.

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Category: ECE

ZigBee Operated Hazardous Free Pesticides Sprayer for use in Vineyards

AHALYA M[#1], MUKTHA A[#2], VEENA M[#3] , VIDYASHREE G[#4], Dr. REHNA V J[*5]

[#] BE [ECE], M S Engineering College ,Visvesvaraya Technological University(VTU), Bengaluru, Karnataka, India

* Professor & HOD, Dept of ECE, M S Engineering College, Visvesvaraya Technological University(VTU), Bengaluru, Karnataka, India

[1]ahalya161@gmail.com;[2]mukthaashwath06@gmail.com;[3]veenamurthy1712@gmail.com;
[4]vidyapintu10@gmail.com;[5]rehnavj09@gmail.com

ABSTRACT

Sprayers are mechanical devices that are specifically designed to spray liquids quickly and easily. They come in a number of different varieties. In this paper we'll take a look at Zigbee operated mechanical sprayers. A sprayer of this type is a great way to use solar energy.Solar based semi-automatic pesticide sprayer are the ultimate cost effective solution at the locations where spraying is difficult. This automatic solar based pesticide sprayer system uses solar energy as source. In this paper we are trying to make a prototype model for farmers and cultivators for whom spraying of insecticides is harmful and hazardous. This is a project which can be viewed as a viable alternate to these methods. The semi-automatic sprayer is a three wheeled vehicle which sprays pesticide in any given vineyard with almost nil human assistance. The vehicle is powered using an on-board solar powered battery which brings down the running cost. The control of the vehicle is achieved using an inbuilt microcontroller unit which is programmed to respond to the Zigbee wireless device.

Introduction

In India, near about 70% peoples are dependent upon agriculture. So the agriculture system in India should be advanced to reduce the efforts of farmers. Agriculture is a profession of many tedious processes and practices, one of which is spraying of insecticides in the vineyards. Autonomous service robots for orchards and vineyards: 3d simulation environment of multi sensor based navigation and applications Linz, A. Ruckelshausen and E. Wunder (2014),[1] - The authors are working in the fields of unmanned or remote controlled autonomous field robots, navigation, image-based sensors fusion as well as agricultural applications. Within an interdisciplinary research group these technologies are transferred to robot applications in vineyards and orchards. The goal is the availability of an autonomous service robot, whereas first applications are site-specific plant protection (e.g. precise spraying), mulching and picking up fruit boxes. A first version of the robot with electrical drives and precise sprayers has already been developed. The applications, however, show a large range of field conditions which have to be considered for the vehicle application design. Thus the authors have developed a 3D simulation environment which allows the virtual test of the robot platform prior to its application.

literature survey

Dr. H. ErdalOzkan et al. [1]: The main goal of this study was to design and develop software and hardware for an intelligent sprayer that can control variable-rate spray outputs through the nozzles based on availability of a target in sight and density level of the canopy sprayed. This has been accomplished to a large degree. However there is still some ineffectiveness associated with the operation of this sprayer that can be addressed by future studies.

C.Umayaal et al. [2]: This paper deals with the exposition of how robotics can be applied to various phase of agriculture. One of the most important occupations in developing country like India is agriculture. It is very important the efficiency and productivity of agriculture by replacing labours with intelligent machine like robots using latest technologies. The paper proposes a new strategy to replace humans in various agricultural operations like detection of presence of pests, spraying of pesticides, spraying of fertilizers etc thereby providing safety to the farmers and precision agriculture.

Poratkar et al. [3]: The working of this manually operated multi nozzle pesticides sprayer pump is based on the principles of motion transmission due to chain and sprocket arrangement and plunger cylinder arrangement. The operator first stand behind the trolley. He will grab the handle and lift it and push the trolley forward. As trolley move forward, the wheel rotates in counterclockwise direction. As sprocket is mounted on same shaft of wheel,it also rotates in counter clockwisedirection. This motion is transferred to freewheel via chain drive arrangement. The free-wheel, thus, also startsrotating in counterclockwise direction. As freewheel and big spur gear are mounted on same shaft, it also start rotating in anticlockwise direction.

A.S. Wankhede et al. [4]: The Equipment is especially made to work in row crops such as cotton pulses etc. of an agricultural field. The economic condition of farmers and the cost of labor, owing to such conditions, this equipment can find its application. The equipment is intended to perform three important operations done in fields, namely, Spraying pesticide, spraying herbicide and applying urea. All the three operations can be performed simultaneously or individually. Application of urea to the crops is not being focused much by various agriculture equipment producing firm and the equipment available are mostly suitable for large field which are in hectors. Moreover, whatever methods are available for applying urea results in high wastage of urea, we have focused on the same.

Present practices: The solar powered pesticide sprayer in general has to be sprayed manually. In the commonly available ones, the user needs to exert a lot of effort to push the lever up and down to create the pressure to spray. Sometimes when the pressure becomes uneven, the nozzle gets blocked and the farmer has to spend time to rectify it. Also the pesticide is harmful and it also affects the farmers and cultivators due to their presence while spraying in the vineyard. As shown in the figure below the farmer sprays pesticide manually.

Fig.1 Hand Compression Spray

A. Hand compression sprayers are either pressure retaining or non-pressure retaining type. The pressure retaining type has an advantage that air charged once may last for weeks, but requires sturdy tank and high pressure, therefore these are not in common use. Non-pressure retaining type is the most commonly used hand compression sprayer. Like other sprayers, it consists of an airtight, metallic tank, air pump, lance fitted with trigger type or shut off valve, gooseneck bend a pair of shoulder mounted straps and nozzle. It is carry it on the back. All the parts are made from brass alloy and the tank is fabricated to withstand high pressure up to the order of 18 kg/cm^2. For operation, the tank is filled to three fourths of its capacity and pressurized by hand plunger pump, which remain inside the tank or from a compressor. The pressure inside the tank is usually maintained at 3-4 kg/cm^2. The operator mounts the sprayer on his back securing it by shoulder straps and operates the trigger valve, which enables the spray liquid to flow through lance and nozzle. The lance is directed towards the target. A single person can operate the sprayer. For maintaining proper atomization of the spray liquid,

the tank requires frequent pressurization decreases with decrease in pressure.

Figure 2.3: Engine operated sprayer

B. The power sprayer consists of an integrated or external spray tank; a high pressure piston pump usually powered by a petrol engine a pressure regulating valve and a hose of up to 50 m of length. Spray tanks are too big to be carried as a knapsack. The power sprayer is produced in a number of versions. Most simple and common is an engine driven pump mounted on a frame without wheels, a 200 l drum and hose and lance. Flow regulation is to be done via a pressure regulating valve and/or by restrictors (basic power sprayer) and the size of the nozzle. At the other end of sprayers mounted on wheels, equipped with pressure regulators. Technically, the power sprayer has a lot in common with the motorized knapsack-sprayer. The unit is generally set for high volume spraying, transporting the droplets with high pressure. Hallow cone nozzles are the preferred type of nozzles.

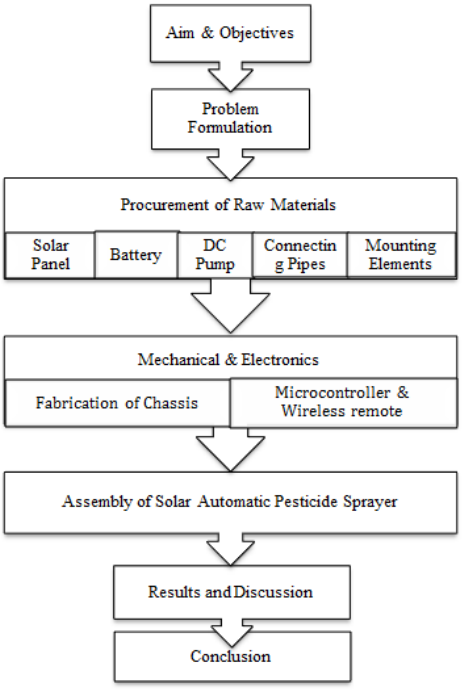
C. Power Tiller Mounted Orchard Sprayer: It consists of an HTP pump, trailed type main chassis with transport wheels, chemical tank with hydraulic agitation system, cut off device and boom equipped with turbo nozzles. It is fitted with turbo nozzles with operating pressure of 9-18 kg/cm^2. It generates droplets of 100-150 micron sizes. Depending upon the plant size and their row spacing, the orientation of booms can be adjusted. The spray booms are mounted behind the operator.

Fig.2 Power Tiller sprayer

METHODOLOGY

1. The first step involved the selection of the project. After weighing in various factors like feasibility, cost, usefulness and challenges involved we settled on this project. This was done after extensive discussions with our guide.
2. After selection of project we went on to select the various general elements required for the project. This involved sourcing a welder and getting a quote on the steel pipes used.
3. We next designed the chassis of the sprayer unit. We based this on an guided vehicle structure and made the necessary modifications.
4. The electrical components were selected to best suit the project requirements. The circuit diagram was used as a basis for selection of components.
5. The next step involved two steps carried out almost simultaneously – the fabrication of the model according to the design and putting together the electrical circuits, calibrating the sensors and the micro-controller.
6. After the fabrication of the model and the completion of the electrical circuits, we integrate the mechanical and electronic parts into one unit for further testing.
7. We test the integrated unit on accuracy and robustness.

8. If any changes or additions are required, we implement them and re-test them until satisfactory results are obtained.



VI. Proposed Block Diagram

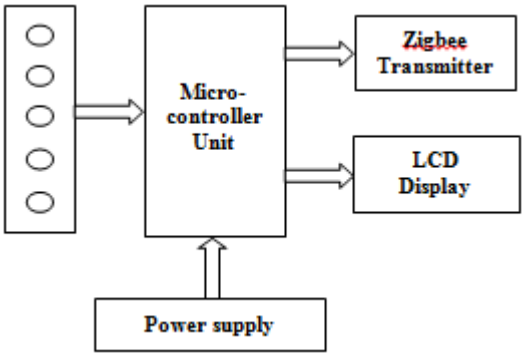


Fig. 3.1 Block diagram of Transmitter

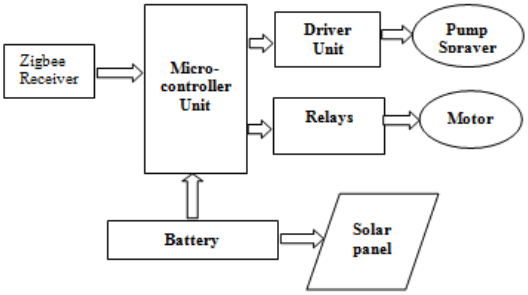


Fig.3.2 Block diagram of Receiver

Actual circuitry; the working is as given below –

1. A 12V battery powers the entire unit including the D.C. motors, pump, relays, Zigbee device and micro-controller. As soon as the control switch is on the vehicle starts moving and spraying.
2. When we press the control switch it sends signal F indicating forward direction via Zigbee Transmitter to microcontroller.
3. The vehicle receives a command to move forward - In this case the relays which were initially in normally closed position get switched and the relay controlling the right motor goes to open condition, thus shutting off the right motor. Thus facilitating a forward motion.
4. To make a right or left turn, signal R or L is send to the micro-controller and vehicle receives the signal and in this case the relay controlling the left motor goes to open and thus shutting off the left motor.
5. This loop continues until the entire area has been sprayed with pesticide and the pump is switched off.

