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Content Sharing over Smartphone-Based Delay-Tolerant Networks

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Abstract—
With the growing number of smartphone end users, peer-to-peer ad hoc content giving is likely to occur often. Thus, new articles sharing mechanisms must be developed since traditional information delivery schemes will not be efficient with regard to content sharing due to the sporadic connectivity between smartphones on the market. To obtain data delivery such challenging environments, researchers include proposed the employment of store-carry-forward methodologies, in which a node stores a communication and holds it until a forwarding prospect arises through an encounter together with other nodes. Most past works in this field have dedicated to the conjecture of whether two nodes could encounter the other, without thinking about the place and also time from the encounter. In this particular paper, we propose to her discover-predict-deliver as a possible efficient articles sharing scheme for delay-tolerant touch screen phone networks. In this proposed scheme, contents are usually shared while using the mobility information of people. Specifically, our strategy employs the mobility understanding algorithm to spot places inside your own home and outdoor.
Keywords— Wireless Networks, Location Dependency, DTN

I. Introduction

In the last few several years, the amount of smartphone customers has speedily increased. As smart phone interfaces are convenient and user friendly, users can create various types of content. On the other hand, content sharing remains worrisome. It requires several person actions, such as registration, uploading to key servers, as well as searching as well as downloading subject matter. One approach to reduce a user's burden would be to rely while on an ad hoc approach to peer-to-peer articles sharing. With this method, subject matter are in an instant discovered as well as shared. The effectiveness of this sharing method is determined by the productivity of sharing and also the significance on the shared subject matter. In this kind of paper, we mainly focus on the productivity of articles sharing, and we provide suggestions upon creating substantial content.

Although ad hoc networks can certainly be constructed with smartphones since they include various multilevel interfaces, such as Bluetooth as well as Wi-Fi, the on the web connectivity between smartphones is expected to be intermittent a result of the movement styles of carriers and also the signal propagation phenomena. To overcome this challenge, researchers possess proposed various store carry-forward routing schemes. In these types of schemes, a node stores an email and carries it for just a certain length of time until a communication possibility arises. Local forwarding decisions are at home made making use of utility capabilities, and multiple copies on the same information are disseminated in parallel to raise the delivery probability. Therefore, Delay-Tolerant System (DTN) routing protocols achieve better overall performance than classic mobile ad hoc network (MANET) routing protocols. The advantage of both DTN as well as MANET routing protocols may be the absence on the requirement of the central server.

For this reason, contents usually are distributed as well as stored for the smartphones. Among your proposed DTN routing protocols, Epidemic routing is a basic DTN routing solution. Within Epidemic routing, messages usually are forwarded in order to every encountered node that will not have a copy on the same information. This solution demonstrates the most effective performance regarding delivery price and latency, but it requires sufficient resources, such as storage, bandwidth, as well as energy. The works, that happen to be proposed pursuing Epidemic routing, are categorised into 3 categories: learning resource based, possibility based, as well as prediction structured. In the 1st category, methods employ “data mules” as message ferries that directly produce messages in order to destinations. Opportunity-based routing protocols work with unscheduled as well as random encounter opportunities to change messages. Within prediction-based schemes, sophisticated electric functions were created using a brief history of mobility, encounter instances, and encounter rates. Each node maintains a computer program value for any other node, this also value continues to be updated while using time involving contacts. A node forwards an email copy simply to nodes which has a higher utility to the message vacation spot. Prediction-based schemes outperform opportunity-based routing protocols both regarding delivery rate and delivery latency. In addition, the schemes reduce learning resource consumption by simply adequately choosing how many message identical. However, a lot of the existing prediction-based schemes focus on the prediction of whether or not two nodes could encounter the other down the road and not necessarily on once they would encounter the other again. On the other hand, Yuan et 's. use the time of incurs to properly predict encounter opportunities. Nevertheless, the prediction of encounter opportunities using the encounter record of nodes is just not optimal on account of missing connection opportunities.

