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RANK BASED ANT COLONY OPTIMIZATION FOR PATH SELECTION IN MOBILE SOCIAL NETWORKS

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Abstract— **Normally mobile social network is one kind of delay tolerant network which composed of mobile nodes that can move anywhere in any direction within the network coverage area. Mobile nodes can able to share their information with each other through their specified path with the help of wireless communication devices. We are going to discuss with a Rank based Ant Colony Optimization technique for improving the packet delivery. Since, in existing system they proposed with a novel zero-knowledge multi-copy routing algorithm which did not provide efficient packet delivery. For that we propose a new algorithm to effectively identify the destination and select route between the source and destination for packet transmission. Rank based Ant Colony Optimization technique choose shortest path between the source and target destination. Our simulation result shows that our proposed approach efficiently select destination and reduces the packet delivery delay.**

Keywords — Mobile Social Network, Rank Based Ant Colony Optimization, Packet Delivery

I. INTRODUCTION

Delay-tolerant networking (DTN) is an approach to computer network architecture that seeks to address the technical issues in heterogeneous network that may lack continuous network connectivity. Mobile social-networking services enable individuals to connect to their social communities with a mobile device, through one or more available mobile channels. Members share experiences, interests, opinions, presence information and personal content through their mobile devices. Mobile adds new capabilities to social networking, such as location-related services (e.g., check-in) and new visualization mechanisms (e.g., augmented reality showing where friends are). Mobile social networking is social networking where individuals with similar interests converse and connect with one another through their mobile phone and/or tablet. Much like web-based social networking, mobile social networking occurs in virtual communities. A current trend for social networking websites, such as Facebook is to create mobile apps to give their users instant and real-time access from their device.

In turn, native mobile social networks have been created like Foursquare, Instagram, and Path, communities which are built around mobile functionality. More and more, the line between mobile and web is being blurred as mobile apps use existing social networks to create native communities and promote discovery, and web-based social networks take advantage of mobile features and accessibility. As mobile web evolved from proprietary mobile technologies and networks, to full mobile access to the Internet, the distinction changed to the following types: 1) Web based social networks being extended for mobile access through mobile browsers and smart phone apps, and 2) Native mobile social networks with dedicated focus on mobile use like mobile communication, location-based services, and augmented reality, requiring mobile devices and technology. Initially, there were two basic types of mobile social networks. The first is companies that partner with wireless phone carriers to distribute their communities via the default start pages on mobile phone browsers. An example of this is Juice Caster. The second type is companies that do not have such carrier relationships (also known as "off deck") and rely on other methods to attract users.

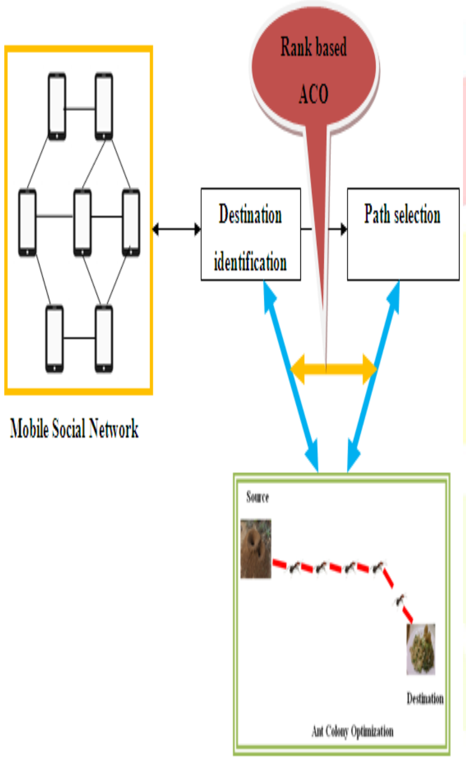

Fig: 1 The architecture for the Mobile Social Net (left) and components for request handling and resource allocation (right).