Microcontroller*:* It is the heart of our system. It is the main control block and all other blocks are interfaced to the controller. The software fed into the controller is the main logic of our system. The completion and implementation of our system depends on this logic and finally worked by the controller. We have selected ATMEGA 2560 microcontroller. Motor driver keypad, led and LCD display are interfaced to the various ports of 2560.

Sensor: It is the most important element of this system. We are using IR sensors for obstacle detection, after detecting the object, the sensor sends a pulse to the microcontroller. Then microcontroller decide its path. The sensors is used to detect the obstacles on the path of the robot where it has to perform the seed sowing operation, then the robotic system takes a deviation and start with the next predefined loop of the land.

Display*:* Here we are using LCD type display; LCD display is display of welcome message of project and direction of vehicle.

Liquid crystal display

A liquid crystal display (LCD) is a thin, flat device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector.

Enable (E)

This line allows access to the display through R/W and RS lines.

Read/Write (R/W)

This line determines the direction of data between the LCD and micro-controller.

Register Select (RS)

With the help of this line, the LCD interprets the type of data on data lines.

Logic status on control lines

- E - 0 Access to LCD disabled - 1 Access to LCD enabled
- R/W – 0 Writing data to LCD - 1 Reading data from LCD
- RS – 0 Instruction - 1 Character

Writing data to the LCD is done in several steps

- Set R/W bit to low
- Set RS bit to logic 0 or 1 (Instruction or character)
- Set data to data lines (If it is writing)
- Set E line to high
- Set E line to low

Power supply unit:

Power control unit consists of a lead acid battery with specifications of 12V/2A. A low weight power supply unit can be proposed for better system performance. The power supply in this robotic based farming system is used as back source in the case of low energy supplied from the solar panel.

VI. CONCLUSIONS

This project demonstrates the implementation of robotics and mechatronics in the field of agriculture. This being a test model the robustness of the vehicle is not very high. The performance is satisfactory under laboratory condition. The model gave a fairly good rate of area coverage and the cost of operation as calculated was also reasonably low.

In addition the safety and long term health of the farmers is ensured by eliminating human labour completely from this process. It does not compromise the performance of a petrol based pesticide sprayer.

The future scope of this project include –

1. Take up build a full-scale prototype which can be utilized in the fields in real time.
2. Facilitate charging of the battery using a solar charger thus bringing the costs even further down.
3. Battery energy can be saved by using PWM scheme for driving pump.

REFERENCES

[1] Linz, A. Ruckelshausen and E. Wunder, *"Autonomous Service Robots for Orchards and Vineyards: 3d Simulation Environment of Multi Sensor Based Navigation and Applications".*

[2] Degarmo, E. Paul; Black, J T.; Kohser, Ronald A.(2003), *Materials and Processes in Manufacturing (9th ed.), Wiley, ISBN 0-471-65653-4*

[3] Groover, Mikell P. (2007), *"Theory of Metal Machining"*, Fundamentals Of ModernManufacturing (3rd ed.),John Wiley & Sons, Inc., pp. 491–504, ISBN 0-471-74485-9

[4] Oberg, Erik; Jones, Franklin D.; McCauley, Christopher J.; Heald, Ricardo M. (2004), Machinery's Handbook (27th ed.), Industrial Press, ISBN 978-0-8311-2700-8.

[5] Isabelle Baldi, Pierre Lebailly, *"Pesticide contamination of workers in vineyards in France"*, Journal of Exposure Science and Environmental Epidemiology (2006) 16, 115–124.

[6] *"The Problem with Pesticides"*(http://www.toxicsaction.org/problems-and solutions/pesticides)

[7] "*Solar Operated Multiple Granulated Pesticide Duster*" WCE 2011, July 6 - 8, 2011, London, U.K, and Vol. III. ISBN: 978-988-19251-5-2.

[8] R.JOSHUA, V.VASU & P.VINCENT, Solar Sprayer-*Agriculture Implement, International Journal of Sustainable Agriculture.*

[9] *"Solar photovoltaic's for sustainable agriculture and rural development"* by B. van Campen, D. Guidi and G. Best, Environment and Natural Resources Working Paper No. 2 FAO, Rome, 2000.

[10] http://www.agriculturesnetwork.org/magazines/india/greening-the-economy/solar-powered-sprayer.

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DWT based Image Registration of Medical Images for Efficient Disease Diagnosis System

SUNITHA.P.H[1], TEJASWINI.C[2], VENKATESHAPPA[3]
Electronics and Communication Engineering, VTU, M.S Engineering College, Bengaluru, India
1sushreeanju@gmail.com;2tejuomshankar@gmail.com;3venkat_harshit@gmail.com

ABSTRACT
An efficient architecture is proposed in this paper for high speed 3D - Discrete Wavelet Transform computing. Volumetric data sets produced by various 3D image acquisition devices such as computed tomography (CT) and magnetic resonance imaging (MRI) are processed in the wavelet filters (3D-DWT) with a efficient PSNR and Compression ratio

Keywords: Computed tomography (CT), Position emission tomography (PET), Magnetic resonance imaging (MRI), Discrete Wavelet Transform, PSNR, MSE.

I. INTRODUCTION

Image processing methods, which are possibly able to visualize objects inside the human body, are of special interest. Advances in computer science have led to reliable and efficient image processing methods useful in medical diagnosis, treatment planning and medical research. In clinical diagnosis using medical images, integration of useful data obtained from separate images is often desired. The images need to be geometrically aligned for better observation compression and processing applications. Encoding volumetric data sets produced by various 3D image acquisition devices such as computed tomography (CT), position emission tomography (PET) and magnetic resonance imaging (MRI) are a number of 3D DWT applications. Scalable video coding and noise reduction between frames of a video are the applications that we can name for 3D DWT in the field of video coding and processing. DWT is one of the most computationally intensive parts in these image and video coding applications.

The available DWT architecture can be divided broadly into two schemes named as convolution scheme and lifting scheme. Normally convolution scheme is used to implement DWT filters. But this scheme uses huge number of multipliers which is very difficult to implement and take a large amount of resources in hardware. To eliminate those problems lifting schemes is used. This scheme uses the basic convolution equations in such way that the numbers of multipliers are drastically reduced. Due to this reason lifting scheme is widely used to build chip than convolution scheme.

In this paper, a novel approach for the fusion of computed tomography (CT) and magnetic resonance images (MR) images based on wavelet transform has been presentedThe rest of the paper is structured as follows. Section 2, computed tomography (CT) magnetic resonance imaging (MRI) with respect to DWT In section 3 and 4, the high efficient architecture for the (5, 3) filter based 3D - DWT followed by the implementation and performance analysis in section 5, and section 6 concludes the work.

II MEDICAL IMAGING - MAGNETIC RESONANCE IMAGING (MRI) AND COMPUTED TOMOGRAPHY (CT)

Magnetic resonance imaging (MRI) of the body uses a powerful magnetic field, radio waves and a computer to produce detailed pictures of the inside of your body. It may be used to help diagnose or monitor treatment for a variety of conditions within

the chest, abdomen and pelvis. If you're pregnant, body MRI may be used to safely monitor your baby.

Computed tomography (CT) of the body uses special x-ray equipment to help detect a variety of diseases and conditions. CT scanning is fast, painless, noninvasive and accurate. In emergency cases, it can reveal internal injuries and bleeding quickly enough to help save lives.

Medical imaging provides a variety of modes of image information for clinical diagnosis, such as CT, X-ray, DSA, MRI, PET, SPECT etc. Different medical images have different characteristics, which can provide structural information of different organs. For example, CT (Computed tomography) and MRI (Magnetic resonance image) with high spatial resolution can provide anatomical structure information of organs. And PE (Positive electron tomography) and SPECT (Emission computed tomography) with relatively poor spatial resolution, but provides information on organ metabolism. Thus, a variety of imaging for the same organ, they are contradictory, but complementary and interconnected

III. ARCHITECTURE OF DWT – GENERAL STRUCTURE

The best way to describe discrete wavelet transform is through a series of cascaded filters. We first consider the FIR based discrete transform. The input image X is fed into a low-pass filter h´ and a high-pass filter g´ separately. The output of the two filters are then sub sampled, resulting low-pass sub band y(L) and high-pass sub band y(H) as shown in the figure 1.

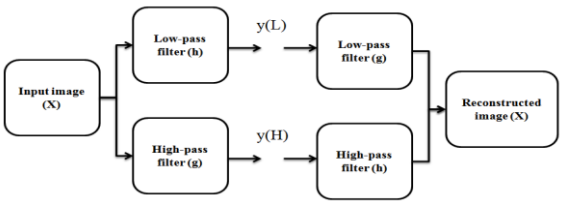

Figure 2: DWT general structure

The original signal can be reconstructed by synthesis filters h and g which take the up sampled y(L) and y(H) as inputs. To perform the forward DWT the standard uses a 1-D sub band decomposition of a 1-D set of samples into low-pass samples and high-pass samples. Low pass samples represent a down sampled low-resolution version of the original set. High-pass samples represent a down sampled residual version of the original set, needed for the perfect reconstruction of the original set.

A. Proposed Architecture of 3D-DWT

The one-dimension (DWT) filter bank consists of two analysis filters, a low pass filter (LPF) and a high pass filter (HPF), which separate the frequency contents of input signal into the approximation (low frequency) coefficients and the details (high frequency) coefficients. The two dimensional (DWT) can be obtained by applying the one dimensional (DWT) along the rows and columns of the input image.

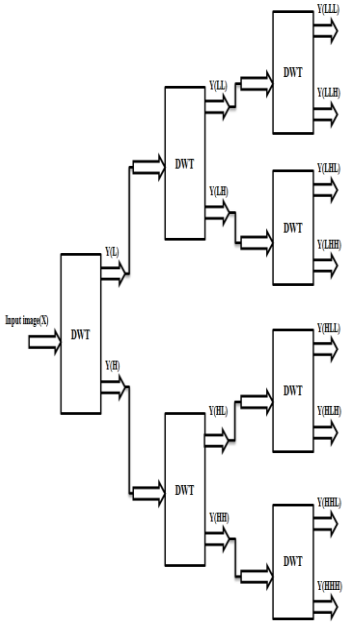

Figure 3: Architecture of 3D-DWT

the first level of computation, the input image is decomposed horizontally by applying one-dimensional (DWT) on each row to get two coefficients (y(L) and y(H)), then it is decomposed vertically by applying one-dimensional (DWT) on each column to get four wavelet coefficients y(LL), y(LH), y(HL), and y(HH). Further these co-efficient are processed for 3D-DWT and produce eight co-efficient as, y(LLL), y(LLH), y(LHL) , y(LHH), y(HLL), y(HLH), y(HHL) and y(HHH) as shown in Fig. 3.