DTN routing protocols are made to deliver an email to the destination, whereas this content sharing device first discovers content previous to delivering it towards destination. This two-step functioning is challenging a result of the absence connected with central servers. In in search of contents, prior works employed two techniques: flooding as well as random stroll. Most flooding-based schemes work with a time-to-live (TTL)-based limit to regulate the spread on the search requests. By compare, search schemes depending on random walks avoid the massive distributed of messages that racing creates but nonetheless achieve trustworthiness using probabilistic paths to realize the responder.

II. Previous Work

Wireless ad hoc networks have been traditionally modelled as connected graphs with stable end-to-end paths. However, for emerging wireless applications, such as sensor networks for wildlife tracking and MANETs operating in challenging environments, wireless links are short-lived and end-to- end connectivity turns out to be sporadic. Such phenomena are prevalent in disruption tolerant networks (DTNs), where the connection between nodes in the network changes over time, and the communication suffers from frequent disruptions, making the network partially connected.

The intermittent end-to-end paths and the changing topology make conventional MANET routing protocols fail, as they are designed with the assumption that the network stays connected. Routing in DTNs is an especially challenging problem because of the temporal scheduling element in a dynamic topology, which is not present in traditional MANETs. Nodes have to decide who the next hop is, but also when to forward, as they route packets to destinations in a store-and-carry way.

Researchers have proposed a number of broad methods to solve the above issue. In general, previous related works fall into three categories: mobile resource-based, opportunity- based, and prediction-based. In the first category, systems employ mobile resources (data mules and mobile agents) as message ferries. These can be directed to pick up, move towards the next hop, and deliver messages to implement end to end store-and-carry message delivery. In opportunity-based schemes, nodes forward messages during contacts that are unscheduled or random.

For the prediction-based schemes inter-node contacts and mobility behavior are predicted, generally using prior con- tact history. The next hop and the contact in which a message is forwarded are selected using the predictions such that a quality of service (QoS) metric (e.g. delay or delivery ratio) is maximized. Most of the existing prediction-based routing protocols focus on the prediction of whether two nodes would have a contact in the future without considering when the contact happens. We believe that lack of con- tact timing information undermines the contact prediction accuracy, and consequently reduces routing performance. [1]

The most expensive routing protocol, epidemic, forwards copies of a message to any possible node and guarantees a maximized delivery rate. Effectively flooding the network with every message, epidemic is impractical because of poor scalability in large networks. Recently, much effort has been focused on probabilistic forwarding (or opportunistic forwarding), which tries to reduce the number of copies of each message while retaining a high routing performance, i.e., a high delivery rate. Since only a small fraction of the nodes can get copies of a message, it is desired that these copies are forwarded by the nodes which have a higher de- livery probability than the other nodes.

The first drawback is that a forwarding decision based on comparing the direct forwarding qualities of nodes i and j cannot guarantee a good forwarding. (1) The forwarding quality of j being better than i does not necessarily mean that j is a good forwarder. (2) Even though the quality of j is high, i might encounter better nodes in the near future. (3) Similarly, even though the quality of j is lower than i, j might still be the best forwarder that i could encounter in the future. To rectify this drawback, we use a comprehensive metric which reflexes not only the direct delivery probability of a particular message copy but also its indirect delivery probability when the node can forward the message to other intermediate nodes.

The second drawback is that the quality of a node is a constant regardless of two important states of the copy: remaining hop-count and residual lifetime. Remaining hop-count is an important factor: a node can be a bad 1-hop forwarder for having a low direct delivery probability, but it can still be an excellent 2-hop forwarder if it has a frequent contacting node which has a high direct delivery probability. On the other hand, residual lifetime is important because it affects a node's direct delivery probability and also the message's chance of being forwarded to other high quality nodes.[2]

A different approach to significantly reduce the overhead of epidemic routing, while still maintaining good performance, is to distribute only a bounded number of copies. In a manner similar to the 2-hop scheme, a copy is handed over to a fixed number of relays, each of which can then deliver it only directly to the destination. Nevertheless, in many situations where node movement is strongly correlated or predominantly local, the performance of this scheme deteriorates.

