International Journal of Engineering Research-Online
A Peer Reviewed International Journal
Articles available online http://www.ijoer.in

Vol.3., Issue.3, 2015

REVIEW ARTICLE

ISSN: 2321-7758

# AUTOMATIC MOOD RECOGNITION SYSTEM OF INDIAN POPULAR MUSIC AND ITS APPLICATIONS

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Article Received:12/05/2015 | Article Revised on:20/05/2015 | Article Accepted on:29/05/2015

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**ABSTRACT**

Music has been an inherent part of human life when it comes to recreation; entertainment and much recently, even as a therapeutic medium. The way music is composed, played and listened to has witnessed an enormous transition from the age of magnetic tape recorders to the recent age of digital music players streaming music from the cloud. What has remained intact is the special relation that music shares with human emotions. We most often choose to listen to a song or music which best fits our mood at that instant. In spite of this strong correlation, most of the music softwares present today are still devoid of providing the facility of mood-aware play-list generation. This increases the time music listeners take in manually choosing a list of songs suiting a particular mood or occasion, which can be avoided by annotating songs with the relevant emotion category they convey. The problem, however, lies in the overhead of manual annotation of music with its corresponding mood and the challenge is to identify this aspect automatically and intelligently.So, we have tried to make a model for mood recognition of audio songs and then describing the applications of the subject in the real life.

**Keywords :** Mood identification, mood recognition, music, music therapy, information retrieval, mood learner

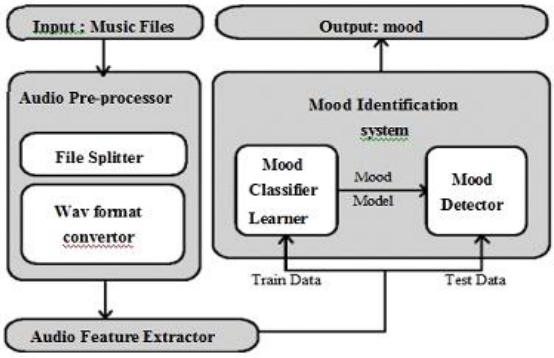


## INTRODUCTION

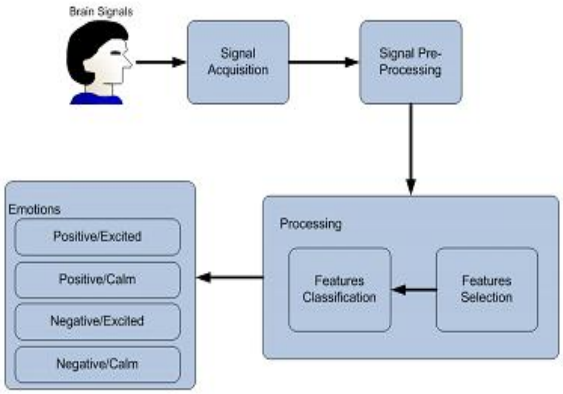
The study of mood recognition in the field of music has gained a lot of momentum in the recent years with machine learning and data mining techniques contributing considerably to analyze and identify the relation of mood with music. We take the same inspiration forward and contribute by making an effort to build a system for automatic identification of mood underlying the audio songs by mining their spectral, temporal audio features. Our focus is specifically on Indian Popular Hindi songs. We have made a model which will describe the working of mood recognition system in music.

**Material and Methods :**

**Mood recognition system**




**Mood Identification System**




**Mood Identification System**

This is the main processing unit of the whole system and is responsible for mining the mood from the music data-set obtained as input from the audio feature extractor module. The module has two important roles to perform as mentioned below:-

**(a) Mood Learner:** In this case, the input received is a training data-set of music features with the "Mood" attribute manually updated by the domain experts, from the point of view of training. This module can serve as the experimenter so that user - analyst or researcher - can utilize it to try various algorithms to mine mood aspect of the underlying music data-set. The classifier model learnt can thus be saved so that it can be utilized for further evaluation purpose. The output of this part of the module generally serves useful to end-users who are analysts or researchers, keen to understand and tune the machine learning aspect of this whole process. Mood learning is generally one-time activity. Once done, the model is saved and can be re-used for evaluations any number of times. However, depending upon the user preference, the learning can be made iterative to improve accuracy with the most updated music data which evolves over time to a great extent..

