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RESEARCH ARTICLE

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AN EFFICIENT SOCIAL CHARACTERISTICS BASED OPPORTUNISTIC ROUTING PROTOCOL

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ABSTRACT

Disruption tolerant networks (DTNs) consist of mobile devices that contact each other opportunistically. Due to the low node density, unpredictable node mobility, noise, sparsity of nodes and lack of global network information only intermittent network connectivity exists in DTNs makes difficulty maintaining end-to-end communication links. Social-aware Content-based Opportunistic Routing Protocol,(SCORP), is proposed to support (DTNs) that considers the users social interaction and their interests to improve data delivery in urban area network. Through simulations, using synthetic mobility and human traces scenarios. Social network properties of node contact pattern such as the centrality and community structures have also been exploited for relay selection in recent social based data forwarding schemes. Extensive trace-driven simulations are used to show this approach significantly improves data access performance compared to existing schemes.

Keywords: Social aware routing, disruption tolerant networks, network model, mobility model, fuzzy

1. INTRODUCTION

Disruption tolerant networks (DTNs) consist of mobile devices that contact each other opportunistically. Due to the low node density and unpredictable node mobility, noise, sparsity of nodes, and lack of global network information only intermittent network connectivity exists in DTNs and the subsequent difficulty maintaining

End-to-end communication links makes it necessary to use "carry-and-forward" methods for data transmission. In such networks, node mobility is exploited to let mobile nodes carry data as relays and forward data opportunistically when contacting others. The key problem is, therefore, how to determine the appropriate relay selection strategy. Although forwarding schemes have been proposed in DTNs there is limited research on providing efficient data access to mobile users, despite the importance of data accessibility in many mobile applications.

In vehicular ad-hoc networks (VANETs) the availability of live traffic information will be beneficial for vehicles to avoid traffic delays. In these applications, data are only requested by mobile users whenever needed, and requesters do not know data locations in advance. The destination of data is, hence, unknown when data are generated. This communication paradigm differs from publish/subscribe systems in which data are forwarded by broker nodes to users according to their data descriptions

A common technique used to improve data access performance is caching, to cache data at appropriate network locations. Opportunistic network connectivity complicates the estimation of data transmission delay and difficult to determine the appropriate caching locations and also coordinating multiple caching nodes, it is difficult to be realized in DTNs due to the lack of persistent network connectivity. It is hard to optimize the tradeoff between data accessibility and caching overhead. In this paper, we propose a novel scheme to address the aforementioned challenges and to efficiently support cooperative caching is fully distributed manner in DTNs with heterogeneous node contact patterns and behaviors.

2. Related work

Routing is the most important challenging in disruption tolerant networks (DTNs) because of short lived wireless connectivity environment. Social-assisted routing schemes in DTNs describes the current trends and development in this area, mainly compare the positive (community, centrality, similarity and friendship) and negative (selfishness) social effects in designing the routing schemes. In a set of social based approaches have been proposed to improve the efficiency and effectiveness of content dissemination. Multicast routing methods using both centrality and community for relay selection. Design a preference-aware data dissemination protocol using users' centrality values. However, the above approaches have two obvious drawbacks. First, the above schemes use users' social profiles, e.g., contact history, contact duration and friendships, to design their routing metrics, which is even impractical in daily life, in the sense that one may not render his/her contact history to a stranger. Second, all their schemes rely on the a posteriori knowledge (e.g., centrality values, betweenness utility, etc.) to design the routing protocols. Unfortunately, as a mobile user, he/she will not know such crucial information before the experimental analysis is done, and hence they cannot forward data to the "best" relay. Wu and Wang propose a social feature based multi-path routing scheme in DTN, which is similar to our idea in using users' features (attributes) to route packets, but they do not consider the distribution of social features together with the trace file. Privacy-preserving dissemination in DTNs. In terms of privacy preservation, propose a privacy-preserving relay filtering scheme for DTN, which intends to enable contact users to filter junk packets for the destination node. Their scheme considers the privacy of the relay packets, but it lacks of practical applications to maintain connection with spam filter users. They also propose a privacy- preserving scheme for vehicular DTNs in, which consider the existence of infrastructures that handle the parameter distribution and content dissemination. Privacy-preserving mutual authentication scheme that uses the verified identical attributes to establish potential social relationships between arbitrary users. We design an attribute-based privacy-preserving mobile dissemination scheme that provides the confidentiality of users' content. This scheme enables users who have the corresponding attributes required by the content owner to decrypt the content. To better capture the characteristics of the network, we make extensions to better fit practical scenarios in terms of setting different weights on users' attributes based on the analysis of real-world trace file. To apply real-world data set to evaluate the routing performance of PSaD scheme, which outperform several existing approaches. Extensive simulations and experiments are conducted to verify the performance of our scheme on the aspects of security, efficiency, and feasibility.