Despite the variety of existing approaches, the majority of them are multi-copy ones. Furthermore, the minority that deals with single-copy techniques only studies direct transmission or some form of utility-based schemes in relatively different contexts. In this work, we perform a detailed inquiry into the problem space of single-copy routing, and show how to achieve competitive performance without using multiple copies. We look into how utility functions can be designed to fully take advantage of the “field” of past encounters, and propose a function that is shown to achieve up to an order of magnitude improvement in ICMNs over existing utility functions. Finally, we propose a novel, hybrid routing scheme, which uses randomization when necessary to overcome some inherent shortcomings of utility-based forwarding. [3]

The traditional approach to map search queries to resources is implemented by maintaining an index about the resources. The index contains keywords and maps them to sets of related resources. This can be used to map a query consisting of several keywords to a list of suggested search results. Examples of centralized search engines using such indices are Google, MSN, and Yahoo. The problem with such centralized services is that it is expensive to keep the index up-to date and the assumption is made that the clients can reach both the index and the locations where the contents reside. There are approaches for managing decentralized indexes in peer-to-peer environments, but these models often assume good connectivity among the nodes. Otherwise, unreliable connections may lead to a high maintenance cost of the index.

Furthermore, not all contents of interest resides on servers connected to the infrastructure network: mobile users are not just consumers, but also prime producers of contents and often eager to share their impressions with others. Particularly in disconnected environments, this “mobile” contents cannot easily be indexed by centralized search engines unless uploaded to a some server. Yet, such contents may be especially interesting to other mobile users in proximity, which could access it by means of ad-hoc networking. [5]

Communities and social relationships are formed when a set of nodes are doing the same activity in the same location. For example, nodes with the same home are family members, while nodes with the same location are colleagues from work. Nodes are doing the activities on a daily basis starting from home in the morning. Each node is assigned a wakeup time, which determines when the node should start from home. This value is drawn from a normal distribution with mean 0 and configurable standard deviation. The node uses the same wakeup time every morning during the whole simulation. The variance in the wakeup time models the differences in rhythms in real life.

At the wakeup time, nodes leave their homes, and use different transport methods to travel to work. Nodes travel between activities either by car or by bus, which are both different submodels. The working time is configurable. After the working hours, the nodes decide, by drawing, whether they go out for the evening activity, or return home. Again, different submodels are used for transitions between the locations. Different user groups have different locations where the activities take place.[8]

The recent advances in WSNs are rapidly expanding the range of applications they can support: from “traditional” environmental monitoring, where a number of nodes is scattered across an area collecting data for a single sink, to mobile scenarios involving multiple sinks. This happens when the entities to monitor are animals (e.g., in farming scenarios), people (e.g., in elderly care scenarios), or things moving around (e.g., in logistics), while several mobile devices (e.g., PDAs) are used as sinks, or actuators, also acting as sinks, are involved. Unfortunately, mobility and the presence of multiple sinks is something that has been largely neglected by research on WSNs so far, especially if we consider the case of data-aware routing protocols. Indeed, one of the main peculiarities of WSNs is the data-centric form of communication that they usually adopt: a few sinks (a single one in the simplest scenarios) are interested in receiving only some specific data among those collected by sensors, e.g., the temperature readings that exceed some threshold. This suggests abandoning traditional, address-based routing protocols, to adopt a Content-Based Routing (CBR) protocol, in which messages do not carry any explicit address, while they are routed based on their content and on the interests specified by nodes. This is the solution taken by popular protocols for WSNs like Directed Diffusion and TinyCOPS, without however considering mobility as a key aspect. Moreover, if we look at the typical scenarios of usage of a WSN, we may notice that communication is not only data-centric but it is also often context-aware. As an example, a farmer could be interested in knowing the activity level of "young" cattle only, while, in a logistics application, different temperature thresholds are critical for different goods. Encoding such context-awareness as part of the message content and using standard CBR to route messages is possible, but can be inefficient, increasing message size and communication overhead. [9]