IV ANALYSIS OF 3D - DWT DESIGN WITH MEDICAL IMAGING APPLICATIONS

PSNR is used to measure the quality of reconstruction compression codec. MSE is a measure of error between original I(i,j) and reconstructed image K(i,j). When comparing compression codecs, PSNR is an estimate to human perception of reconstruction quality.

$$PSNR = 10 \cdot \log_{10}\left(\frac{255^2}{MSE}\right)$$

Where

$$MSE = \frac{1}{m\,n}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

I (i,j) : Original Image

K (i,j) : Reconstructed Image and

m x n : Total number of Pixels in the Original image.

Table I: Comparison of Quality of Reconstructed Images

Input Image	PSNR for 3D-DWT in dB	MSE for 3D-DWT
human_brain.jpg	53.0	0.2
elbow.jpg	52.3	0.3
ct_lungs.jpg	51.8	0.4
ct_neuro.jpg	53.0	0.3

V. Decomposition levels of image in 3D-DWT

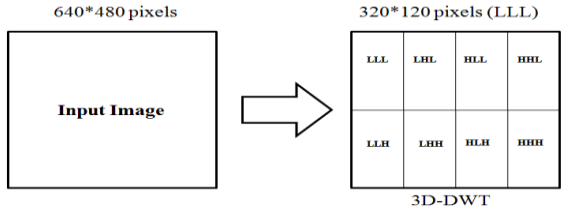

Figure 4: Image decomposition in 3D-DWT

The one-dimension (DWT) filter bank consists of two analysis filters, a low pass filter (LPF) and a high pass filter (HPF), which separate the frequency contents of input signal into the approximation (low frequency) coefficients and the details (high frequency) coefficients. The two dimensional (DWT) can be obtained by applying the one dimensional (DWT) along the rows and columns of the input image. At the first level of computation, the input image is decomposed horizontally by applying one-dimensional (DWT) on each row to get two coefficients (y(L) and y(H), then it is decomposed vertically by applying one-dimensional (DWT) on each column to get four wavelet coefficients (y(LL), y(LH), y(HL), and y(HH)). Further these co-efficient are processed for 3D-DWT and produce eight co-efficient as, y(LLL), y(LLH), y(LHL), y(LHH), y(HLL), y(HLH), y(HHL) and y(HHH) as shown in Fig. 4.

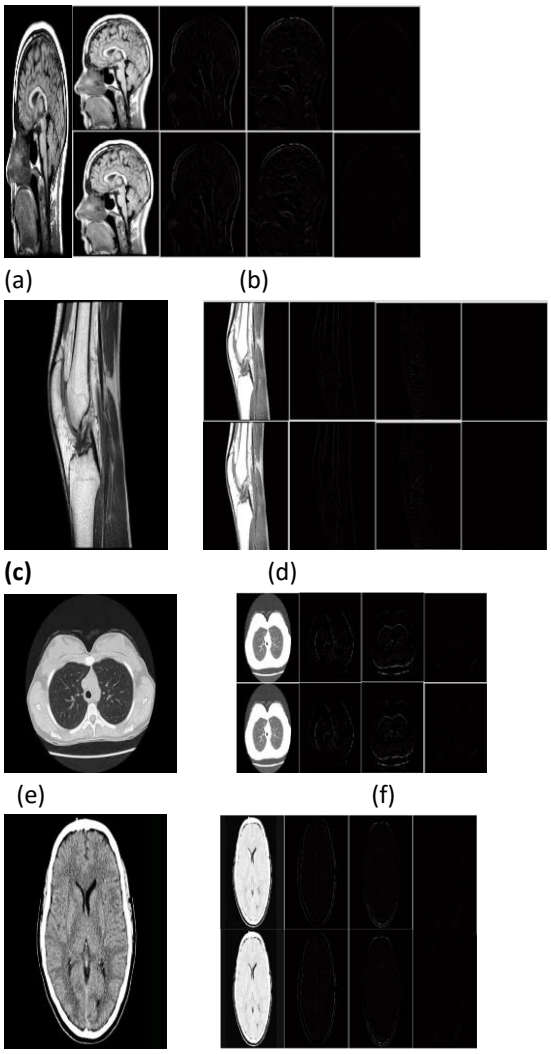

Figure 5: Decomposition of images (MRI and CT) in 3D-DWT

(a) MRI - Human brain(500*500)

(b) Decomposition of human brain(250*125)

(c) MRI – Elbow(1280*720)

(d) Decomposition of elbow (640*180)

(e) CT – Lungs (480*360)

(f) Decomposition of lungs (240*90)

(g) CT – neuro (960*720)

(h) Decomposition of neuro (480*180)

The Block based scheme was implemented in Matlab. As examples, four "standard" test images were chosen for the experiment. All these test images have different dimensions. As per the requirements of JPEG2000 standard, one can select blocks of size 4x4 pixels or more. Smaller the block size, smaller will be the computation time required for processing transforms DWT and IDWT.

VI. CONCLUSION

We successfully implemented the 3D- discrete wavelet transformation on the DSP as applied to lossless image compression. We also implemented the transformation and its inverse in Matlab and compared the results to verify that our algorithm was working correctly. PSNR and Mean square error (MSE) for the Human brain, elbow, lungs and neuro system has been tabulated for the quality of the image reconstructed. Image compression and de-compression levels of MRI and CT images with respect to its size are described.

REFERENCES

[1]. Bowman, M., Debray, S. K., and Peterson, L. L. 1993. Reasoning about naming systems. .

[2]. Ding, W. and Marchionini, G. 1997 A Study on Video Browsing Strategies. Technical Report. University of Maryland at College Park.

[3]. Fröhlich, B. and Plate, J. 2000. The cubic mouse: a new device for three-dimensional input. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems

[4]. Tavel, P. 2007 Modeling and Simulation Design. AK Peters Ltd.

[5]. Sannella, M. J. 1994 Constraint Satisfaction and Debugging for Interactive User Interfaces. Doctoral Thesis. UMI Order Number: UMI Order No. GAX95-09398., University of Washington.

[6]. Forman, G. 2003. An extensive empirical study of feature selection metrics for text classification. J. Mach. Learn. Res. 3 (Mar. 2003), 1289-1305.

[7]. Brown, L. D., Hua, H., and Gao, C. 2003. A widget framework for augmented interaction in SCAPE.

[8]. Y.T. Yu, M.F. Lau, "A comparison of MC/DC, MUMCUT and several other coverage criteria for logical decisions", Journal of Systems and Software, 2005, in press.

[9]. Spector, A. Z. 1989. Achieving application requirements. In Distributed Systems, S. Mullender.

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RECOGNITION/IDENTIFICATION OF VEHICLE NUMBER PLATE USING MATLAB/CONTROLLER/GSM

MUKESH GIRI[1], PUJA BHAGAT[1],Dr. REHNA V J[2],DEVMALLYA KARAR[1]

[1]Student, ECE Department, M S Engineering College, Bangalore, Karnataka, India
[2]Head Department Of ECE & Guide M S Engineering College, Bangalore, Karnataka, India

ABSTRACT

The aim of this project is to detect, extract, recognize text from Number plated and convert it to editable text for further processing. Automatic recognition of car license plate number has become a very important in our daily life because of the unlimited increase of cars and transportation systems which make it impossible to be fully managed and monitored by humans, examples are so many like traffic monitoring, tracking stolen cars, managing parking toll, red-light violation enforcement, border and customs checkpoints. Yet it's a very challenging problem, due to the diversity of plate formats, different scales, rotations and non-uniform illumination conditions during image acquisition. Automatic vehicle Identification (AVI) has many applications in traffic systems. License plate Recognition is an effective form of AVI systems

In this project, a smart and simple algorithm is presented for vehicle's license plate recognition system. The proposed algorithm consists of three major parts: Extraction of plate region, segmentation of characters and recognition of plate characters. The operations include Optical Character recognition, Morphological operations, Histogram manipulation and Edge detection Techniques for plate localization and characters segmentation. Artificial Neural Networks are used for character classification and recognition. For extracting the plate region, edge detection algorithms and smearing algorithms are used. In segmentation part, smearing algorithms, filtering and some morphological algorithms are used. And finally statistical based template matching is used for recognition of plate characters.

Real time Number Plate recognition with SMS Alert system is also implemented. Image is acquired through the camera onto the MATLAB using Image acquisition tool box, then processing is done onto to recognise and identify the Number plate, the results are convincing.

Once the Number plate is recognised it is matches with the user data base and an SMS text is sent to the recipient if he details are in the database. MATLAB communicated with Controller via USB-serial RS232 protocol and Controller communicates with the GSM module for sending SMS.

I. INTRODUCTION

Number plates are used for identification of vehicles all over the nations. Vehicles are identifying either manually or automatically. Automatic vehicle identification is an image processing technique of identify vehicles by their number plates. Automatic vehicle identification systems are used for the purpose of effective traffic control and security applications such as access control to restricted areas and tracking of wanted vehicles. Number plate recognition (NPR) is easier method for Vehicle identification.

NPR system for Indian license plate is difficult compared to the foreign license plate as there is no standard followed for the aspect ratio of licence plate. The identification task is challenging because of the nature of the light. Experimentation of number plate detection has been conducted from many years, it is still a challenging task .

Number plate detection system investigates an input image to identify some local patches

containing license plates. Since a plate can exist anywhere in an image with various sizes, it is infeasible to check every pixel of the image to locate it. In parking, number plates are used to calculate duration of the parking. When a vehicle enters an input gate, number plate is automatically recognized and stored in database. In NPR system spectral analysis approach is used were acquiring the image, extract the region of interest, character segmentation using SVM feature extraction techniques.

The advantage of this approach is success full recognition of a real time Number plate detection addition to the static recognition .

This Project represents an algorithm for implementation of Optical Character Recognition (OCR) to translate Numer Plate images with Standard Labels with standard font sizes, typewritten or handwritten characters into electronically editable format and then to speech to assist in applications.OCR can do this by applying pattern matching algorithm. The recognized characters are stored in editable format. Thus OCR makes the computer read Input Image Text Label discarding noise.

Image Detection and Extraction is done using OCR algorithm, then the extracted text of the image is converted to Actually text using Cross Correlation algorithm, then finally The converted text is converted to speech/audio.

II. PROCEDURE

The Number plates are created using a software, The created number plates are kept in front of the camera and the program is run, it's a live capture, the lighting conditions shoud be good for the capture to happen, once it is captured the algorithm segment's the lines and characters from the image.

