EFFECTIVE SOCIAL ROUTING FRAMEWORK FOR MOBILE SOCIAL SENSING NETWORK USING MULTI HIERARCHICAL ROUTING

1. E.SATHISHKUMAR M.Sc(CS),
RATHNAVEL SUBRAMANIAM
COLLEGE OF ARTS *& SCIENCE,*
SULUR,COIMBATORE-641 402.

2. Mrs. M.SUGANYA M.Sc,Mphil.
ASSOCIATE PROFESSOR & (HOD)
SCHOOL OF COMPUTER STUDIE*S*
RATHNAVEL SUBRAMANIAM
COLLEGE OF ARTS *& SCIENCE,*
SULUR,COIMBATORE-641 402.

Abstract In this paper, describe an Energy Efficient framework for Social-based Routing (EE-SR) 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. In this paper, propose an improved version of EE-SR to dynamically adjust the controlling parameter. Simulation results on real-life mobile traces demonstrate the efficiency of proposed framework. In this paper, the problem of routing in intermittently connected wireless networks comprising multiple classes of nodes is addressed. We show that proposed solutions, which perform well in homogeneous scenarios, are not as competent in this setting. To this end, propose a class of routing schemes that can identify the nodes of "highest utility" for routing, improving the delay and delivery ratio. Additionally, proposed an analytical framework based on fluid models that can be used to analyze the performance of various opportunistic routing strategies, in heterogeneous settings.

Keywords— Social Routing, Social Metrics, MANET, Multi Topology Routing, Multi Hierarchical Routing, EE-SR,

I. INTRODUCTION

A Mobile Wireless Sensor Network (MWSN) can simply be defined as a wireless sensor network (WSN) in which the sensor nodes are mobile. MWSNs are a smaller, emerging field of research in contrast to their well-established predecessor. MWSNs are much more versatile than static sensor networks as they can be deployed in any scenario and cope with rapid topology changes. However, many of their applications are similar, such as environment monitoring or surveillance. Commonly, the nodes consist of a radio transceiver and a microcontroller powered by a battery, as well as some kind of sensor for detecting light, heat, humidity, temperature, etc.

Recently, social-based routing has attracted a lot of attention since most mobile devices (such as smart phones) are now used and carried by people and the network behaviors can be better characterized by their social attributes. Social-based routing methods aim to carefully choose the relay nodes by choosing a good social metric to measure the capability of nodes to deliver the message to the destination. During any encounter, if the encountered node has higher social metric than the current node, the current node will forward its message copy to the encountered node.

Despite a large number of existing proposals, there is no routing scheme that both achieves low delivery delays and is energy-efficient (i.e. performs a small number of transmissions). With this in mind, in this paper we introduce a novel routing scheme called enhanced energy efficient social routing framework for the mobile social sensing networks. Leveraging the node mobility and opportunistic relay for packet delivery is a common technique developed for Delay Tolerant Networks (DTNs) or mobile opportunistic networks.

In these delay tolerant networks, the end-to-end path does not exist all the time from the current node to the destination node due to the frequent network partitions. This makes routing tasks more challenging than those in traditional wireless networks. Through this thesis introducing energy awareness as an important criterion in the routing decision. The thesis presents an experimental results showing that the proposed approach delivers performances with balancing the load and the energy consumption between nodes in the network.

Traditional 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. One of the challenges faced by mobile sensing is how to efficiently collect the mobile data beyond the existing capacity of 4G networks. One possible solution is to leverage the occasional device-to-device contact opportunities among mobile devices to deliver sensing data rather than using the fixed network infrastructure.

The main objective of the thesis is to reduce the load of nodes in social-based mobile networks. 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. Traditional social-based routing methods generally select 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, in this study aim to minimize the number of forwards for message transmission while maintaining acceptable delivery ratio.

II. LITRATURE SURVEY

Huiji Gao, et al [1] describes a preference propagation algorithm named Breadth-first Preference Propagation (BPP). The algorithm follows a relaxed breath first search strategy, and returns recommendation results within at most 6 propagation steps. Our experimental results on two real world datasets show that the proposed graph-based approach outperforms state-of-the-art POI recommendation methods substantially.

