IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
ISO 3297:2007 Certified
Vol. 6, Issue 11, November 2017

Improved Energy Efficient Social Routing Using EPDR Model

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Abstract: Social sensing network is one kind of emerging networks in which sensing tasks are performed by users and sensing data are shared and collected by leveraging the intermittent inter-contacts among users. An ad-hoc routing protocols are inapplicable or perform poorly for data collection or data sharing in such mobile social networks because nodes are seldom fully connected. In recent years, many routing protocols (especially social-based routing) are proposed to improve the delivery ratio (PDR) in Social networks, but most of them do not consider the load of nodes thus may lead to unbalanced energy consumption among nodes. In this paper, propose a Energy Efficient framework for Social-based Routing (EES-R) in mobile social sensing networks to balance the load of nodes while maintaining the delivery ratio within an acceptable range by limiting the chances of forwarding in traditional social-based routing. Furthermore, propose an improved version of EES-R to dynamically adjust the controlling parameter. Simulation results on real-life mobile traces demonstrate the efficiency of proposed framework EPDR analysis.

Keywords: Social Ad-Hoc Network, Social Routing, Social Content, EES-R, PDR Analysis

I. INTRODUCTION

Today, mobile users interact with each other and share files via an infrastructure formed by geographically distributed base stations. However, users may find themselves in an area without wireless service (e.g., mountain areas and rural areas). Moreover, users may hope to reduce the cost on the expensive infrastructure network data.

End to End file sharing model makes large-scale networks a blessing instead of a curse, in which nodes share files directly with each other without a centralized server. Wired P2P file sharing systems like BitTorrent have already become a popular and successful paradigm for file sharing among millions of users. The successful deployment of P2P file sharing systems and the aforementioned impediments to file sharing in SANETs make the End to End file sharing over Ad-hock network a promising complement to current infrastructure model to realize pervasive file sharing for mobile users. The mobile digital devices are carried by people that usually belong to certain social relationships. So this thesis is focused on the E2E file sharing in a disconnected ANET community consisting of mobile users with social network properties. In such a file sharing system, nodes meet and exchange requests and files in the format of text, short videos, and voice clips in different interest categories.

One typical scenario is a course material (e.g., review sheets, course slides, assignments) sharing system in a college/school campus. Such scenarios ensure for the most that nodes sharing the same interests (i.e., math), carry corresponding files (i.e., math files), and meet regularly (i.e., attending math classes). SANETs consisting of digital devices in which nodes are constantly moving, forming disconnected SANETs with opportunistic node encountering. Such transient network connections have posed a challenge for the development of E2E SANETs.

II. RELATED WORKS

Zhiwen Yu [1] describe the surging of smartphone sensing, wireless networking, and mobile social networking techniques, Mobile Crowd Sensing and Computing (MCSC) has become a promising paradigm for cross-space and large scale sensing. MCSC extends the vision of participatory sensing by leveraging both participatory sensory data from mobile devices (offline) and user-contributed data from mobile social networking services (online). Further, it explores the complementary roles and presents the fusion/collaboration of machine and human intelligence in the crowd sensing and computing processes.

Pan Hui [2] describe a cope with explosive traffic demands on current cellular networks of limited capacity, Disruption Tolerant Networking (DTN) is used to offload traffic from cellular networks to high capacity and free device-to-device networks. Current DTN-based mobile data offloading models are based on simple and unrealistic network assumptions which do not take into account the heterogeneity of mobile data and mobile users. We establish a mathematical framework to study the problem of multiple-type mobile data offloading under realistic assumptions, where (i) mobile data are heterogeneous in terms of size and lifetime; (ii) mobile users have different data subscribing interests; and (iii) the storages of offloading helpers are limited.

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Yu Wang [3] describes the appearance of smart phones and increasing popularity of various mobile applications and services have caused the explosion of mobile data track. To avoid overloading the cellular networks, different loading solutions such as WiFi networks have been proposed and adopted. Recently, loading cellular track through opportunistic communications among mobile phones becomes a new and promising option, due to free cost. In this paper, by using real race data from the Orange \Data for Development" (D4D) challenge, we investigate the feasibility of delivering data packets among mobile cellular users through opportunistic communications in a large scale network. Our experimental results show that by using social or location properties of mobile users opportunistic routing can indeed complement the traditional cellular network to deliver delay-tolerant data packets among certain portion of cellular users. Such solution is especially cost efficient and beneficial for developing countries, as Ivory Coast.