Once it has done it, then it performs correlation with the available database, once the correlated values matches with the required value in the data base, an editable character is printed on the note pad

Below is the complete block diagram of the vehicle no. plate detection.

1. The image is being captured by any camera.
2. Each character is being extracted from the no. plate image.
3. Then the edge is being detected of each character.
4. Image of each character is being segmented.
5. And at last the no. is being recognized.

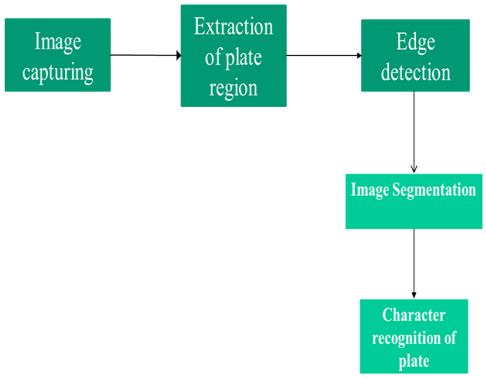
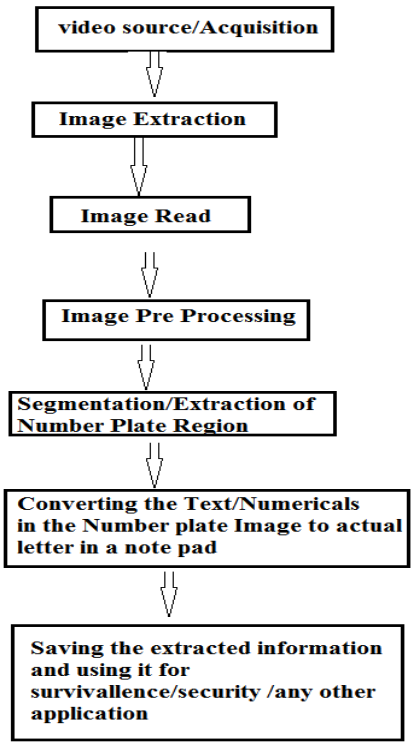


Fig1.Block diagram

A. Flow Chart

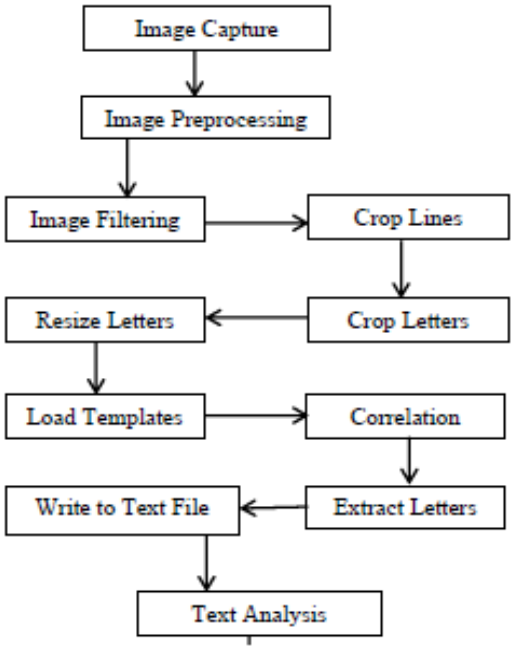
Following is the detailed flow char for the present work



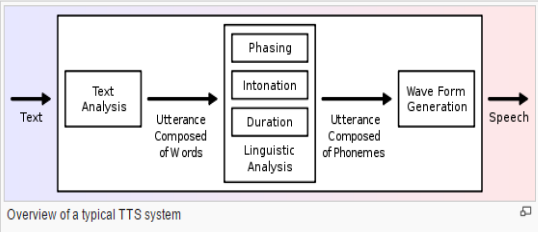
Flow chart1: Project flow

B. Flow Chart for recognition

Below is the flow chart for character and line recognition



C. Text to speech



Speech synthesis is the artificial production of human speech. A computer system used for this purpose is called a speech computer or speech synthesizer, and can be implemented in software or hardware products. A text-to-speech (TTS) system converts normal language text into speech; other systems render symbolic linguistic representations like phonetic transcriptions into speech.

Synthesized speech can be created by concatenating pieces of recorded speech that are stored in a database. Systems differ in the size of the stored speech units; a system that stores phones or diphones provides the largest output range, but may lack clarity. For specific usage domains, the storage of entire words or sentences allows for high-quality output. Alternatively, a synthesizer can incorporate a model of the vocal tract and other human voice characteristics to create a completely "synthetic" voice output.

The quality of a speech synthesizer is judged by its similarity to the human voice and by its ability to be understood clearly. An intelligible text-to-speech program allows people with visual impairments or reading disabilities to listen to written works on a home computer. Many computer operating systems have included speech synthesizers since the early 1990s.

A text-to-speech system (or "engine") is composed of two parts:[5] a front-end and a back-end. The front-end has two major tasks. First, it converts raw text containing symbols like numbers and abbreviations into the equivalent of written-out words. This process is often called text normalization, pre-processing, or tokenization. The front-end then assigns phonetic transcriptions to each word, and divides and marks the text into prosodic units, like phrases, clauses, and sentences. The process of assigning phonetic transcriptions to words is called text-to-phoneme or grapheme-to-phoneme conversion. Phonetic transcriptions and prosody information together make up the symbolic linguistic representation that is output by the front-end. The back-end—often referred to as the synthesizer—then converts the symbolic linguistic representation into sound. In certain systems, this part includes the computation of the target prosody (pitch contour, phoneme durations),[4] which is then imposed on the output speech.

D. Optical Character Recognition (OCR)

Optical character recognition (optical character reader) (OCR) is the mechanical or electronic conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example from a television broadcast)[1]. It is widely used as a form of data entry from printed paper data records, whether passport documents, invoices, bank statements, computerized receipts, business cards,

mail, printouts of static-data, or any suitable documentation. It is a common method of digitizing printed texts so that it can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision.

Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems capable of producing a high degree of recognition accuracy for most fonts are now common, and with support for a variety of digital image file format inputs [2] . Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.

The goal of Optical Character Recognition (OCR) is to classify optical patterns (often contained

In a digital image) corresponding to alphanumeric or other characters. The process of OCR Involves several steps including segmentation, feature extraction, and classification. Each of these steps is a field unto itself, and is described briefly here in the context of a Matlab implementation of OCR.

History

Early optical character recognition may be traced to technologies involving telegraphy and creating reading devices for the blind.[3] In 1914, Emanuel Goldberg developed a machine that read characters and converted them into standard telegraph code.[citation needed] Concurrently, Edmund Fournier d'Albe developed the Optophone, a handheld scanner that when moved across a printed page, produced tones that corresponded to specific letters or characters.[4]

In the late 1920s and into the 1930s Emanuel Goldberg developed what he called a "Statistical Machine" for searching microfilm archives using an optical code recognition system. In 1931 he was granted USA Patent number 1,838,389 for the invention. The patent was acquired by IBM.

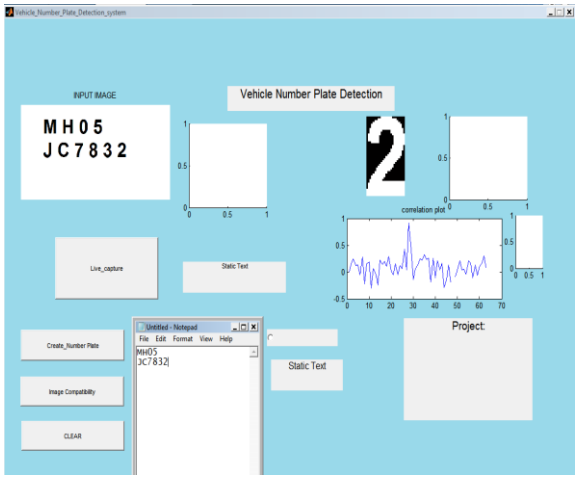
With the advent of smart-phones and smart-glasses, OCR can be used in internet connected mobile device applications that extract text captured using the device's camera. These devices that do not have OCR functionality built-in to the operating system will typically use an OCR API to extract the text from the image file captured and provided by the device.[5][6] The OCR API returns the extracted text, along with information about the location of the detected text in the original image back to the device app for further processing (such as text-to-speech) or display.

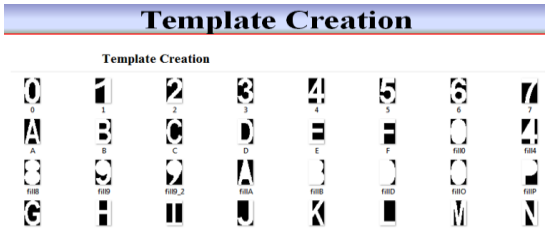
E. GSM-Controller

GSM (Global System for Mobile communications) is the most popular standard for mobile phones in the world. 80% of the global mobile market uses the standard. GSM is used by over 3 billion people across more than 212 countries and territories. Its ubiquity makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world.

III. RESULTS

Following are the results.the system was tested for various number plates, both with white background and yellow background, to simulate all models.





IV. Development process

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor and economy.

Following are the works carried out by the researchers in this field.

[1] Author Joshi Kumar, Mohan Raj, Madhan Prabhu(2011) has proposed "a pragmatic approach to aid visually impaired people in reading, visualizing and understanding textual contents with an automatic electronic pen" .This is about an automated pen which will assist the lives of the blind. This pen helps them with the non-digitized printed documents or any handwritten documents. This Pen consists of a camera, which is used to capture the image of the document to be read. However it is then given to various image processing algorithms in order to increase its overall efficiency. Page alignment process can be done depending upon the output of the image. This image file is given as the input to the IWR (Intelligent Word Recognition) which is used to convert the captured image into corresponding text. It actually works by extracting the text structured letter from it.

[2] Author Vincent Gaudissart, Silvio Ferreira, Bernard Gosselin have proposed "sypole: a mobile assistant for the blind", has presented a complete assistant with unique functionalities, specially designed to visually impaired people. Based on recent scientific breakthrough about character recognition and speech synthesis and using recent hardware evolutions and powerful data processing, this device can assist visually handicapped users to increase their environmental awareness and improve their autonomy and social integration. A key idea assistant is to be modular to continuously integrate new image processing technologies to develop, but also third-party technologies, such as GPS positioning, other input/output modalities.

[3] Anubhav Kumar, Neeta Awasthi (2013) proposed "An Efficient Algorithm for Text Localization and Extraction in Complex Video Text Images", have described the methods which consists three steps. Firstly edge generation using Line edge detection mask applied. After this, text localization using projection profiles based has been done. At last text segmentation and text recognition has been applied on the Localized images.