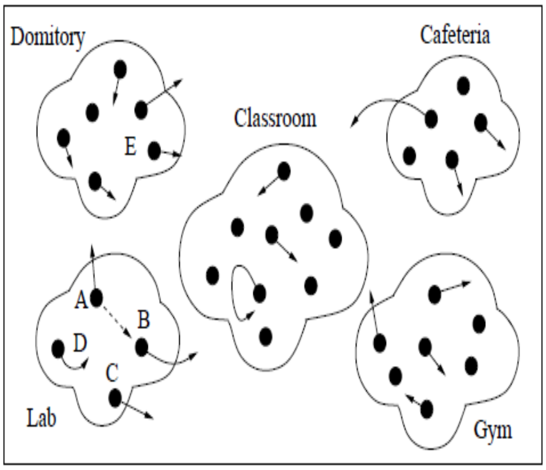


Fig: 1 An example of a landmark-based mobility model.

The solid line denotes the mobility behavior of nodes. The dashed line stands for forwarding packets.

Figure gives an example of the PER process. Node A needs to send a message to node E. located at the same landmark with node A are nodes B,C,D. Based on the history mobility information, A predicts that before the TTL expires node B has a better delivery performance to node E than all other nodes in the Lab. Therefore, node A will forward the message to node B. In this scenario, node B will leave the Lab landmark later and will meet E in the classroom for delivery.

In prediction-based routing schemes, history information is used to predict nodes' future mobility, which becomes the basis of the decision to forward messages towards the destination. Most of the previous prediction-based DTN routing methods predict whether two nodes would encounter, but consider when two nodes will meet insufficiently. We argue that when two nodes will meet with a probability distribution could improve the delivery ratio, as well as reduce the delivery latency.

Routing Protocols: Epidemic Research on data forwarding in DTNs originates from Epidemic routing which floods the entire network.

Utility-based routing: Each node maintains a utility value for every other node in the network, based on a timer indicating the time elapsed since the two nodes last encountered each other.

Random selection: A node would randomly pick a neighbor as a relay node to forward the message until the message reaches its destination.

PER: A node would distribute a message with the schemes described in this paper. Since we have three different criteria to indicate whether to forward messages for a node

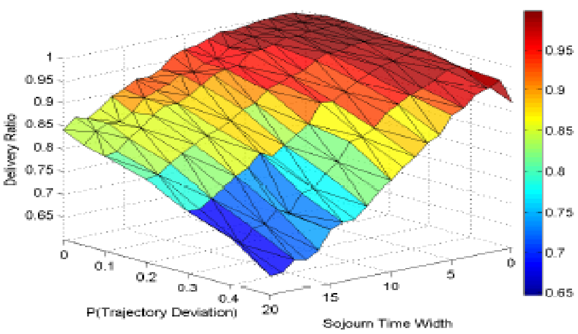


Fig: 2 PER

We employ Per1, Per2, and Per3 to refer to our three schemes respectively. The prediction time window for the three PER algorithms is fixed to 60 time units.

3.Privacy-Preserving Social-Assisted Mobile Content Dissemination Scheme in DTNS

Privacy-Preserving Social-Assisted Mobile Content Dissemination Scheme is a social based schemes. Content dissemination is very useful for many mobile applications, like instant messaging, file sharing, and advertisement broadcast, etc. In real life, for various kinds of time- insensitive contents, such as family photos and video clips, the process of content dissemination forms a delay tolerant network (DTNs). To improve the data forwarding performance in DTNs, several social-based approaches have been proposed ,most of which leverage mobile users' social information, including contact history, moving trajectory and personal profiles as metrices to design routing schemes. Social-based schemes leverage users' contact history and social information (e.g., community and friendship) as metrics to improve the dissemination performance. To provide the confidentiality of contents, our approach enables users to encrypt contents before the dissemination process, and only allows users who have particular attributes to decrypt them. Sometimes use expire social value for routing the packet.

4. A Survey of Social-Based Routing in Delay Tolerant Networks: Positive and Negative Social Effects

Delay tolerant networks (DTNs) may lack continuous network connectivity. Routing in DTNs is thus challenging since it must handle network partitioning, long delays, and dynamic topology in such networks. Analysis Positive and Negative Social based packet routing technique is used .In recent years, social based approaches, which attempt to exploit social behaviours of DTN nodes to make better routing decision. To improve routing performances these methods either take advantages of positive social characteristics such as community and friendship to assist packet forwarding or consider negative social characteristics such as selfishness.