Yue Shi1 et al [3] describe a Geotagged photos of users on social media sites provide abundant location-based data, which can be exploited for various location-based services, such as travel recommendation. In this paper, we propose a novel approach to a new application, i.e., personalized landmark recommendation based on users' geo tagged photos. Author formulates the landmark recommendation task as a collaborative filtering problem, for which we propose a category-regularized matrix factorization approach that integrates both user-landmark preference and category-based landmark similarity. We collected geotagged photos from Flickr and landmark categories from Wikipedia for our experiments. Our experimental results demonstrate describe The rapid urban expansion has greatly extended the physical boundary of users' living area and developed a large number of POIs (points of interest). POI recommendation is a task that facilitates users' urban exploration and helps them filter uninteresting POIs for decision making. While existing work of POI recommendation on location-based social networks (LBSNs) discovers the spatial, temporal, and social patterns of user check-in behavior, the use of content information has not been systematically studied.

The various types of content information available on LBSNs could be related to different aspects of a user's check-in action, providing a unique opportunity for POI recommendation. In this work, study the content information on LBSNs. POI properties, user interests, and sentiment indications. We model the three types of information under a unified POI recommendation framework with the consideration of their relationship to check-in actions. The experimental results exhibit the significance of content information in explaining user behavior, and demonstrate its power to improve POI recommendation performance on LBSNs

Quan Yuan et al [2] describe the availability of user check-in data in large volume from the rapid growing location-based social networks (LBSNs) enables a number of important location-aware services. Point-of-interest (POI) recommendation is one of such services, which is to recommend POIs that users have not visited before. It has been observed that:

- Users tend to visit nearby places
- Users tend to visit different places in different time slots, and in the same time slot, users tend to periodically visit the same places. For example, users usually visit a restaurant during lunch hours, and visit a pub at night.

In this paper, we focus on the problem of time-aware POI recommendation, which aims at recommending a list of POIs for a user to visit at a given time. To exploit both geographical and temporal influences in time-aware POI recommendation, we propose the Geographical-Temporal influences Aware Graph (GTAG) to model check-in records, geographical influence and temporal influence. For effective and efficient recommendation based on GTAG, we develop that the proposed approach outperforms popularity-based landmark recommendation and a basic matrix factorization approach in recommending personalized landmarks that are less visited by the population as a whole.

First, a traveler may benefit from recommendations of landmarks to visit, when she, is traveling or plans to travel to a city for the first time. Deriving the traveler's preference from her activity at social media sharing websites for landmark recommendations requires no effort from the traveler. Second, different travelers may probably have different preference for places to see in the same city.

To meet the specific needs of individuals, landmark recommendations must be personalized. Therefore, a promising solution we propose in this paper is to provide landmark recommendations in a city for a traveler based on both the other travelers' preference for landmarks in the city and her preference on landmarks in the cities that she has visited before. We propose to tackle the personalized landmark recommendation problem via the collaborative filtering (CF) paradigm, which recommends, for a given user, favored items of similar users. We reason that a user in a new city may like landmarks that are already favored by other users who have similar landmark visiting experience in other cities in the past. Note that we define a landmark in our work as a place with significance for history, culture or contemporary society.

They emphasize that the personalized landmark recommendation studied in this paper differs from conventional CF scenarios in the following aspects. First, item ratings, i.e., graded preferences on certain landmarks are not directly available from the users' photos, as they would be in a conventional recommendation scenario such as movie recommendation, where users rate movies explicitly. Second, travelers often seek to enjoy a unique experience or to avoid tourist traps

Xin Lu [3] solving the problem of automatic travel route planning. We propose to leverage existing travel clues recovered from 20 million geo-tagged photos collected from www.panoramio.com to suggest customized travel route plans according to users' preferences. As the foot prints of tourists at memorable destinations, the geotagged photos could b e naturally used to discover the travel paths within a destination (attractions/landmarks) and travel routes between destinations. Based on the information discovered from geo-tagged photos, we can provide a customized trip plan for a tourist, i.e., the popular destinations to visit, the visiting order of destinations, the time arrangement in each destination, and the typical travel path within each destination.