[4] Author Baranski Przemyslaw, Polanczyk Maciej(2013), have proposed "mobile travel aid for the blind", and have presented the device which features two main functionalities: a mobile phone and a remote assistant module. The device is capable of receiving and dispatching text messages, handling phone calls and browsing a contact book. Text messages, menu, contact book and so on are read by a speech synthesizer which was developed from scratch.

The main issue is the stability of voice transmission in the remote assistance mode. At the current stage of the project, there is only one server that mediates between a blind user and operator. The server relays the traffic and therefore neither a mobile terminal nor a remote operator must have an external IP number. Larger number of users might exhaust resources of one server. Several servers connected to different Internet providers can improve the system reliability which was a problem on several occasions.

[5] Arpit Jain, Pradeep Natarajan (2014) has proposed "Text detection and recognition in natural scenes and consumer videos", have proposed an end to-end system for text detection and recognition in natural scenes and consumer videos. Maximally Stable Extremal Regions which are robust to illumination and viewpoint variations are selected as text candidates. Rich shape descriptors such as Histogram of Oriented Gradients, Gabor filter, corners and geometrical features are used to represent the candidates and classified using a support vector machine. Positively labeled candidates serve as anchor regions for word

formation. Then group the candidate regions based on geometric and color properties to form word boundaries.

[6] Xujun Peng, Huaigu Cao, Rohit Prasad and Premkumar Natarajan (2011), have proposed "Text Extraction from Video Using Conditional Random Fields", Author describe an approach to extract text from broadcast videos. Candidate blocks are detected based on edge extraction results. Corners and geometrical features are used for the purpose of initial classification which is carried out by using a support vector machine (SVM). Considering the spatial inter-dependencies of different regions in the image, they propose a novel conditional random field (CRF) based framework which integrates the outputs of SVM into the system to improve the accuracy of labeling for blocks. The experimental results show that the proposed system achieves reliable performance for text detection/extraction from videos. They present a conditional random field-based method to locate the areas of text from video frames.

To integrate an SVM into the framework of CRFs, they use the estimated posterior from an SVM as a feature in the potential function of a CRF, where a distance based function is used to compute optimal labels for text blocks.

[7] Xuwang Yin, Xu-Cheng Yin, and Khalid Iqbal(2012) proposed "Effective Text Localization in Natural Scene Images with MSER, Geometry-based Grouping and AdaBoost". Text localization in natural scene images is an important prerequisite for many content-based image analysis tasks. They proposed a novel and effective approach to accurately localize scene texts. Firstly, maximally stable extremal regions (MSER) are extracted as letter candidates. Secondly, after elimination of non-letter candidates by using geometric information, candidate regions are constructed by grouping similar letter candidates using disjoint set.

Candidate region features based on horizontal and vertical variances, stroke width, color and geometry are extracted. An AdaBoost classifier is built from these features and text regions are identified.

[8]Mohammad Khodadadi, Azadboni Alireza Behrad(2012) proposed "Text Detection and Character Extraction in Color Images using FFT Domain Filtering and SVM Classification", Author described, a new approach for text detection and localization. For this purpose, first localize text location and then determine characters' pixels.

[9]Author Joshi Kumar.A, Mohan Raj, Madhan Prabhu(2011) have proposed, " PENPAL- Electronic Pen Aiding Visually Impaired in Reading and Visualizing Textual Contents" , The proposed system instead uses other senses that visually challenged person possesses, such as the ability to listen and convert the textual material into an audio stream. This concept starts with the capturing of the image and recognizing the text in the image using OCR/ICR..

[10]Author ching-ching chengl, teng-hui tseng, chun-ming tsai(2014) have proposed , "Text string detection for the first grade visually impaired pupils reading mandarin textbooks" ,it presents a text string detection method to detect the text string in a mandarin textbook. Using the method, the text strings can be detected by combining methods for detection of seeing the textbook, modified skin detection, holding-textbook detection, text string region detection, text string detection, and text string identification. The proposed method also reduces the time complexity by using M2FD method. Experimental results comparing the proposed M2FD method with conventional 2FD method applied to experimental videos demonstrate that the proposed M2FD method is more efficient and achieves text string total detection rates accuracy up 98.52%.

[11]Author Kamrul Hasan Talukder, Tania Mallick (2014) has proposed, "Connected Component Based Approach for Text Extraction from Color Image" Image based text extraction is one of the fastest growing research areas in the field of multimedia technology. The extraction of text from a complex or more colorful images is a challenging problem. Extraction of this information involves detection, localization, tracking, extraction, enhancement, and recognition of the text from a given image. For fast extracting text from images, they have proposed a

connected component based approach which identifies more accurately for small or large texts in the image. The text extraction process starts with conversion of the color image to gray scale image and then it converts the gray scale image into a binary image. Then each text region is marked and the text is extracted from the image. Finally, the extracted text is written into another gray scale image.

V. CONCLUSIONS

The version of this template is V2. Most of the formatting instructions in this document have been compiled by Causal Productions from the IEEE LaTeX style files. Causal Productions offers both A4 templates and US Letter templates for LaTeX and Microsoft Word. The LaTeX templates depend on the official IEEEtran.cls and IEEEtran.bst files, whereas the Microsoft Word templates are self-contained. Causal Productions has used its best efforts to ensure that the templates have the same appearance.

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REFERENCES

[1]. S. M. Metev and V. P. Veiko, Laser Assisted Microtechnology, 2nd ed., R. M. Osgood, Jr., Ed. Berlin, Germany: Springer-Verlag, 1998.

[2]. J. Breckling, Ed., The Analysis of Directional Time Series: Applications to Wind Speed and Direction, ser. Lecture Notes in Statistics. Berlin, Germany: Springer, 1989, vol. 61.

[3]. S. Zhang, C. Zhu, J. K. O. Sin, and P. K. T. Mok, "A novel ultrathin elevated channel low-temperature poly-Si TFT," IEEE Electron Device Lett., vol. 20, pp. 569–571, Nov. 1999.

[4]. M. Wegmuller, J. P. von der Weid, P. Oberson, and N. Gisin, "High resolution fiber distributed measurements with coherent OFDR," in Proc. ECOC'00, 2000, paper 11.3.4, p. 109.

[5]. R. E. Sorace, V. S. Reinhardt, and S. A. Vaughn, "High-speed digital-to-RF converter," U.S. Patent 5 668 842, Sept. 16, 1997.

[6]. (2002) The IEEE website. [Online]. Available: http://www.ieee.org/

[7]. M. Shell. (2002) IEEEtran homepage on CTAN. [Online]. Available: http://www.ctan.org/tex-archive/macros/latex/contrib/supported/IEEEtran/

[8]. FLEXChip Signal Processor (MC68175/D), Motorola, 1996.

[9]. "PDCA12-70 data sheet," Opto Speed SA, Mezzovico, Switzerland.Karnik, "Performance of TCP congestion control with rate feedback: TCP/ABR and rate adaptive TCP/IP," M. Eng. thesis, Indian Institute of Science, Bangalore, India, Jan. 1999.

[10]. J. Padhye, V. Firoiu, and D. Towsley, "A stochastic model of TCP Reno congestion avoidance and control," Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02, 1999.

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Anti-theft Control System for Forest Trees Using GSM Technology

K JYOTHI LATHA [#1], HARSHITHA L[#2], PADMAPRIA B[#3], CHALUVARAJU[#4]

[1] ECE Department, M S Engineering College, Navarathna Agrahara, SadahalliPost, Off. Bengaluru International Airport Road, Bangalore, Karnataka, India

[2] ECE Department, M S Engineering College, Navarathna Agrahara, SadahalliPost, Off. Bengaluru International Airport Road, Bangalore, Karnataka, India

[3] ECE Department, M S Engineering College, Navarathna Agrahara, SadahalliPost, Off. Bengaluru International Airport Road, Bangalore, Karnataka, India

[4]Assistant Professor, ECE Department, M S Engineering College, Navarathna Agrahara, SadahalliPost, Off. Bengaluru International Airport Road, Bangalore, Karnataka, India

[1]jyothil399@gmail.com;[2]harshithakushi1@gmail.com;[3]priyabollu44@gmail.com;[4]chaluva.hr@gmail.com

ABSTRACT

Trees are a very important part of the ecosystem on our planet . Amongst the variety of flora available on the planet, “Sandalwood” are one of the most costly as well as less available trees. They are useful in medical sciences and cosmetics. From the past few years, we are finding that the newspapers and news channels are frequently filled with news regarding the smuggling activities. Since they are costly, smugglers alledgely cut down many of these trees and transport them to their factories for commercial purposes. Anti-theft control system is a measure that has been taken to stop these smuggling activities. This particular system uses GSM technology, with the 32-bit microcontroller ARM cortex M3, playing the key role in processing of information. The source of input is metal sensor, temperature sensor and PIR sensor which also play the key role in detection.

Keywords— Sandalwood, smuggling, ARM Cortex M3, GSM technology, metal sensor, temperature sensor, PIR sensor.

I. INTRODUCTION

The anti-theft control system is a very effective system that helps in controlling smuggling activities in forests. ARM cortex M3 microcontroller is the heart of the system. There are three crucial sensors that provide input to the microcontroller ; metal , temperature and PIR sensors. Based on the type of input received from these sensors, the microcontroller sends messages through the GSM module to the registered mobile number of the forest officials. These notifications help the forest officials to take immediate action thereby stopping the smuggling of trees.

II. PROCEDURE

The microntroller ARM cortex M3, is very well known for its high speed. It is programmed using embedded C and has the forest officials' numbers and the messages stored in its memory. Metal sensor, as we know works on electro-magnetic induction.

The metal sensor detects metal, when some comes in contact with the tree. The temperature sensor LM35, senses the temperature of the surrounding areas of trees. When temperature rises above 35 degrees, the sensor's internal resistance decreases and current increases, and sends information to the microcontroller.

The PIR (Passive Infrared Sensor), detects human movement. When a human being or an animal pass by the tree, the sensor emits buzzer sound and also sends a signal to the microcontroller.

Based on these three types of input, respectively the microcontroller coveys three different messages to the registered number of the forest officers through GSM. These messages are also displayed on the LCD.

Solar panels are used in this system. These panels absorb solar power and converts it into voltage and sends an input of 12V,5W to dc-dc converter. This converter regulates the input voltage and voltage of 15 volts is stored in a Lead-Oxide battery.

The system concept is that input consists of detectors for three different conditions; firstly, when a tree is under the process of being cut down; secondly, when the surrounding temperature of the trees being very high; thirdly, detection of trespassers (human beings) coming within the range of the sensor. The information is sent to the microcontroller wherein it is processed. Since we aware that the controller is completely programmed using embedded C, on receiving the signals, as per the program and the signal received, it pops the corresponding message from the memory and sends it out.

Output is provided by microcontroller through the GSM module to the registered mobile number. The corresponding messages from the microcontroller are sent out through its output pin, which is then passed on to the GSM module. The module, as we know using a SIM card passes the messages to the registered mobile number of the forest officials.

