Optimal Opportunistic Routing in Mobile Social Network

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Abstract— **Mobile Social Networks (MSN) consist of frequently moving nodes and which provides various data delivery by considering social relationship among mobile users. Mobile social networks consist of human-carried mobile devices that communicate with each other in a"store-carry-forward" fashion. A recent routing protocol in Mobile social network tends to forward packets to the nodes based on locally optimal social characteristics, and fails to achieve the optimal performance as computational and maintenance cost increases. This paper presents a opportunistic routing scheme in MSN which gives optimal routing performance than all previous social aware algorithms. This paper presents home aware community model which uses community aware opportunistic algorithm (CAOR) along with a reverse Dijkstra algorithm to calculate expected network delay in network. As number of communities are less in number than number of nodes in magnitude computing cost reduced due to reduction in contact information.**

Keywords- Mobile social network, home-aware community, Dijkstras alogorithm

I. INTRODUCTION

Mobile Social Network which are one of the manifestations of delay tolerant system comprise of loads of versatile hubs which move around one another and correspond with one another. Ordinary MSN comprise of remote gadgets like laptops, Smartphone's, ipads, portable Pcs, sensors [1]. In an opportunistic network nodes are either fixed or mobile and communication is possible even if no connecting route exits between nodes also in this network routes are built dynamically.

Every hub on getting message abuses LOCAL learning to choose which is the best next jump, among its present neighbors, for the message to reach it to final destination [2] [3] [13] [14]. In MSNs we confront an irregular integration caused by the versatility of clients, steering is a predominantly concerning and testing issue. Past social mindful steering plans like Bubble Rap[3], Simbet[4] are focused around fundamentally two key ideas group and centrality and these two calculations either uses flooding or likelihood based methodologies to forward messages to their particular objectives. These calculations help to figure out groups and centrality for every node. Forward the messages focused around the nodes with great centrality values. These three measures for centrality are as shown in following Fig 1. This centrality values plays an important role in message transmission in an opportunistic Network. Tie-strength tends to evaluate the social graph at a microscopic level. It concentrates on the robustness of relationship for a dyad [10],this will help us to represents a pair of nodes and the edge linking them.

We can measure tie-strength with three different metrics: From each of the methodologies over an alternate correspondence example can be inferred relying upon the normal conduct of the hubs. These different tie-strength factors are as follows. These are frequency, recency and duration each one of them are used for different purpose while making an routing decision in opportunistic network Frequency which gives how often does the node meet. Recency which help us to give time period since the last experience with a particular node [14]. Duration: How long does the link last (i.e. average or aggregated) with a specific node.

II. EXISTING SYSTEM

In existing Social-aware algorithms assume that each node has some social characteristics like community, centrality, and similarity, etc. and then uses local knowledge to make the routing decision, due to which improve in the delivery ratio. Just like previous existing community models, each community home in our model contain a throwbox to store and transmit messages. Compared with the CAOR algorithm, these algorithms previous ones just exploit the social characteristics and local knowledge about nodes to improve the probability of meeting the destination for each message. However, this is still not predictable, and thus cannot give the optimal result.

III. LITERATURE REVIEW

Some of the algorithms are used in opportunistic routing which uses either probability or flooding based approach to deliver messages. These algorithms are mainly used potential nodes to forward messages to destination based on utility function.

E. Daly and M. Haahr, propose techniques that based on similarity and betweenness metric for each node and propose a SimBet utility algorithm. The ego network analysis technique is used to estimate the values of the betweenness centrality metric and the similarity metric for each node, based on local information [3]. Based on local information, when some nodes encounter each other, the algorithm lets the node with the maximum utility value deliver messages. •K. Psounis demonstrates a scheme which is used to overcome the disadvantage of flooding based algorithms called Spray and Wait, which "sprays" a number of copies into the network, and then waits till one of these nodes meets the destination [12].

P. Hui, J. Crowcroft, and E. Yoneki propose a social based forwarding algorithm, BUBBLE, which is able to improve the forwarding efficiency significantly compared to previous forwarding schemes. They provide a detailed description of MSN routing algorithm based on k-clique community detection and computes centrality ranks for each node [16]. Messages are forwarded (bubble) up along the hierarchical tree using the global rank, and then bubble up by using the local rank.

IV. MOTIVATION

Despite the significant research interest in algorithms for addressing routing problems in mobile social network based on probability and flooding based strategies. One critical factor that has not been previously examined in the literature is routing performance of such algorithm degraded due to contention, decrease in average delivery ratio, increase in delivery delay and high computational cost. Even though most previous work on opportunistic routing techniques has been evaluated empirically, researchers typically design their own evaluation workloads. This decision introduces a strong need to construct routing scheme that unconsciously favor proposed algorithms and strategies. Previous work on routing in mobile social network shows there is still chance to improve routing in this network. For improving routing performance in mobile social network there is need of developing a proper strategy and algorithm.