In Rank based Ant Colony Optimization technique all successful solutions are ranked according to their length. The amount of pheromone deposited is then weighted for each solution, such that solutions with shortest paths deposit more pheromone than the solutions with longer paths. It also leads to find out he frequently visiting home of each node should be identified. Our proposed approach discarded with all the above said approached in our proposed system. Finally our proposed approach finds out the shortest path based on their path weight. It can efficiently reduces the packet delivery delay caused during the path selection also can be reduced.

II. Overview : RACO

Rank based Ant Colony Optimization technique which improving the packet delivery rate. Normally an ant colony optimization algorithm (ACO) is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs. In Rank based Ant Colony Optimization technique all successful solutions are ranked according to their length. The amount of pheromone deposited is then weighted for each solution, such that solutions with shortest paths deposit more pheromone than the solutions with longer paths. The concept of homing spread discussed in the existing paper since it increases memory occupation of multiple copies of messages. It also leads to find out he frequently visiting home of each node should be identified. Our proposed approach discarded with all the above said approached in our proposed system. Finally our proposed approach finds out the shortest path based on their path weight. It can efficiently reduces the packet delivery delay caused during the path selection also can be reduced. All solutions are ranked according to their length. The amount of pheromone deposited is then weighted for each solution, such that solutions with shorter paths deposit more pheromone than the solutions with longer paths.

III. Principles of Ant Behavior

Ants are social insects living within a collective (a family or colony). Some two percent of insects are social, and ants account for half of these. The number of ants in a single colony may vary from 30 to tens of millions. Ants are dominant in the Amazon basin, constituting more than 30% of the biomass of the local forests. The behavior of ants in transporting food, overcoming obstacles, building anthills, and other operations is almost optimal. Principles of ant behavior have withstood the proof of one hundred million years, after they had “colonized” the Earth. Ant colonies are amazingly survivable: a reduction of up to 40% of insects has practically no effect on the functioning of the whole society. A mass destruction of ants (for example, resulting from a

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chemical treatment of their habitat) leads to the consolidation of insects from the neighboring anthills into one family to save the society The social behavior of ants is based on *self-organization,* a set of dynamical mechanisms ensuring that the system can achieve its global aim through low-level interactions between its elements. A key feature of this interaction is that the system elements use *only local information.* In this case, any centralized control and reference to the global pattern representing the system in the external world are ruled out. Self-organization is a result of the interaction between the following four components:

(1) multiple renewal;
(2) randomness;
(3) positive feedback;
(4) negative feedback.

There are two ways of information transfer between ants: a direct communication (which includes food exchange and mandible, visual, and chemical contacts) and an indirect communication, which is called stigmergy. *Stigmergy* is a form of communication separated in time, when one participant of the communication modifies the environment, and the others make use of this information later, when they occur in a neighborhood of the modified environment. Biologically, stigmergy is realized through *pheromones*, a special secretory chemical that is deposited as trail by ants when they move. The higher the pheromone concentration on the path, the more the number of ants moving along it.With time, the pheromones evaporate, which allows the ants to adapt their behavior when the environment is modified. The distribution of pheromones is a sort of dynamically varying global memory of the anthill. At any moment, an ant can sense and change only one local cell of this global memory. On the example of experiments with ants on an asymmetric bridge, we demonstrate how the cooperative behavior of ants makes it possible to find the shortest path to food. The asymmetric bridge (Fig. 1) connects the ant nest with the food source by two branches of different length. The experiments were carried out with a laboratory colony of Argentine ants (*Iridomurmex humilis*), which deposit pheromones on the paths both from and to the nest. The scheme of the experiments was as follows:
(1) the bridge A-B-C-D was constructed;
(2) the gate at point A was opened;
(3) the numbers of ants selecting the longer (A-C-D) and shorter branches of the bridge were counted. At the early stage of the experiments, both branches have been selected by the ants at about the same rate. In some time, almost all ants choose to move along the shortest route A-B-D, which is explained in the following way. First, the branches were free of pheromones; therefore, the A-C-D and A-B-D branches have been selected with equal rate. The ants that selected the shorter route A-B-D-B-A returned sooner with food to the nest and laid pheromone trails on this shorter branch. When they had to select the next time, the ants preferred to move along the shorter branch of the bridge, since the concentration of pheromones on it is higher. Therefore, the pheromones are accumulated faster on the branch A-B-D, attracting the ants to select the shortest route.