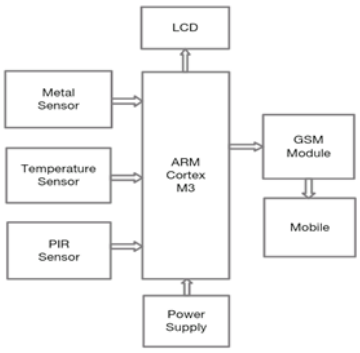

Fig. 1 The main circuit

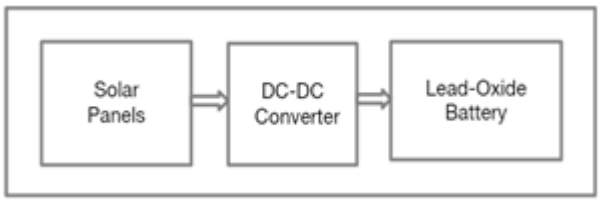

Fig. 2 The power supply

The battery supplies voltage to the entire circuit. Solar panels, as mentioned, absorb solar power during day time and stores it in the battery. At the night time, this stored battery power can be used to run the entire circuit.

Fig. 1 shows the block diagram of the main circuit.

Fig. 2 shows the internal components of power supply.

III. METHODS AND METHODOLOGIES USED

GSM technology is utilized for sending messages to the registered number of the forest officials.

RF technology has been used.

ARM COTEX M3 has been programmed using embedded C.

LCD is used for indication of the microcontroller activities.

Wireless cameras working with a frequency of 27MHz covering upto 100 feet area have been used.

Lead-oxide battery is used as power saver.

A special sensor called PIR sensor is used here.

Solar panels are used within the power supply.

IV. **ADVANTAGES OF THIS SYSTEM**

By using this system, manual power is reduced to a great extent. This is because, the forest officials can supervise via the control room, without the need of going to each and every area of the forest checking for the illegal activities and thereby, saves their time. Global warming is also reduced to a great extent. The habitat of birds is preserved. This sytem is reliable since it works under all environmental conditions and the components donot get worn out.

V. **RESULTS**

The sensors are the main source of input to the microcontroller. Based on the three sensors' input, microcontroller sends three different messages respectively.

Fig. 2 shows the messages that have been received by the forest official's registered mobile number. The first message “SOMEONE ROAMING INSIDE THE

FOREST" is the message that indicates that there is some human being or animal nearby the trees. This is an output obtained due to the detection of the PIR sensor.

The second message "TEMPERATURE HIGH" indicates that surrounding temperature of the trees has risen above 35 degrees' celcius. This is an output obtained due to detection of the temperature sensor.

The third message "SOMEONE CUTTING THE TREE" indicates that a tree is in the process of being cut down. This output is obtained when any metal (in the form of a tool) comes in contact with a tree, the metal sensor for that particular tree detects and notifies the forest officials.Fig. 3 shows the main circuit consisting of (from left) the temperature sensor, GSM module, ARM cortex M3 microcontroller, metal sensor, PIR sensor, RF transmitter, RF receiver, DC-DC converter and LCD.

Fig. 4 shows the three different messages sent to the registered mobile number of the forest officials.

Fig. 5 shows LCD which displays messages before sending them to the registered mobile number.

We can see by the messages that, for each input there is a different message that is being sent to the registered number. This system is thereby, very helpful in conveying messages at the righ time.

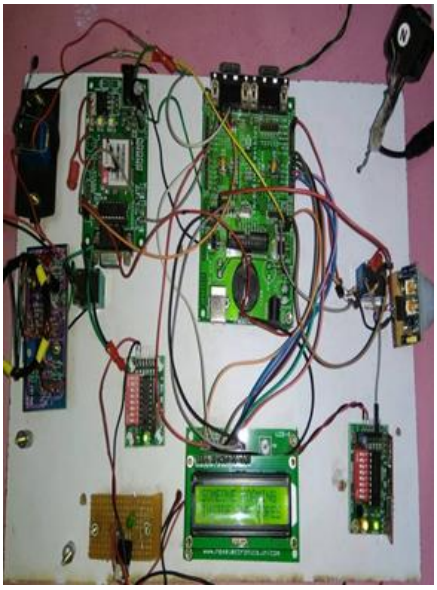

Fig. 3 The picturization of main circuit

Fig. 4 The three different messages based on the three sensors' Metal, Temperature and PIR detection

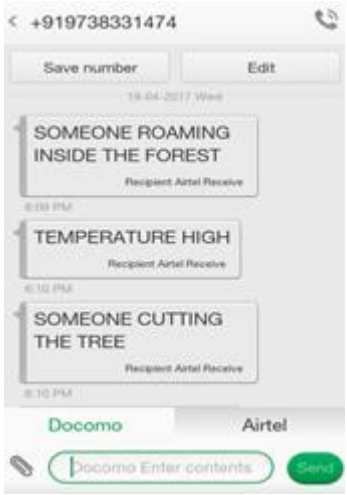

Fig. 5 The LCD displaying the message - " SOMEONE ROAMING INSIDE THE FOREST"

VI. CONCLUSIONS

Thus, this effective and reliable system helps in controlling and stopping the smuggling activities. Apart from the main objective, the system also helps in reducing the global warming to a great extent. The natural habitat of the animals is preserved indirectly. The trees can also be protected from forest fire by using this system. This inturn helps in reducing deforestation. Thereby, the ecological balance is maintained.

REFERENCES

[1]. http://timesofindia.indiatimes.com/city/lucknow/200-teak-trees-cut-TImber-smuggled/articleshow/16804707.cms

[2]. http://ibnlive.in.com/news/endangered-red-sandalwood-seized-from-smugglers-in-berhampur/480595-3-234.html.
[3]. http://esl.fis.edu/learners/support/sci/text/stolenforest.html.
[4]. Yichang, China; Guangyu He ; Junli Wan —Research on Zigbee wireless communication technology Wei Wang‖ In Electr.Eng. & Renewable Energy Sch., China Three Gorges University.
[5]. Chonggang Wang, Tao Jiang, Qian Zhang —ZigBee® Network Protocols and Applications‖
[6]. ZigBee specification version 2006, ZigBee document 064112, 2006.
[7]. ZigBee Alliance, ZigBee Specification. Version 1.0 ZigBee Document 053474r06.
[8]. Jiang, Y., Cao, J., & Du, Y. —Unmanned air vehicle landing based on Zigbee and vision guidance‖ WCICA 2006, 2, 10310 - 10314.
[9]. *Muhammad Ali Mazidi, RolnD.Mckenley, "The 8051 Microcontroller and embedded system using assembly & C‖*
[10]. HuaQian —API: GSM/GPRS Modem User Interface‖ The University of Texas at Dallas University of Texas at Dallas, 2007.

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Review on Performance Analysis of UWB Bandpass Microstrip Filters

K Shobha I Hugar[1], Dr Vaishali Mungurwadi[2], Dr J S Baligar[3]
[1]Asst Prof,ECE, SCE Bangalore, [2]Principal, SCET, Athwa, Surayt, Gujarath,
[3]Assoc Prof ECE, Dr A I T Bangalore
[1]shobha_hugar@yahoo.co.in;[2]Vaishali B M @yahoo.com;[3]JSBaligar@yahoo.com

ABSTRACT
In the last few years, several microwave filter design with band-pass response have been proposed for ultra-wideband (UWB) application. Among various microwave filter design, microstrip filter are most widely used by researcher due to the features like light weight, easy to fabricate and low cost. Conventional microstrip filter can be in any shape like circular, rectangular or elliptical but some modification or additional variation in their basic design can be made for different purposes. This paper reviews the performance analysis of Microstrip UWB bandpass filters designed using MMR, Multi Short Circuited Stubs , PCML, Ring Resonators, SIR.In this paper an effort is made to review performance in terms of insertion loss,return losses, bandwidth and group delay.

Keywords— Multiple Mode Resonators (MMR), Parallel coupled microstrip line (PCML), Stepped impedence resonator (SIR) ,Federal Communication Commission (FCC).

I INTRODUCTION

In early 2002, the U.S. Federal Communication Commission (FCC) approved the unlicensed use of UWB systems for avariety of applications. The FCC defined that bandwidth for indoor and hand-held UWB systems must be strictly in between 3.1 to 10.6 GHz with maximum Equivalent Isotropic Radiated Power (EIRP) equal to -41 dBm as shown in Figure 1.To fullfill the UWB bandwidth constraints sited by FCC, transmitted signal must be shaped to fit the FCC UWB PSD mask. Therefore, there are needs to design the UWB bandpass filter covering the whole UWB passband with the fractional band-width of 109.5% at center frequency of 6.85 GHz, since that, Band Pass Filter (BPF) become one of main blocks that make up UWB transmitter system. Often, in such application, passive filters are used rather than active counterpart. Passive filters designed around reactive elements only, using lumped-components such as inductors and capacitors or distributed elements such as cascaded resonators, can operate up to the microwave region. At upper microwave frequencies, the parasitic in the inductors and capacitors often proved too much constraint to use them in the wireless system. Hence, many of the filters used in microwave communication systems employed the distributed elements types. Prime advantages of Microstrip are low cost and compact sizes.

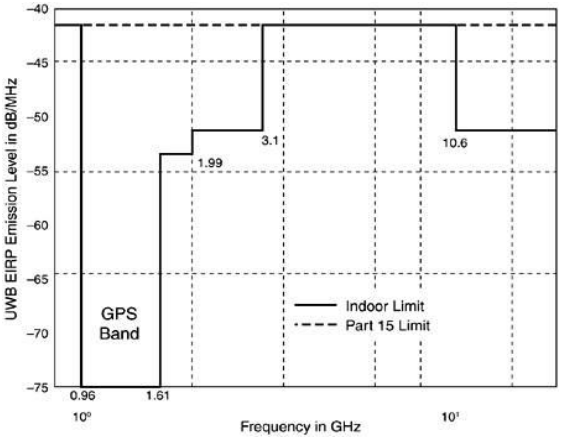

Fig.1 Spectrum mask in indoor FCC[1]

Performance Review of UWB Bandpass Filters

Sl no	Title	BW	Insertion Loss	Return Loss	Group Delay
1	"Development of band pass filter for ultra wideband (UWB) communication,"	93%	-6.7dB	-11.4 Db	within 0.2nsec.
2	"Design and analysis of UWB band pass filter with ring resonator	109.50%	better than 0.53dB	greater than 10dB	below 0.6nsec
3	Design of Parallel-Coupled Microstrip Line Band Pass Filter (BPF) for UltraWide Band (UWB) Applications	---	Less than 0.2 dB in pass band	Greater than 10 dB	--
4	Novel UWB Bandpass Filter Using Multiple-Mode Resonator Units in Series	111 %.	Less than l.5 dB	Less than -10 dB	Less than 0.63 nsec
5	Ultra-Wideband (UWB) Band pass Filters Using Multiple-Mode Resonator	113%	0.55dB at 6.85 GHz	More than 10dB	---
6	Design of UWB band pass filter for wireless communication application	110%	0.45 dB	11 dB	0.4 nsec

An UWB filter proposed in [1] was constructed by mounting the microstrip line in the lossy composite substrate so as to attenuate the signals at high frequencies and achieved UWB pass band. The reported performances in [1] showed that this filter had an insertion loss higher than 6.0 dB in the UWB pass band and the return loss as high as 4.5 dB in the upper stop band above 10.6 GHz. However, the filter lacked sharpness at the lower frequency and quite poor impedance matching. Since filter was developed using a lossy composite substrate that absorbs high frequency signals. But in this work bandwidth is improved compared to [8].