S. Raghavendra [4] describe the intermittently connected mobile networks are sparse wireless networks where most of the time there does not exist a complete path from the source to the destination. These networks fall into the general category of Delay Tolerant Networks. There are many real networks that follow this paradigm, for example, wildlife tracking sensor networks, military networks, inter-planetary networks, etc. In this context, conventional routing schemes would fail. To deal with such networks researchers have suggested to use flooding-based routing schemes. While flooding-based schemes have a high probability of delivery, they waste a lot of energy and suffer from severe contention, which can significantly degrade their performance. Furthermore, proposed efforts to significantly reduce the overhead of flooding-based schemes have often be plagued by large delays. With this in mind, we introduce a new routing scheme, called Spray and Wait, that “sprays” a number of copies into the network, and then “waits” till one of these nodes meets the destination.

Olov Schelen [5] describe a the problem of routing in intermittently connected networks. In such networks there is no guarantee that a fully connected path between source and destination exists at any time, rendering traditional routing protocols unable to deliver messages between hosts. There do however exist a number of scenarios where connectivity is intermittent, but where the possibility of communication still is desirable. Thus, there is a need for a way to route through such networks. To propose PROPHET, a probabilistic routing protocol for such networks and compare it to the earlier presented Epidemic Routing protocol through simulations. We show that PROPHET is able to deliver more messages than Epidemic Routing with a lower communication overhead.

III. SOCIAL BASE ROUTING

The traditional social-based routing protocols, the messages are forwarded to the encountered nodes with larger social metrics. This may help to achieve higher delivery ratios, but nodes with large social metric values may run out of battery soon due to their heavy load. The existing system consists of all nodes which are participating in the network holds all the neighbor nodes information in every time cycle. This results in increased overheads. Existing social based routing methods usually choose a node with higher social metric to be the next relay and it does not consider the energy consumption. The existing system has following disadvantages,

- All nodes maintains most of the data about the neighbor nodes
- The size of node information is big.
- The encountering node needs to have amp ratio times higher social metric value.
- More number of nodes are participating it is difficult to identify the shortest path.

In the proposed system, along with the existing system, an energy efficient framework for social-based routing to reduce the load of nodes in mobile social-based mobile networks is proposed. It reduces the load of nodes in social based routing by limiting the chances of forwarding at each encounter. To achieve the scalability and energy efficiency, constructed a hierarchical network by performing multilevel clustering. In this method, a node selects itself as a cluster head if it has the highest priority among its unclustered neighbors. A non-cluster head joins the cluster of a cluster head that has the highest priority among the node’s neighboring cluster heads. Hierarchical routing is a hop-by-hop routing rather than a source routing. Before any routing, each node in the network needs to obtain the topology information of its clusters in all levels.

Social Metric (SM) could be any existing social metrics. To calculate the social metric value of a node, a social graph is needed to describe the social relationships among nodes. Social-based routing methods by enlarging the social metric of current node vi, amp ratio times of the original value. Here, am ratio > 1. Thus, it becomes more difficult for the current node to transfer its message because the encountering node needs to have amp ratio time’s higher social metric value than that of current node to be chosen as a relay. The proposed system has following advantages,

- Size of node information is small.
- Cluster head maintains most of the data.
- Path finding is efficient and routing performance is increased.
- Hierarchical routing does not need location information.

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IV. ENHANCE SOCIAL ROUTING

In this routing application, to reduce the load of nodes in social-based mobile networks is committed. It is well-known that the energy of mobile devices is very precious due to the limited capacity of battery. When some nodes run out of energy, it may have a great impact on the performance of the network, especially for sparse mobile networks. Existing social based routing methods usually choose a node with higher social metric to be the next relay, and they do not consider the energy consumption.

In order to save node energy in social-based mobile networks, aim to minimize the number of forwards for message transmission while maintaining acceptable delivery ratio. The methodology is the general research strategy that outlines the way in which research is to be undertaken and, among other things, identifies the methods to be used in it. These methods, described in the methodology, define the means or modes of data collection or, sometimes, how a specific result is to be calculated.