Due to DTN dynamics, deterministic data forwarding, either unicast and multicast, is only guaranteed in two cases: (i) the network is flooded, and (ii) the data forwarding process does not have time constraint. Neither of the two cases are practical in DTNs due to the inevitably high forwarding cost. Thus, a more practical solution is to maximize the data forwarding probability with a given time constraint. From such a probabilistic perspective, the *essential difference* between multicast and unicast in DTNs is that, a selected relay for multicast is expected to forward data to as many destinations as possible. The cumulative probability for a relay to forward data to multiple destinations therefore needs to be calculated, and such calculation may require global knowledge of social relations among nodes.[10]

III. Proposed System

A. *Content Discovery*

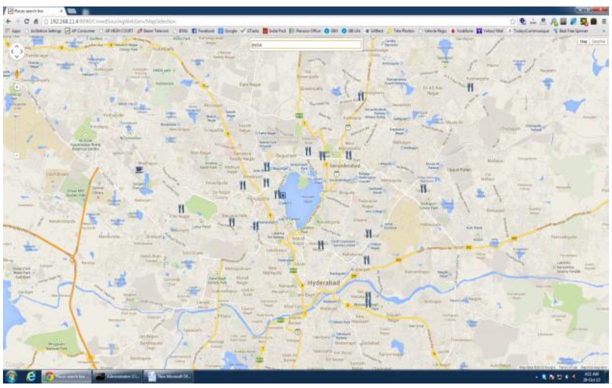
In content discovery, most systems focus on how to formulate queries, which depends on assumptions about the format of the content to be discovered. A general protocol should support many different types of queries and content, but we abstract from the actual matching process in order to focus on discovering content over the network. The simplest strategy to discover and deliver contents is Epidemic routing. However, due to resource limitations, Epidemic routing is often wasteful, so we need to consider methods that limit the system resources spent on both content discovery and delivery. Ideally, a query should only be forwarded to neighbors that hold matching contents or that is on the path to other nodes having matching content. Different nodes should return non overlapping responses to the requester. As global knowledge or active coordination is not an option in our scenario, each node can only make independent forwarding decisions. These forwarding decisions should achieve a good tradeoff between discovery efficiency and required resources. Similar limitations apply to content delivery.

B. *Content Delivery*

When query matching content is discovered, the content carrying node should send only a subset of the results. This requirement is necessary to limit the amount of resources used both locally and globally for transmitting and storing the responses, and to remove potential duplicates. The query originator assigns a limit for both the number of replications and the volume of content that should be generated. When nodes need to forward a query message, the limitations included in the query message are used to make a forwarding decision. If the volume of the content exceeds the response limit, the node needs to select which ones to forward. For example, when AP hotspots are huge in number, the set of AP hotspots with the most reliable Internet speed is chosen and forwarded to the query originator.

C. *Movement Tracking*

In proposed system the Activity Manager monitors the acceleration vector of a three-axis accelerometer and detects the motion of the user.



The motion detector function of the Activity Manager is basically a classifier M that has two outputs: moving or stationary. When the user is walking, running, or moving in a vehicle, the motion is classified as moving, whereas when the user stays at a certain location, the motion is classified as stationary.

D. Mobility Prediction

As location information to estimate if a node approaches the destination of the content or diverges from the destination, the prediction of nodes' mobility information is essential.

In computing we first need to estimate the predicted mobility information from time for the duration of query lifetime per time instance. The prediction of the required mobility information is formulated as a posterior distribution where the past mobility observation is used. The direct estimation of this probability distribution is not feasible as the complexity is huge for smartphones. The first-order Markov chain assumption is made, with which the probability of observing location at time is only conditionally dependent on the location at t. Further, we apply temporal feature extraction to reduce observation size, that is, we extract the locations where the user has mostly visited in the past from time t for the duration T.

IV. Results

The concept of this paper is implemented and different results are shown below, The proposed paper is implemented in Java technology on a Pentium-IV PC with 20 GB hard-disk and 256 MB RAM with Java Environment. The propose paper's concepts shows efficient results and has been efficiently tested on different Datasets. The Fig 1, Fig 2, Fig 3 and Fig 4 shows the real time results compared.