Hitoshi Ishida and Kiyomichi Araki proposed a microstrip ring filters [2] with the dual stop bands below 3.1 GHz and above 10.6 GHz and was constructed to make up the most initial UWB filter and have reasonably achieved UWB pass band. However, this filter in fact has many problematic issues, such as unexpected pass bands below 3.1 GHz, narrow lower/upper stop bands, large size, complexity in configuration .

In paper[3] UWB BPF using parallel-coupled microstrip line technique,that has two or more resonators cascaded as such to form the coupled multi-resonator BPF. Each individual resonator is affected by reactive loading from adjacent couplings and open-ended capacitive fringing. However, this structure often requires a very small coupling gap on the outermost resonators, which makes it difficult to realize using low cost methods such as FR-4 type circuit boards and thick-film Alumina processing.

Lang Wang, Han-Li Liu, Joshua Le-Wei Li proposed A novel ultra-wide band (UWB) bandpass filter (BPF) using three multi-mode resonator (MMR) units in series[4]. Each of the units is a resonator made by attaching a ring open stub in shunt to a high impedance microstrip line. The units form a MMR to improve the selectivity. By properly adjusting the radius of the circles of the ring stubs and the length of the coupling segments, the resonant modes of this units can be allocated within the 3.1-to-l0.6 GHz UWB while the upper-stopband is also wide.

In [5] A novel microstrip-line ultra-wideband (UWB) bandpass filter is proposed and implemented using a multiple-mode resonator (MMR), aiming at transmitting the signals in the whole UWB passband of 3.1–10.6 GHz.It was designed by forming a microstrip-line multiple-mode resonator (MMR) and introducing quarter-wavelength parallel coupled

lines in the input and output ports, a UWB passband with five transmission poles were realized. Within the UWB passband, the measured insertion and return losses are lower than 2.0 dB and higher than 10.0 dB, respectively, while the group delay varies in between 0.20 and 0.43 ns. Compact filter size is reported.

S.Rabia Jebin, M.Ganesh Madhan proposed An Ultra Wide Band , band pass filter (BPF)[6] with a fractional bandwidth (FBW) of about 110% and was developed using a microstrip transmission line structure, comprising of bent short circuited stubs separated by bend connecting lines. This approach resulted in a compact structure and it exhibited a selective filtering characteristic equivalent to a 9-pole Chebyshev filter.

II CONCLUSION

In this paper, an effort has been made to review performance of UWB bandpass filter in terms of insertion loss,return losses, bandwidth and group delay. Microwave filter plays important roles in wireless communication system.Design modifications can yield a compact size, high bandpass performance and good measurement results.

REFERENCES

[1]. Akihiko Saito" Hiroshi Harada, Atsuhiro Nishikata ''Development of Band Pass Filter for Ultra Wideband (UWB) Communication Systems IEEE Conference on Ultra Wideband Systems and Technologies, 2003 Year: 2003 Pages: 76 - 80, .

[2]. Hitoshi Ishida and Kiyomichi Araki ''Design and Analysis of UWB Bandpass Filter with Ring Filter IEEE MTT-S International Microwave Symposium Digest (IEEE Cat. No.04CH37535) Year: 2004, Volume: 3 Pages: 1307 - 1310 Vol.3.

[3]. Mohamed Azaga1 , Masuri Othman,'' Design of Parallel-Coupled Microstrip Line Band Pass Filter (BPF) for UltraWide Band (UWB) ApplicationS International Conference on Computer and Communication Engineering Year: 2008 Pages: 280 – 283.

[4]. Mohamed Azaga1 , Masuri Othman,'' Novel UWB Bandpass Filter Using Multiple-Mode Resonator Units in Series IEEE International Workshop on Electromagnetics: Applications and Student Innovation Competition Year: 2012 Pages: 1 – 2.

[5]. Lei Zhu, Sheng Sun, and Wolfgang Menzel ''Ultra-Wideband (UWB) Bandpass Filters Using Multiple-Mode Resonator Microwave and Wireless Components Letters Year: 2005, Volume: 15, Issue: 11 Pages: 796 – 798.

[6]. S.Rabia Jebin and Ganesh Madhan ''Design of UWB bandpass filter for Wireless Communication Applications '' International Conference on Electronics and Communication Systems (ICECS) Year: 2014 Pages: 1 – 5.

[7]. Lei Zhu, Huuheng Bu, and Ke Wu ''Aperture Compensation Technique For Innovative Design Of ultra-Broadband Microstrip Bandpass Filter IEEE MTT-S International Microwave Symposium Digest (Cat. No.00CH37017) Year: 2000, Volume: 1 Pages: 315 - 318 vol.1.

[8]. Hitoshi Ishida and Kiyomichi Araki '' A design of tunable UWB filters International Workshop on Ultra Wideband Systems Joint with Conference on Ultra Wideband Systems and Technologies. Joint UWBST & IWUWBS 2004 (IEEE Cat. No.04EX812) Year: 2004 Pages: 424- 428.

[9]. Lung-Hwa Hsieh and Kai Chang ''Compact, Low Insertion-Loss, Sharp-Rejection, and Wide-Band Microstrip Bandpass Filters g, IEEE Transactions on Microwave Theory and Techniques Year: 2003, Volume:51, Issue: 4 Pages: 1241 - 1246

[10]. Di Kai Liu, Chen Fei Su, Xue Yan Wang ''A Novel Microstrip UWB Bandpass Filter Using Stub-Loaded Multiple-Mode Resonator'' IEEE International Conference on Applied Superconductivity and Electromagnetic Devices Year: 2013 Pages: 146 – 148.

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SANITARY STROLLER BIONIC PERSON

SWETHA TN[1], POORNIMA CR[2], THEJASWINI SB[3]

Department of ECE, S.J.C.I.T , CHICKBALLAPUR
[1]swethareddy.t.n@gmail.com, [2]poornimacrp51@gmail.com,[3] sbth.theju@gmail.com

ABSTRACT

The design of dustcart ,a wheeled autonomous robot for door to door garbage collection. Aims at developing a urban hygiene management. Dustcart is able to navigate in urban environment avoiding static and dynamic obstacles and to interact with human users. Dustcart aims at providing a solution to door-to-door garbage collection, the robot called by a user navigates autonomously to his\her house. collects the garbage from the user and then discharge collected waste to dedicated area. The robot is managed by an Ambient intelligence system(AMI). An additional feature of dustcart is the capability to monitor the air pollution by means of an board Air Monitoring Module(AMM).The AMM integrates sensors to monitor several atmospheric pollutants, such as carbon monoxide(co),particular matter, nitrogen dioxide(NO2),relative humidity.AMI is able to collect measurements taken by different robots and to process them to create a pollution distribution map. In this paper we describe the dustcart robot system , focusing on the AMM and on the process of creating the pollution distribution maps.

KEYWORDS-Autonomous robot, Ambient intelligence system, Air Monitoring Module(AMM)

I. INTRODUCTION

Among the next frontiers for operation of service robot in the urban surroundings. Evidence can be found both at the research and profitable levels .Also at the commercial level it is possible to find companies selling autonomous mobile robots, such as .Among the applications envisaged so for urban robots are: human guidance and assistance, human or object transportation, rubbish collection, street cleaning, patrolling.

Crucial challenges for autonomous robots moving in urban environments are many and different localization, environmental awareness, obstacle avoidance, navigation, communication , human robot interaction. Other important problems that have to be solved are those related to non technical issues such as traffic law ,insurance and social acceptability .In this paper ,drawing on the data obtained from the demonstration carried out with our autonomous robot dust cart, we will point out and discuss the results concerning navigation in different urban sites and the of a long term robotic automated service for door-to-door garbage collection in real urban environment.

On the other hand technologies using GPS signal can be used to achieve an estimate of the robot position .Despite these difficulties the development of autonomous agents able to move in outdoor environment can provide new systems to fulfill useful tasks in the near future such as cleaning, supervision, transportation and environmental monitoring . one of the two kinds of robot created during the project is dustcart.The robot is designed to provide an automatic door-to-door garbage collection service in the pedestrian areas of the historical centers of town where other vehicles can face difficulties to move .In a typical operational situation, a user requests garbage removal by placing a call to dust boot call center .A robot is then dispatched to the predefined user home address. A robot interacts with the user through a touch screen and receives a bag .Then it moves to a discharging site where it deposits the bag in different locations based on the of garbage the user choose on touch screen .The robot operation are

performed by Ambient intelligence platform(AMI).which receives a phone calls, select the robot to move and manages the robot's environments avoiding static and dynamic suggested us to bestow it with additional features: the possibility of providing useful information about the city through the touch screen and capability of monitoring the air quality using different environmental sensors. Different kind of sensors were integrated in a robot's module called ambient monitoring module (AMM) connected to the main robot's controller board including NO_2,CO,PM10,temperature and humidity sensors .vehicular traffic ,industrial exhaust and the fossil fuels combustion have a well known impact on the health of people ,especially for people living in cities. Nowadays these pollutants are monitored by stationary stations located in strategic positions of cities .The monitoring stations send the measured pollutant levels to a central station for data processing .To increase spatial resolution of the monitoring is the use of autonomous robots equipped with environmental sensors.

II.DUST CART ROBOT

Dust cart robot is a two wheeled robot based on the commercial segway platform .This platform guarantees a high maneuverability in the urban spaces. A metallic frame was built on the RMP 200 to contain robot's electronic and the bin(77 liters of volume) that can be opened/closed by the robot figure 1. ..The system planning is shown in figure 2. The core part of dustcart is the supervisor software running on industrial PC with Pentium M 1.7 GHZ processor ,512 MB RAM ,with linux (ubuntu 8.04) 0S.. It acquires the data coming from the sensors ,communicates with AMI through wireless connection (using internet) receives the commands (tasks and destination points)and communicates with other boards (all based on ARM9STR912F boards from STMicroelectronics) using a CAN BUS as a communication channel .In a particular ,the AMM module collects raw measurements from the sensors at different frequencies ,processes them and send the data to the supervisor through the CAN BUS.