**(b) Mood Detector:** In this case, the music data-set received as input will have some dummy data in the "Mood" attribute as this feature is not known ans is expected to be predicted by this module. The Mood detector then evaluates the data-set under consideration against the mood classifier model that has been saved. The evaluation results in predicting the mood for every 30 second music clip that was fed to the system by the user. In case a whole song was fed instead by the user, the system returns the maximum voted mood from the moods predicted for all of the clips derived from that song. The output of this module is generally used by the end-user application such as a mood-annotator or any Music information retrieval application or even the end-user himself/herself. Although the module helps in detecting the mood of the music under consideration, the whole and sole control of accepting or rejecting this decision can be always given to the end-user with some minor enhancements to the code.

**Applications of the system:**

Our work we believe can contribute substantially to a variety of real world applications involving music. Following are a few of the many fields that can reap the benefits this system:-

**A. Music Therapy Applications**

The field of Music Therapy involves clinical use of music in a therapeutic way to treat individuals by addressing their physical, emotional, social and cognitive needs. As a result of the tremendous research and successful experiments, Music Therapy has emerged as an important field using music as medium to improve the quality of life of the people in spite of diversity, disability or illness. Receptive Musical Therapy is one of the many important streams of this field wherein after examining the condition of the individual; the Music Therapy Expert plans and recommends a routine involving listening to a particular type of music. Since this therapy is more close to emotional and psychological needs of the individual, mood underlying the music plays an important role in the choice of music. Automatic mood recognition of music can help to reduce eforts of the expert to manage, search and recommend the appropriate music relevant for the individual. This can also be extended to online self-therapy applications wherein the individuals can themselves choose the appropriate music accurately as directed by the

expert and without much search efforts.

**B. Music Information Retrieval**

MIR systems aim at extracting information from music. This information can be used for various music applications like Recommender systems, Instrument recognition and separation applications, Automatic categorization systems and many more. Our system can contribute to the Automatic categorization systems wherein the music can be categorized by its corresponding mood recognized by our system automatically. This will not only help to organize the music in a much better way but also reduce the overhead on users for selecting a list of songs suiting the current mood or occasion. With this system in place, user can just choose a mood and the system can give him the list of all songs belonging to that mood. From this subset, the user has to select the songs he wishes to listen to and this subset is very small in size as compared to the whole set of songs wherein by using traditional technique the user selects the songs list either by song name, album or artist and then searches for the song that matches the mood. The system can also find application in recommender system to recommend the songs matching the mood along with other traditional parameters, which can definitely give better results.

**C. Intelligent Automatic Music Composition**

Music in today's world is created and composed by highly skilled and trained musicians. With the increasing innovations in technology, many softwares and devices have also proved beneficial in assisting the musicians in easing the efforts put to compose music from various instruments, singers and merge or process it. A lot of research is going on from all parts of the world with the aim of building a system which can compose music automatically and intelligently enough to sound interesting the way humans compose it. Building such application will not only require a lot of music signal processing , pattern recognition and matching but also a great deal of information and data about the music in order to produce a novel music composition. Mood of the music pieces can form one of the important parameter in searching music pieces to be put together to generate a new music. Our system can help at this stage by automatically recognizing and annotating music pieces.

**RESULTS**

**Evaluation Matrices-**

- Receiver operating characteristic (roc)-Two-dimensional plot with vertical axis representing the true positive rate and horizontal axis representing the false positive rate. A model with perfect accuracy will have an area of "1". The area under curve is a measure of the accuracy of the model
- Confusion matrix-contains information about actual and predicted classifications done by a classification system. It evaluates the performance of system
- Recall is a metric that gives a percentage of how many of the actual class members the classifier correctly identified. ''Completeness''
- *Precision:* It gives us the total the percentage of how many of a particular class instances as determined by the model or classifier actually belong to that particular class. ''Exactness''

Experimental results on test dataset of 2938 music clips :

| a | b | c | d | e | ←Classified as |
|---|---|---|---|---|---|
| **704** | 16 | 1 | 0 | 9 | a = excited |
| 69 | **511** | 7 | 15 | 33 | b =happy |
| 94 | 16 | **470** | 10 | 20 | c =romantic |
| 34 | 5 | 1 | **314** | 28 | d= sad |
| 36 | 11 | 5 | 23 | **506** | e = silent |

Table displays the confusion matrix for the evaluation of the Test dataset of 2938 music clips belonging to Indian popular music. As seen from the matrix, the diagonal elements marked bold are the correctly identified data instances and denote the True positives. From the data seen in the matrix, following can be inferred:-

Total number of instances: 2938

Number of correctly classified instances: 2505 (85.26%)

Number of incorrectly classifier instances: 433 (14.74%)

**CONCLUSION**

We successfully experimented with the task of mapping audio features of Indian Popular Music with respective moods with the top precision ranging in between 75% and 81% with respect to Fmeasure and 70% to 75% precision measure.

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