5. Bubble Rap: Social-Based Forwarding in Delay Tolerant Networks

Bubble rap is to improve the forwarding efficiency. Each node belongs to at least one community. Here we allow single node communities to exist. Each node has a global ranking (i.e. global centrality*) across* the whole system, and also a local ranking within its local community. It may also belong to multiple communities and hence may have multiple local rankings. For this algorithm, we make two assumptions:

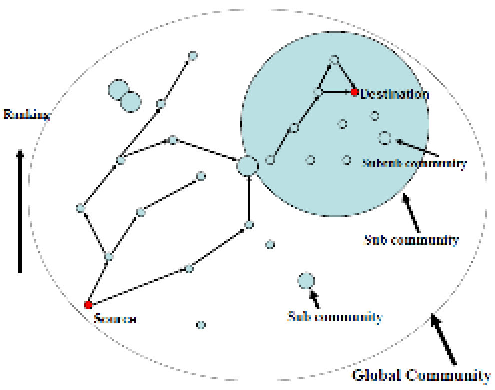


Fig: 3 Illustration of the BUBBLE algorithm

Each node belongs to at least one community. Here we allow single node communities to exist Each node has a global ranking (i.e. global centrality) across the whole system, and also a local ranking within its local community. It may also belong to multiple communities and hence may have multiple local rankings.

Forwarding is carried out as follows. If a node has a message destined for another node, this node first bubbles the message up the hierarchical ranking tree using the global ranking, until it reaches a node which is in the same community as the destination node. Then the local ranking system is used instead of the global ranking, and the message continues to bubble up through the local ranking tree until the destination is reached or the message expires. This method does not require every node to know the ranking of all other nodes in the system, but just to be able to compare ranking with the node encountered, and to push the message using a greedy approach. In order to reduce cost, we also require that whenever a message is delivered to the community, the original carrier can delete this message from its buffer to prevent further dissemination. This assumes that the community member can deliver this message. We call this algorithm BUBBLE, using the metaphor of bubble for a community

6.Social Feature-Based Multi-Path Routing in Delay Tolerant Networks

Social feature based routing protocols that take advantage of recorded social features to steer the routing in the right direction indicates this algorithm can improve routing performance with a low implementation cost. In this approach includes two unique processes social feature extraction and multi-path routing. Social feature extraction, it use entropy to extract the m most informative social features to create a feature space (F-space): (F1, F2, ..., Fm), where Fi corresponds to a feature. Two special multi-path routing schemes node-disjoint-based routing and delegation- based routing.

7. Proposed work

7.1 Network model

Opportunistic contacts in DTNs are described by a network contact graph G (V, E), where the stochastic contact process between a node pair I, j 2 V is modeled as an edge eij 2 E. We assume that node contacts are symmetric; i.e., node j contacts i whenever i contacts j, and the network contact graph is, therefore, undirected. The characteristics of an edge e_{ij} 2 E are determined by the properties of inter contact time among nodes. Similar to previous work we consider the pair wise nodes inter contact time as exponentially distributed. Contacts between nodes i and j then form a Poisson process with contact rate λ ij, which is calculated in real time from the cumulative contacts between nodes i and j because the network starts. We call the node set {j| λij >0} as the contacted neighbors.

7.2 Mobility Model

Node movement capabilities are implemented through mobility models. Mobility models define the algorithms and rules that generate the node movement paths. Three types of synthetic movement models are included

7.2.1 Human behavior based movement

To better model real-world mobility, map-based mobility constrains node movement to predefined paths and routes derived from real map data. Further realism is added by the Working Day Movement (WDM) model that attempts to model typical human movement patters during working weeks.

7.3 Fuzzy Technique

Fuzzy based technique is used to decide and make the best NCL metric   The fuzzy membership functions can be adaptively constructed based on known network parameters. The fuzzy decision mechanism is very simple compared to complex prediction mechanisms used in many other DTN protocols.

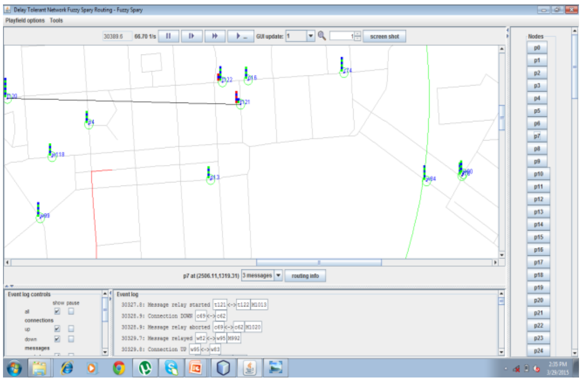


Fig :4 Fuzzy selection

It uses only two parameters namely, probability of delivery and energy value as input to fuzzy system in order to compute the delivery predictability value which determine the routing path for packets.