Methodology does not define specific methods, even though much attention is given to the nature and kinds of processes to be followed in a particular procedure or to attain an objective. A paradigm is similar to a methodology in that it is also a constructive framework. In theoretical work, the development of paradigms satisfies most or all of the criteria for methodology. An algorithm, like a paradigm, is also a type of constructive framework, meaning that the construction is a logical, rather than a physical, array of connected elements.

A. SOCIAL NODE CREATION

In this user interface form, the network nodes count is given as input which is used to create the number of nodes to be created in a network. In this form, the number of nodes to be created or deployed in the wireless network is submitted to the system. Once the submission of number of nodes count, the system creates or deploys the specified number of nodes and displays the node identification number on this form. And also it provides the option to change or modify the node identification number in this form.

B. TYPICAL NETWORKING

The nodes which are connected in the network are collect or sensing the data and forward them into the destination. Between the source and destination, the nodes are acts as relay nodes. While forwarding or relaying the sensed data to the destination, the load of the node is considered for the energy efficiency to improve the life time of the nodes. The nodes collection is input using this module. The minimum and maximum ids for nodes are given as input. The number of nodes 'N' is also given. Then 'N' number of nodes with random numbers between minimum id and maximum id is generated. Finally it shows the sorted order of nodes with the various cluster levels.

B. EES Routing Algorithm

The aim of EES- Routing to save the energy consumption of the whole network by limiting the number of message forwarding. The message will not be forwarded to the encountered node unless the current node has lower social metric than the encountered node. To reduce the load of each node, social-based routing method is applied and it use social metric per node for relay selection and forwarding decision. To calculate the social metric (SM) value of a node, a social graph is generated from historical contacts to describe the social relationships among nodes. To generate the social graph, a threshold is set on contact frequency to judge whether there is a close relationship between two nodes in the network. EESR puts minimizing the load of nodes as its first priority, thus the value of amp ratio is set high.

C. IEES- Routing Algorithm

In this form, dynamically adjust amp ratio based on past encounters to improve the delivery ratio. When a node encounters more than N nodes whose Social Metric values are larger than itself, but still does not forward the message (since the SM values of the encountered nodes are not greater enough than amp ratio times of the current node), then our method slowly relaxes the forwarding condition by gradually decreasing the value of amp ratio. In both TT_L (Time to Live) of the packet and the number of encounter nodes whose SM values are larger than that of the current node but smaller than amp ratio times of that.

D. Sender Based Communication Model

In this form, the results of the general sender based communication log details will be shown in the experimental application. In this result, the communication entry time, sender node identification number and the receiver node's identification number details will be displayed.

E. Neighbor Nodes communication

In this form, the results of the Neighbor Nodes Location Details will be shown in the experimental application. In this result of neighbor node updation, the update entry time, neighbor node number, the current (x, y) position of the node and pervious x, y position of the nodes are displayed.

F. EES-Routing Algorithm

Node Qi with message MS meets Qj which does not hold M.
if Pj is the destination then
Qi forwards M to Qj
Else if amp ratio = 1 + (ttl / TTL0) . θ
if SM (Q) . amp ratio <= SM(Vj) then
Vi forwards M to Vj
ttl = ttl - 1
else Vi holds the M and waits for the next encounter end if end if

G.IEES- Routing Algorithm

Node Qi with message MS meets Qj which does not hold MS .
if Qj is the destination then
Qi forwards MS to Qj
else
if SM (Qi) . amp ratio < SM(Qj) then
node_counter = node_counter + 1
if node_counter >= K then
amp_ratio = 1 + (ttl / TTL0) . θ . (1/ node_counter - K + 1)
else amp_ratio = 1 + (ttl / TTL0) . θ
end if end if
if SM(Qi) . amp_ratio <= SM(Qj) then
Qi forwards Mz to Vj
ttl = ttl - 1
node_counter = 0 else node Vi holds the M and waits for the next encounter end if

H. Hierarchical Cluster Base Routing

- Find the lowest level k where the source s and the destination d have a common cluster,
- Define the intermediate source s_0 and the intermediate destination d_0 , which are the level k clusters of s and d respectively,
- Use the optimal time-space Routing algorithm to find the next hop n_0 on the shortest path from s_0 to d_0 based on the level k topology information of s.
- if k = 0, n_0 is the forwarding decision of s, otherwise go back to step 3 with a new k = k¡ 1, a new d_0 being the remote gateway from s_0 to n_0, and a new s_0 being the node on level k (new k) which is either s or a cluster of s.