The system architecture dashed rectangles represent distinct hardware component on the robot,solid rectangle are processes as shown in figure 2.

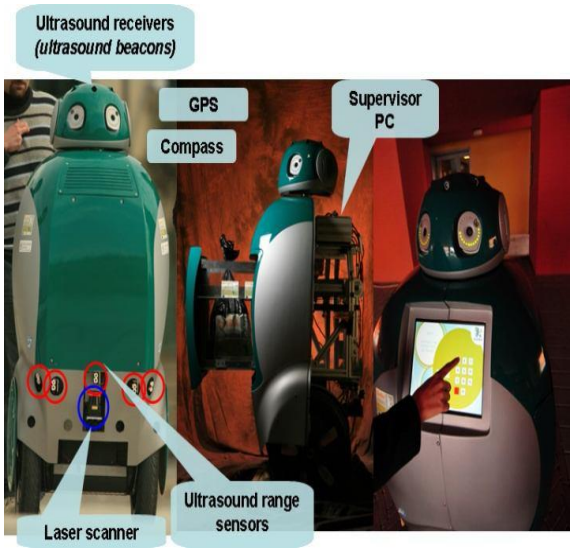

Figure 1: Dust cart robot

This dust cart robot has the navigation sensors, ultrasound range sensors ,laser scanner, with open bin, having a pc with touch screen which is used for interaction as shown in figure 1.

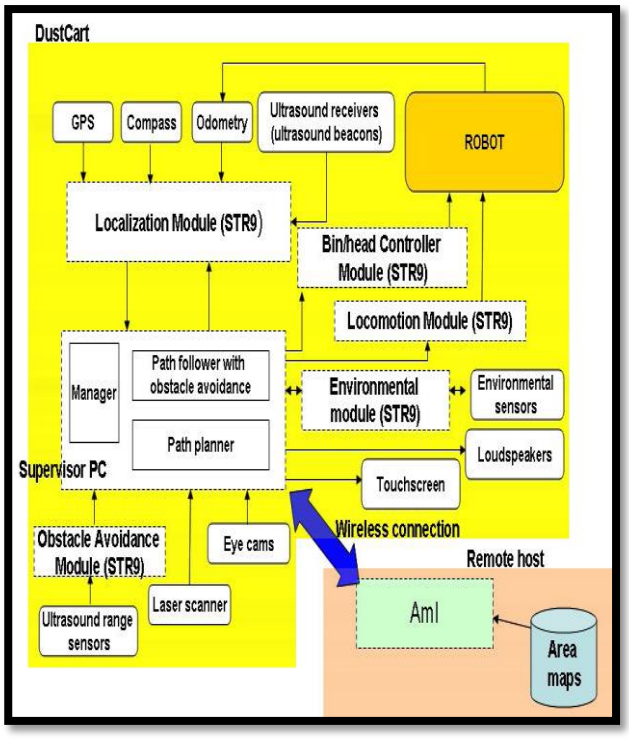

Figure 2: Flow chart of dust cart robot

III. METHODOLOGY

A. AMBIENT MONITORING MODULE (AMM):

The ambient module integrates several environment sensors for pollution monitoring. The selection of sensors type was done on the base of several characteristics such as accuracy, sensibility,time of response and power consumption. It is also used to measure pollutants nitrogen dioxide(NO_2),particular matter(PM10-PM2.5),ozone(O_3) and carbon monoxide(co),which we selected to monitor .The microcontroller is devoted to communicate with the supervisor and sensors .The AMM is connected to the sensors through an I^2c modified bus figure 3 shows a block diagram of the AMM system.Furthermore ,the problem is designed to be "open" providing the capability of adding new sensors at any time with no need of modifying configuration parameters in the robot .To perform these actions the universal smart sensor interface(USSI) was used[1] . . These characteristics are achieved by the use of communication code of behavior complaint to the family standard 1451 and by the use of the sensor descriptor, the transducer electronic datasheet (TEDS)[2],[3]. By the USSI'S 8 different sensors were integrate figure 3,.Figure 4 shows the developed model integrated in the dust cart robot.

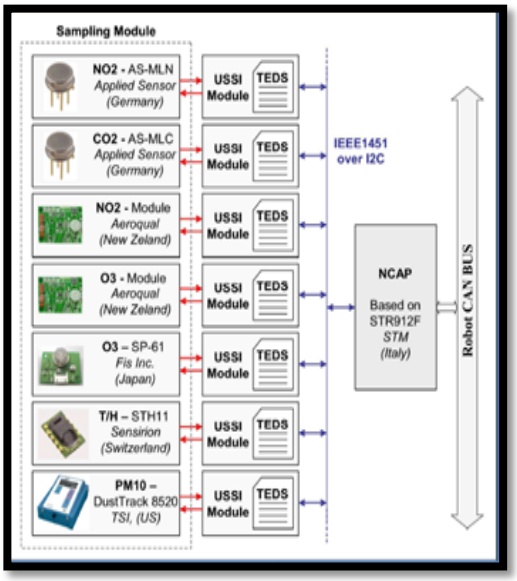

Figure3- Block diagram of AMM system

Figure4- Sensors integrated in the AMM module

B. NAVIGATION

The navigation strategy implemented for the dustcart robot is conceptually structured in three control layers (figure 5). In the context of robot navigation ,AMI maintains a geo –referenced map of the city ,along with locations known users ,available roads and important locations . AMI identifies the user ,selects an idle robot in the vicinity and plans a path using DIJKSTRA[4] algorithm in a network of predefined waypoints locations spaced about 20m .Once the dustcart robot is assigned to a task ,an iterative procedure guides it through the city .The robot receives the coordinates of the next goal point ,together with a map of the relevant portion of the city. .At this point the problem is essentially reformulated into a classical motion planning problem and solved using wave front path planning algorithm [5].Wave front generates a sequence of waypoints that have to be reached by the robot . An obstacle avoidance strategy is used to guide the robot to the next way point , while avoiding collisions and obstacles not present in the map .The vector field histogram(VFH+) algorithm was chosen as obstacle avoidance and path following approach .Sonar and laser range measurement are fused and used to

compute the safest caption and speed for the robot .Once dustcart reaches the goal point. In this way AMI can change dynamically the maps and the path of the robot if some changes occur .Dust cart navigation software is based on the open –source-framework player[6] .

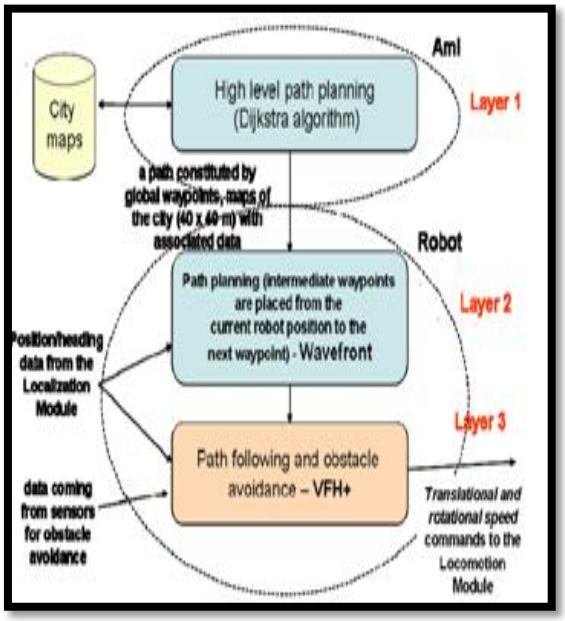

Figure 5: scheme of navigation system

C.GPS

A low cost commercial superstar 2 GPS receiver from NOVATEL is used to provide a latitude / longitude measurement at 1 HZ frequency . The GPS receiver performance was characterized in different environments showing errors strongly depending on the GPS reported figures of merit .The GPS fixes are inserted in the filter only when some conditions on the figure of merits are respected .

D. Artificial beacons for localization

The used landmarks are a combination of an optical beacon and a radio module (figure 6) .Beacons were made from plexiglass tubes (1m high ,5 cm diameter) wrapped with reflective material ,topped with a radio module CC2430 from Texas instruments .The reflective surface registers a high intensity point when hit by a laser beam from robot's Hokuyo UTM30-LX laser scanner .thus it is possible to identify reliably the beacons when in line of sight and up to a distance of about 7 meters .when the robot observes a laser point with high reflectivity ,the position of that point is calculated using present robot's position and heading estimate .However, two issues have to be considered for safe navigation :the spacing with which beacons have to be placed and the robustness to external disturbances regarding the distances suggests a drift about 1m in position approximation every 20 m of covered distance for this reason we placed a visible beacon every 20 m to keep the estimate error sufficiently low for safe navigation and performing a radio communication with the beacons . Once the threshold reaches a maximum value ,whenever the robot sees a high reflective point ,checks via a CC2430 module .If there are beacons nearby .If one beacon is present ,it answers with its identification number allowing in this way ,even If the robot get lost ,when it sees a beacon it can reset the error can re-localize itself.

Figure 6: An optical beacon used as an navigation

IV. RESULT

In this paper we addressed the problem of mapping chemicals in real urban atmosphere using autonomous agents .To this aim, we equipped dust cart robot, a two wheeled robot developed with different environment sensors. AMI manages the robot's movements and collects environmental data produced by the robots . We showed the maps produced using the kernel DM+V algorithm using one dust cart autonomously navigating in garbage collection tasks. This paper shows that robots can be used as moving monitoring stations to provide a synoptic and invasive view of the air quality in a city not achievable by traditional fixed stations .The

localization system based on optical beacons resulted to provide position sufficient for robot navigation in our application .The system proved easy to rapidly transported from one experimental site to another.

REFERENCES

[1]. v. Mattoli , A .Mondini, B.Mazzoli, G. Ferri ,and P. Dario ,"single chip universal smart sensor interface based on IEEE 1451 Standard ",submitted to sensors and Actuators A.

[2]. IEEE Std 1451.1-1999,Standard for a smart transducer interface for sensors and Actuators – Network capable application processor(NCAP) information mode, institute of electrical and electronics engineers ,Inc., Piscataway ,New Jersey 08855,June 25,1999

[3]. IEEE Std 1451.3-2003,IEEE Standard for a smart transducer interface for sensors and Actuators –Digital communication and transducer electronic data sheets(TEDS) formats for distributed multi drop systems

[4]. E.W. Dijkstra , "A note on two problems in connexion with graphs", Numerische Mathematik ,vol.1,pp.269-271,1959

[5]. S.M. Lavalle, Planning algorithms, Cambridge university press Cambridge,UK,2006

[6]. J.R. Borenstein ,H.R Everett, and L. Feng,"Where am I ?,Sensors and methods for immobile robot positioning". report ,The university of Michigan, 1966. ftp://ftp.eecs.umich.edu/people/johannb/pos96rep.pdf.