7.4 Social Aware Metric

Social proximity and content knowledge to augment the efficiency of data delivery in urban, dense scenarios that brings to the operation of opportunistic networks (in terms of delivery, cost and latency) through simulations based on synthetic mobility and trace-based scenarios.

These social-aware content-oriented approaches differ from SCORP as Social Cast is based on the publish/subscribe paradigm (i.e., our solution does not require propagation of interests further than encountered nodes), and Content- Place is much more data-aware: besides the content type and interested parties, it also considers how much content has already been spread and its availability.

7.4.1 Social interested algorithm:

Interest profile of user *i*

MX1 probability vector

$$Pi = [p_{I1} \ldots . p_{Im}]^T$$

p_{ij}: *i*'s probability to be interested in the *j*-th keyword Data item: *n* *keywords* $k_{1,\ldots,k_n} \in k$andweights indicating the importance of k_i in describing data Vector

$$\mathrm{D} = [\mathrm{d}_1, \mathrm{d}_2, \mathrm{d}_3, \ldots \mathrm{d}_M]^{\mathrm{T}}$$

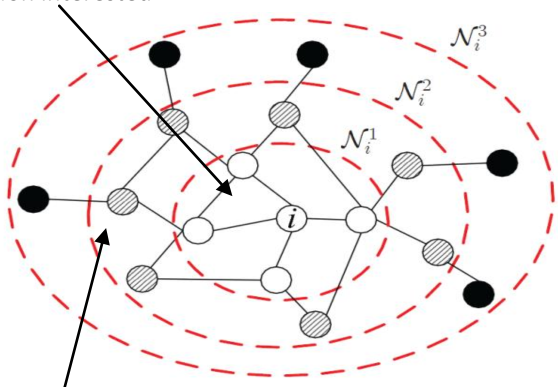
where $d_{ki} = w_{ki}$

User interest probability:

$$p_i = P_i^T D = \sum_{j=i}^{n} w_{kj} \cdot p_{ikj}$$

Node *i*'s interest probability is estimated by other nodes Different scopes for maintaining network information the *r*-hop neighborhood of node *i* on the network contact graph Tradeoff between dissemination cost-effectiveness and maintenance overhead

Non interested



Interested

Fig: 5 Social aware metric routing

7.4.2 Social aware Routing:

Social proximity and content knowledge to enhance the efficiency of data delivery in urban. the operation of opportunistic networks (in terms of delivery, cost and latency. This efficient routing scheme by using a node's local contact history and social network metrics. Each node first chooses a proper relay node based on the closeness to the destination node. A locally computed betweenness centrality is additionally utilized to enhance the routing efficiency.

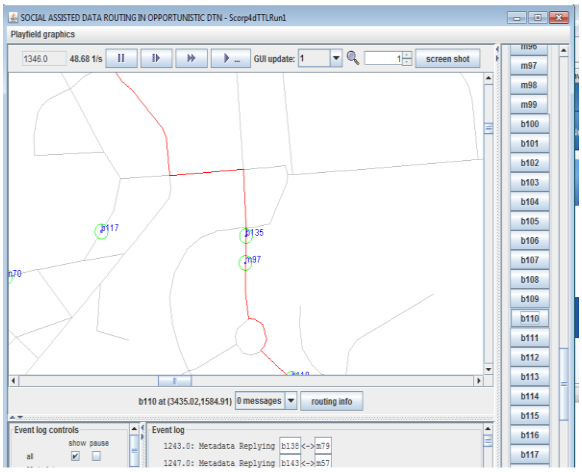


Fig :6 Social Assisted Data Routing in Opportunistic DTN

CONCLUSION

Disruption tolerant networks (DTNs) consist of mobile devices that contact each other opportunistically. Fuzzy technique is proposed to improve delivery predictability value and controlled message replication and also able to identify appropriate forwarding opportunities that could deliver the message faster .Social-aware Content-based Opportunistic Routing Protocol,(SCORP), is proposed to support (DTNs) that considers the users social interaction and their interests to improve data delivery in urban area network. SCORP has better performance than previous social-aware content-oblivious routing proposals. Finally demonstrate that our algorithm performs efficiently compared to the existing NCL routing scheme.

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