V. RESULT ANALYSIS

The following **Table 5.1** describes experimental result for number of social file search process in existing and proposed hit rate analysis. The table 5.1 contains number of search social file; existing and proposed probability distribution rate details are shown.

S.No.	Number of file Search	Existing System PDR	Proposing System PDR
1	50	0.266	0.321
2	100	0.279	0.287
3	150	0.315	0.328
4	200	0.348	0.352
5	250	0.389	0.397
6	300	0.395	0.398
7	350	0.413	0.420
8	400	0.434	0.449

Table 5.1 Probability Distribution Rate Analysis

The following **Fig 5.1** describes experimental result for number of file search process in existing and proposed hit rate analysis. The figure contains number of search file; existing and proposed probability distribution rate details are shown.

The following **Table 5.2** describes experimental result for number of video file search process in existing and proposed average delay of video file analysis. The table contains number of search social content file sharing, existing and proposed average social content file share details are shown.

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ISSN (Print) 2319 5940

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ISO 3297:2007 Certified
Vol. 6, Issue 11, November 2017

The following **Fig 5.2** describes experimental result for number of social content file search process in existing and proposed average delay of file analysis. The figure contains number of search social content file share and existing and proposed average social content file share details are shown.

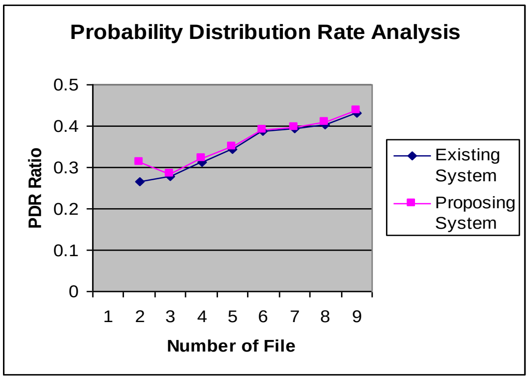

Fig 5.1 Average Probability Rate Analysis

S.NO.	Number of file Share	Existing System AVG	Proposing System AVG
1	50	60.36	61.19
2	100	63.55	64.29
3	150	70.28	73.16
4	200	74.39	76.39
5	250	78.65	80.13
6	300	82.78	83.69
7	350	86.40	88.74
8	400	92.17	94.12

Table 5.2 Average File Share Analysis

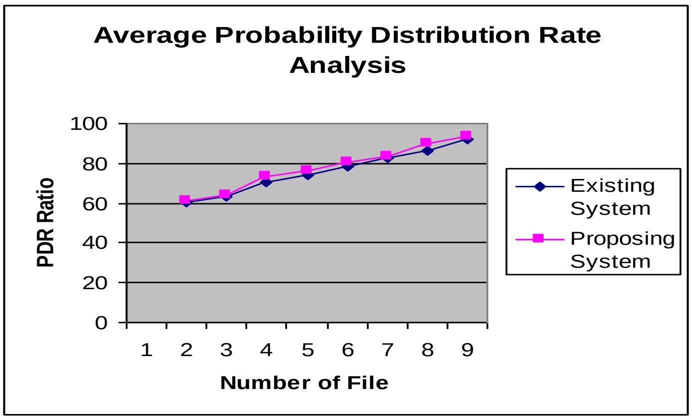

Fig 5.2 Average File Share Analysis

VI. CONCLUSION

In this paper, propose an energy efficient framework for social-based routing to reduce the load of nodes in social networks. Our proposed general framework can be easily applied to any social-based routing methods which use social metric per-node for relay selection. Simulation results over real-life data traces demonstrate the efficiency of our proposed method. The future work can be focused on improving the contact information compression algorithms. Relaxing the constraints in our Social model and making necessary changes to the hierarchical clustering and routing algorithms are also very important future work to increase the applicability of Social Model.

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