The ACO algorithm is a kind of natural algorithm inspired by foraging behavior of real ants. Researchers are fascinated by seeing the ability of near-blind ants in establishing the shortest route from their nest to the food source and back. These ants secrete a substance, called pheromone, and use its trails as medium of communicating information. The probability of the trail being followed by other ants is enhanced by further deposition of pheromone by other ants moving on that path. This cooperative behavior of ants inspired the new computational paradigm for optimizing real life systems, which is suited for solving large scale problems. There are different variants of ant colony optimization algorithm. In essence, these algorithms carry out three operations: (1) ant-based solution construction, (2) pheromone update, and (3) daemon actions. In ant-based solution construction, solutions representing artificial ants are constructed. Solutions are chosen probabilistically based on pheromone level. Thus, this operation forces the algorithm to search in the area of better solutions. The aim of pheromone update is to increase the pheromone values associated with good or promising solutions and decrease those that are associated with bad ones. Usually this is achieved by increasing the pheromone levels associated with chosen good solutions and by decreasing the pheromone values through pheromone evaporation, which basically reduces the pheromone level. Daemon actions are used to implement centralized actions which cannot be performed by a single ant.

IV. ADVANTAGE OF RACO

1. Positive Feedback accounts for rapid discovery of good solutions
2. Distributed computation avoids premature convergence
3. The greedy heuristic helps find acceptable solution in the early solution in the early stages of the search process.
4. The collective interaction of a population of agents.

V. IMPLEMENTATION OF RACO

Routing is the major problem in mobile social network. Since, mobility nature of mobile nodes we cannot effectively select the routing between the source and destination. But recent routing protocols developed for mobile social networks can successfully doing the routing process. So our proposed approach on routing is done with the help of Rank based Ant Colony Optimization technique which improving the packet delivery rate. Normally an ant colony optimization algorithm (ACO) is a probabilistic technique for solving computational problems which can be reduced to finding good paths through graphs. In Rank based Ant Colony Optimization technique all successful solutions are ranked according to their length. The amount of pheromone deposited is then weighted for each solution, such that solutions with shortest paths deposit more pheromone than the solutions with longer paths.

Finally our proposed approach finds out the shortest path based on their path weight. It can efficiently reduce the packet delivery delay caused during the path selection also can be reduced. Form the node to transmit and also to receive the packets in mobile social network. The nodes are in mobile nature that can able to move anywhere in any direction. The nodes are free to move and they can able to change their location anytime.

After mobile node creation processes those collection of mobile nodes construct the mobile social network. After that we have to identify the targeted destination node for transmitting data between source and destination nodes. The destination node can be identified with the help of our proposed Rank Based Ant Colony Optimization technique which identify the actual target that the source node wants to communicate. The destination identification process is performed after node creation and before path selection process.We choose the path for sending packets to the destination from the source node. For that purpose we have to use the Rank Based Ant Colony Optimization technique for selecting the optimal path as well as shortest between the source and destination. A Rank Based Ant Colony Optimization technique can able to successfully select the best path from source to destination. We start the packet transmission between the source and destination nodes. The final stage of our proposed system is that the packet transmission. We transmit the packet between the source and destination node in order to

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achieve the proper communication. The source node sends packets to the intermediate nodes. An intermediate node forwards those packets to the particular destination node.