Users are also enabled to specify personal preference such as visiting location, visiting time/season, travel duration, and destination style in an interactive manner to guide the system. Owning to 20 million geo-tagged photos and 200, 000 travelogues, an online system has been developed to help users plan travel routes for over 30, 000 attractions/landmarks in more than 100 countries and territories. Experimental results show the intelligence and effectiveness of the proposed framework

Lizhu Zhang et [4] describe the increasing availability of GPS-enabled devices is changing the way people interact with the Web, and brings us a large amount of GPS trajectories representing people's location histories. In this paper, based on multiple users' GPS trajectories, we aim to mine interesting locations and classical travel sequences in a given geospatial region. Here, interesting locations mean the culturally important places, such as Tiananmen Square in Beijing, and frequented public areas, like shopping malls and restaurants, etc. Such information can help users understand surrounding locations, and would enable travel recommendation. In this work, we first model multiple individuals' location histories with a tree-based hierarchical graph (TBHG). Second, based on the TBHG, we propose HITS (Hypertext Induced Topic Search)-based inference model, which regards an individual's access on a location as a directed link from the user to that location.

This model infers the interest of a location by taking into account the following three factors. 1) The interest of a location depends on not only the number of users visiting this location but also these users' travel experiences. 2) Users' travel experiences and location interests have a mutual reinforcement relationship. 3) The interest of a location and the travel experience of a user are relative values and are region-related. Third, we mine the classical travel sequences among locations considering the interests of these locations and users' travel experiences. We evaluated our system using a large GPS dataset collected by 107 users over a period of one year in the real world. As a result, our HITS-based inference model outperformed baseline approaches like rank-by-count and rank-by-frequency.

III. METHODOLOGY

A. Social Sensing Network

In the mobile social sensing network, the sensing tasks are performed by mobile nodes and sensing data are shared and collected by leveraging the intermittent inter-contacts among mobile nodes. In this module, such mobile nodes details are created for the experimental analysis. The number of nodes count is keyed in and then the nodes are created. The details of the mobile node are stored into the database table.

B. Social Network Creation

The nodes which are connected in the network is 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 id and maximum id 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. Also they are sorted in ascending order which is used in other modules.

C. Flooding Communication

Flooding is a fundamental communication primitive for wireless sensor networks. Flooding is used for disseminating code updates and parameter changes, affecting the operation of all nodes in the network. When flooding occurs each node, typically, broadcasts the flooding packet once. The costs for flooding, however, can become significant if neighborhood keys are used for communication, instead of a single broadcast, a node is required to perform several unicast transmissions.

In flooding, a node sends a packet received, to all its neighbors other than the neighbor which sent the packet to it, if the packet is not destined to itself or the maximum number of hops a packet can pass is not crossed. Flooding is very simple to implement, and it is reactive protocol, as it does not maintain any routing table and does not require discovering any routes. Similar data produced by nodes in the same region are also flooded, i.e. there is no data aggregation done.

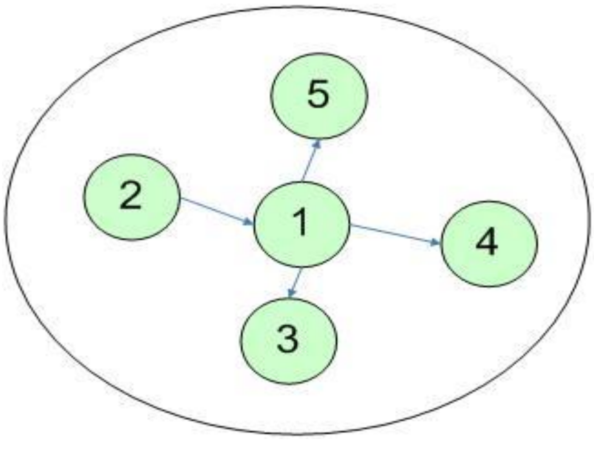


Fig 3.1 Flooding Based Scenario - General Sender Based Approach

For fig 3.1 example, Node 2 sends a packet to node 1, which in turn sends the packet to all its neighbors, i.e. to node

3, node 4, and node 5. Node 1 does not send the packet to node 1 because node 1 knows that node 2 only sent the data to it.