V. PROPOPSED ARCHITECTURE

This paper presents an idea about formation of 'home-aware communities' [1] model which consist of mobile

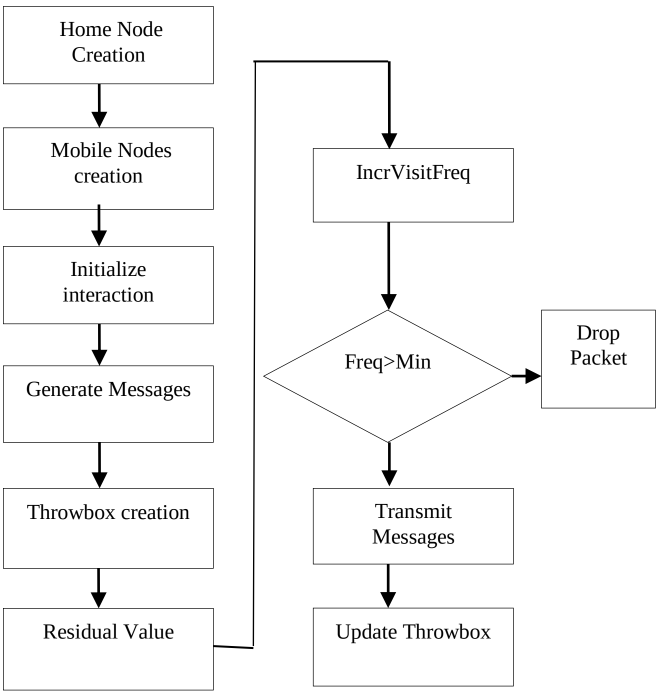

Fig.1: Basic CAOR workflow through Opportunistic Network

users with common interest visit frequently to the particular location of interest [10]. Such mobile users come together and form community and their commonly visited place is treated as home. Each home is equipped with throwbox [2] [4] it is either real or virtual which is used to store and forward messages. Message delivery will happen based on prediction of community. This throwbox mainly stores history of communication. In this way the final message delivery happen with nodes having good centrality values. This CAOR algorithm uses reverse Dijkstra algorithm to calculate to compute maximum expected delay and to find expected network delay in network. Then whatever result we get out of this is finally compared with previous algorithms result which uses either probability or flooding base approach for message delivery are used as shown in Fig 1.

In many real MSNs, mobile users with some common interest frequently visit same location. For example, students with a common interest will visit the same classrooms and share their experiences at frequently visited location; customers having similar interest visit particular shop frequently; friends with similar interest visit particular location frequently. In view of this basic social characteristic, we propose a home-aware community in which versatile clients with frequent visit to the location form a group which is self-governing In which the frequently visited location is their common "home". Moreover, like [9] [15], we assume that each home is equipped with throwbox, a local device which is used for temporarily store and transmit messages.

Along with home-aware community model, we propose a optimal Community-Aware Opportunistic Routing algorithm (CAOR). Whose major contributions are summarized as:

1) This CAOR algorithm changes the centrality concept i.e. centrality between node to centrality between communities.
2) Also present a rule of optimal opportunistic routing to compute optimal relay set through the use of reverse Dijkstra algorithm and also used to compute delivery delay.
3) Turn the routing in mobile nodes into routing in community homes in the home-aware community model

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V MATHEMATICAL MODEL

The optimal opportunistic routing scheme helps to find out that how each message sender delivers messages via its optimal relay set (i.e., delivers messages via the first encountered relay in this set). To determine whether a relay belongs to the optimal relay set for each message sender is the key problem. To this end, we derive an optimal opportunistic routing rule [2]. We consider an opportunistic routing from a message sender i to the destination d via some candidate relays $\{u \mid \lambda_{i,u}>0\}$. Here, the message sender i might be a mobile node or a home. Each u is a one-hop relay of i, i.e., $\lambda_{i,u} > 0$, but it does not must be a one-hop relay of the destination. The optimal relay set, denoted by $\tilde{R}_i$, is given by the following formula:

$$\tilde{R}_i = \text{argmin } D_{i,d}(S). \quad \ldots \quad [1]$$

$$S \subseteq \{u \mid \lambda_{i,u} > 0\}.$$

In Eq.1, Di,d(S) is the expected delay for i delivering messages to d via the relay set S. Moreover, for simplicity, we let

$$D_{i,d} = D_{i,d}(\tilde{R}_i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots [2]$$

Then, the optimal opportunistic routing rule is presented as follows. Optimal Opportunistic Routing Rule: the message sender always delivers messages to the encountered relay that has a smaller minimum expected delay to the destination than itself. Concretely relay *u* belongs to the optimal relay set $\tilde{R}_i$ for the delivery from *i* to *d*, if and only if, Du,d < Di,d,

i.e. $u \in \tilde{R}_i \iff D_{u,d} < D_{i,d}$ .... [3]

According to CAOR algorithm we need to compute and compare the minimum expected delivery delays from the message sender and the relay to the destination. Then, we can determine whether the relay belongs to the optimal relay set of the sender

CONCLUSION

In this paper, we have proposed a system which will help us measure routing performance in mobile social network with the help of community-aware opportunistic routing algorithm. This system will help in identify optimal relay set for each community home and to calculate minimum expected delivery delay for each node and home. This system will help us to know optimal opportunistic routing rule for message delivery and to know whether it achieve optimal opportunistic routing performance in mobile social network.

ACKNOWLEDGMENT

We are glad to express our sentiments of gratitude to all who rendered their valuable guidance to us. We would like to express our appreciation and thanks to Dr. P. T. Kulkarni, Principal, Pune Institute Of Computer Technology Engg. College, Pune. We are also thankful to Prof. D.D. Londhe, Department, Information Technology, Pune Institute Of Computer Technology Engg. College, Pune. We thank the anonymous reviewers for their comments.

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