VI. PRIOR STUDIES WORK

J. Wu, M. Xiao, and L. Huang [1] presented a Homing spread: Community home-based multicopy routing in mobile social networks. Theoretical analysis shows that the proposed algorithm can spread a given number of message copies in an optimal way when the inter-meeting times between any two nodes and between a node and a community home follow exponential distributions. Also calculate the expected delivery delay of HS. In addition, extensive simulations are conducted. Results show that community homes are important factors in efficient message spreading. By using homes to spread messages faster, HS achieves a better performance than existing zero-knowledge MSN routing algorithms, including Epidemic, with a given number of copies, and Spray&Wait.

X. Tie, A. Venkataramani, and A. Balasubramanian [2] presented a R3: Robust replication routing in wireless networks with diverse connectivity characteristics. Implement and deploy R3 on a mesh testbed and a DTN testbed. To the best of our knowledge, R3 is the first routing protocol to be deployed and evaluated on both a DTN testbed and a mesh testbed. We evaluate its performance through deployment, trace-driven simulations, and emulation experiments. Results show that R3 achieves significantly better delay and goodput over existing protocols in a variety of network connectivity and load conditions.

M. Xiao, J. Wu, and L. Huang [3] presented a Community-aware opportunistic routing in mobile social networks. a distributed optimal Community-Aware Opportunistic Routing (CAOR) algorithm. The main contributions are that they propose a home-aware community model, whereby we turn an MSN into a network that only includes community homes. Prove that, in the network of community homes, we can still compute the minimum expected delivery delays of nodes through a reverse Dijkstra algorithm and achieve the optimal opportunistic routing performance. Since the number of communities is far less than the number of nodes in magnitude, the computational cost and maintenance cost of contact information are greatly reduced.

T. Ning, Z. Yang, H. Wu, and Z. Han [4] presented a Self-interest-driven incentives for ad dissemination in autonomous mobile social networks. They propose a Self-Interest-Driven (SID) incentive scheme to stimulate Cooperation among selfish nodes for ad dissemination in autonomous mobile social networks. As a key innovation of SID, we introduce "virtual checks" to eliminate the needs of accurate knowledge about whom and how many credits ad provider should pay. A virtual check is included in each ad packet. When an intended receiver receives the packet for the first time from an intermediate node, the former authorizes the latter a digitally signed check, which serves as a proof of successful ad delivery. Multiple copies of a virtual check can be created and signed by different receivers. Extensive simulations are carried out to compare SID with other existing incentive algorithms under real world mobility traces. As mobile devices have become more ubiquitous, mobile users increasingly expect to utilize proximity-based connectivity, e.g., WiFi and Bluetooth, to opportunistically share multimedia content based on their personal preferences.

L. Guo, C. Zhang, H. Yue, and Y. Fang [5] presented a privacy-preserving social-assisted mobile content dissemination scheme in DTNs. A prediction-based routing protocol for mobile delay tolerant networks works by forwarding a message from one intermediate node to another if the latter has higher probability of encountering the destination node.

However, this process compromises the privacy of the nodes by revealing their mobility patterns. They proposed a privacy preserving prediction based routing protocol that forwards messages by comparing information about communities of nodes instead of individual nodes. Specifically, it compares the maximum probability that a node in the community of a potential intermediate node will encounter the destination node.

B. Gu, X. Hong, P. Wang, and R. Borie [6] presented a Latency analysis for thrown box based message dissemination. We first model the message delivering process among thrown boxes and derive time related message distribution on the boxes. Then we investigate the message collection process to obtain the expected number of informed collectors as a function of time. In addition, we analyze the latency distribution for message collection. The numerical examples are provided to validate our model and to examine the features of message dissemination under different network scenarios.

VII. Conclusion

We proposed with Rank based Ant Colony Optimization technique. Since, in the existing system they used a zero-knowledge multi-copy routing algorithm called Homing Spread which improves duplication of message and also increases the message transmission delay. So our proposed paper comes to Rank based Ant Colony Optimization technique which identifies the target node with the help of this algorithm. Our proposed Rank based Ant Colony Optimization technique also provide a shortest path between the source and target node. Finally our simulation results prove that our proposed system can efficiently reduce the packet delivery delay and reduces the message duplication as well as memory space.

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