Social-based routing methods aim to carefully choose the relay nodes by choosing a good social metric to measure the capability of nodes to deliver the message to the destination. The aim of EE-SR is 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. At the beginning, when TTL (Time To Live) is large, EE-SR puts minimizing the load of nodes as its first priority, thus the value of amp ratio is set high. However, after several hops, when TTL is reduced to a small value, which means the packet will be discarded soon, EE-SR puts improving the delivery ratio as its first priority, so the value of amp ratio should be set small.

D. EER Routing

In this section, dynamically adjust amp ratio based on past encounters to improve the delivery ratio. When a node encounters more than K nodes whose SM(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 TTL (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. Here, K is the pre-defined threshold for node counter. In this process, replace the general SM of nodes in the algorithm with a specific social metric.

Delay Tolerant Networks (DTN) model which is realistic for some practical DTN and with which multilevel clustering can be performed to build a hierarchical network. And build the first hierarchical network in DTNs in which the time-varying nature of the physical topology is reflected by the time-variant information (the contact information) maintained by the links in the hierarchical network. Hierarchical routing facilitates the hierarchical network as a topology abstraction and may not generate a shortest path. The advantage of hierarchical routing is that it is scalable (logarithmic) for localized traffic patterns, and it does not need location information. It 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. Each node makes its forwarding decision via the following steps: Find the lowest level k where the source s and the destination d have a common cluster.

Phase: EE-SR Algorithm:

```
        Node Vi with message M meets Vj which does not
hold M.
                if Vj is the destination then
                        Vi forwards M to Vj
                else
                        amp ratio  =  1 + (  ttl / TTL0) . θ
                if SM (Vi) . 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
```

Phase: EE-SR-I:

```
        Node Vi with message M meets Vj which does not
hold M .
        if Vj is the destination then
                Vi forwards M to Vj
        else
                if SM (Vi) . amp ratio <  SM(Vj)  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(Vi) . amp_ratio <= SM(Vj) then
                Vi forwards M to Vj
                ttl =  ttl - 1
                node_counter = 0
        else
                node Vi holds the M and waits for the next
encounter
        end if
```

F: DTN Hierarchical Routing (DHR) Algorithm Steps:

- 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 Dijkstra's 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.

Step: 1 The Node ad-hoc network creation and view the network
Step: 2 Deployment of Road Side Unit (RSU) with private and public key
Step: 3 Analyze the network coverage area with specified distance
Step: 4 Initialization of Road Side Unit
Step: 5 Create Trajectory between one Road Side Unit (RSU) and neighbor RSU with distance
if receive a packet forwarding request from a source node then
if this. Space Utility < threshold then
Reply to the source node.
end if
end if
if receive forwarding request replies for neighbor nodes then
Determine the packet size Sp (i) to each neighbor I based on
S_p (new)= R/V_iS_p(unit)
Estimate the queuing delay Tw for the packet for each neighbor based on
$T^X = \Sigma T_{t-D} - [T_w/T_a]$ (0<J<x)
Determine the qualified neighbors that can satisfy the deadline requirements based on Tw
Sort the qualified nodes in descending order of Tw
Allocate workload rate Ai for each node based on
A= { $W_g = \Sigma^{N}_{i=1} A_i$
for each intermediate node ni in the sorted list do
Send packets to ni with transmission interval Sp(i) / Ai.
end for
end if