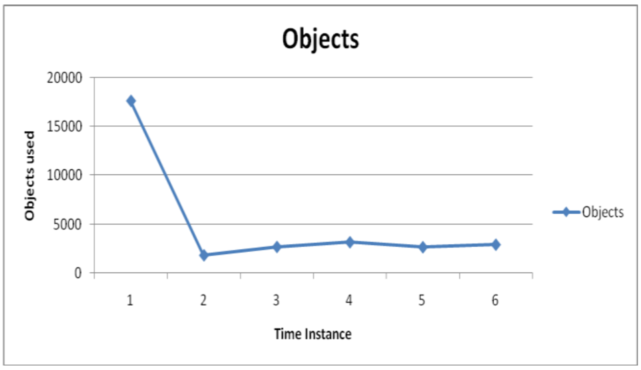


Fig. 1 Time taken by Node to initialize by objects.

Time Instance	Objects
1	17632
2	1800
3	2659
4	3137
5	2629
6	2892

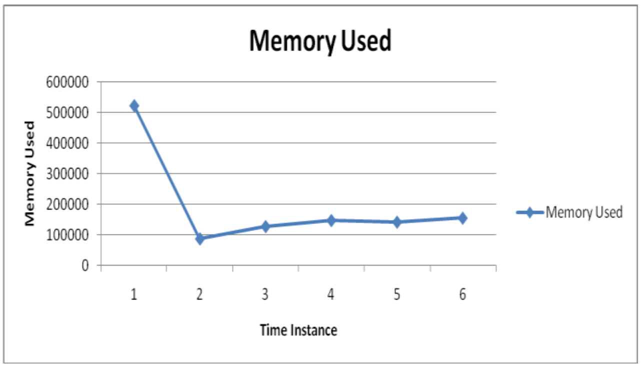


Fig. 1 Time taken by Node to compute Memory Used

Time Instance	Memory Used
1	523752
2	86660
3	127072
4	146904
5	141544
6	154596

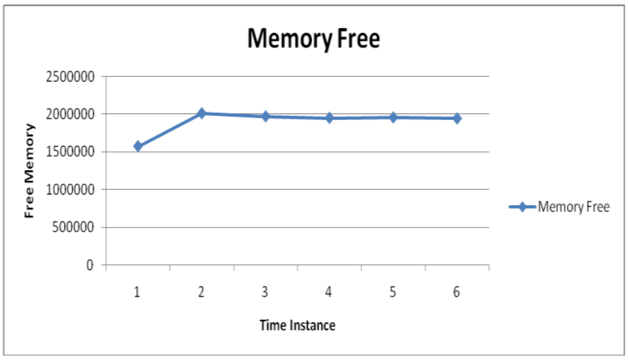


Fig. 4 Time taken by Node Communicating and Free MEmory

Time Instance	Memory Free
1	1573400
2	2010492
3	1970080
4	1950248
5	1955608
6	1942556

V. Conclusions

In this particular paper, we proposed an effective content discussing mechanism inside smartphone-based DTNs. We experimented with utilize why people love today's touch screen phones (i. e., availability of varied localization in addition to communication technologies) in addition to appropriately developed the protocol. In creating a articles sharing criteria, we aimed at two factors: 1) people maneuver meaningful places, and 2) this mobility of folks is expected. Based with this proposition, we developed any mobility mastering and conjecture algorithm in order to compute this utility purpose. Thus, as opposed to conventional procedures, the proposed sharing mechanism won't require make contact with history. We learned that contents without a doubt have physical and temporary validity, in addition to we proposed a scheme by contemplating these features of articles.

VI. Future Scope

For future extent, we believe our system still possesses room regarding improvement. Specifically, the use of asymmetric multicore processors and efficient sensor scheduling is usually reduce the energy consumption connected with smartphones' detectors. Further, since location may be the key portion of the suggested solution, user privacy needs to be carefully considered. We plan to address most of these issues within our future performs.

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