IV. EXPERIMENTAL RESULTS

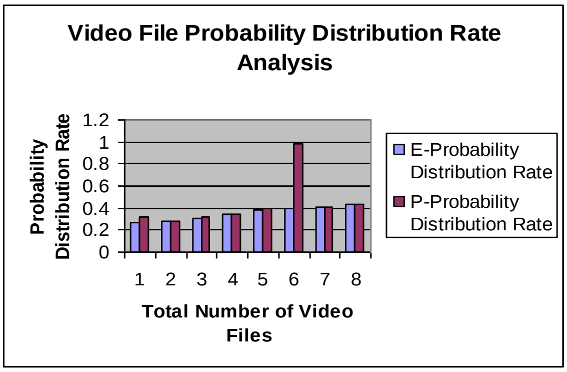
The following **Table 5.1** describes experimental result for number of video file search process in existing and proposed hit rate analysis. The table contains number of search video file, existing and proposed probability distribution rate details are shown.

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

S.No.	Number of Video file Search	Existing System Probability Distribution Rate	Proposing System Probability Distribution Rate
1	25	0.265	0.313
2	50	0.278	0.285
3	75	0.312	0.321
4	100	0.345	0.349
5	125	0.387	0.392
6	250	0.394	0.398
7	275	0.404	0.408
8	300	0.431	0.437

V. CONCLUSION

In this paper, addressed the issues to delivery mobile data efficiently in mobile social sensing networks, where end-to-end paths between any pair of nodes may not exist. Routing in such networks is a challenging problem. Many social-based routing protocols are improving the delivery ratio over time in such delay tolerant networks, but most of them do not consider the load of nodes. In this paper, propose an energy efficient framework for social-based routing to reduce the load of nodes in mobile social networks. Our study general framework can be easily applied to any existing 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.



REFERENCES

[1] B. Guo, Z. Wang, Z. Yu, Y. Wang, N. Yen, R. Huang, and X. Zhou, Mobile crowd sensing and computing: The review of an emerging human-powered sensing paradigm, ACM Computing Surveys, vol. 48, no. 1, p. 7, 2015.

[2] Y. Li, M. Qian, D. Jin, P. Hui, Z. Wang, and S. Chen, Multiple mobile data offloading through disruption tolerant networks, IEEE Trans. on Mobile Computing, vol. 13, no.7, pp. 1579–1596, 2014.

[3] Y. Zhu, C. Zhang, and Y. Wang, Mobile data delivery through opportunistic communications among cellular users: A case study for the D4D challenge, in Proc. Of NetMob, 2013.

[4] L. Wang, D. Zhang, and H. Xiong, Effsense: Energyefficient and cost-effective data uploading in mobile crowdsensing, in Proc. of ACM UbiComp, 2013.

[5] P. Hui, J. Crowcroft, and E. Yoneki, Bubble rap: Social-based forwarding in delay-tolerant networks, IEEE Transactions on Mobile Computing, vol. 10, no. 11, pp. 1576–1589, 2011.

[6] T. Spyropoulos, K. Psounis, and C. S. Raghavendra, Spray and wait: An efficient routing scheme for

intermittently connected mobile networks, in Proceedings of the 2005 ACM SIGCOMM Workshop on Delay-Tolerant Networking, 2005, pp. 252–259.

[7] A. Lindgren, A. Doria, and O. Schel´ en, Probabilistic routing in intermittently connected networks, ACM SIGMOBILE Mobile Computing and Communications Review, vol. 7, no. 3, pp. 19–20, 2003.

[8] V. Erramilli, A. Chaintreau, M. Crovella, and C. Diot, Diversity of forwarding paths in pocket switched networks, in Proceedings of the 7th ACM SIGCOMM Conference on Internet Measurement, 2007, pp. 161–174.

[9] V. Erramilli, M. Crovella, A. Chaintreau, and C. Diot, Delegation forwarding, in Proceedings of the 9th ACM International Symposium on Mobile Ad Hoc Networking and Computing (MobiHoc 2008), 2008, pp. 251–260.

[10] C. Tian, F. Li, L. Jiang, Z. Wang, and Y. Wang, Energy efficient social-based routing for delay tolerant networks, in Prof. of 9th International Conference on Wireless Algorithms, Systems and Applications (WASA 2014), 2014.