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An Enhancement for Content Sharing Over Smartphone-Based Delay Tolerant Networks

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Abstract: ***From the last few years, the Smartphone users has swiftly increased so peer-to-peer ad hoc content sharing is likely to crop up frequently. As the usual data delivery schemes are not efficient for content sharing due to random connectivity amid Smartphone's latest content sharing mechanisms should be developed. To achieve data delivery in such exigent environments, researchers have anticipated the use of encounter-based routing or store-carry-forward protocols, in this a node stores a message may be a note and carries it until a forwarding chance arises through an encounter with other node. Earlier studies in this field focused on whether two nodes would come across each other and the place and time of encounter. This paper proposes discover-predict-deliver as proficient content sharing scheme.A hidden markov model is used to predict an individual's future mobility information .This existing system approximately results in a 2 percent CPU overhead , lessen the battery lifetime of a Smartphone by 15 percent .So to minimize energy consumption we propose the use of sensor scheduling schemes in an opportunistic context.***

Keywords: Encounter Based Routing, Content Sharing, sensor scheduling Schemes, hidden markov model

1. Introduction

The Smartphone users have been rapidly increasing day-by day[1]. A Smartphone is a mobile phone with more advanced computing capability and connectivity than basic feature phones. As interfaces of Smartphone are more handy and accessible users can share any type of contents like images, videos such multimedia content. But content sharing is bothersome. It involves numerous user activities, such as registration, uploading to central servers, and search and download of contents. To minimize users burden we can depend upon an ad hoc technique of peer-to-peer content sharing. Mobile ad hoc network is characterized as multi-hop wireless communications between mobile device. Smartphone's consists of many network interfaces like Bluetooth and Wi-Fi so ad hoc networks can be easily constructed with them. The Connectivity among Smartphone's is likely to be alternating because of movement patterns of carriers and the signal transmission phenomena. A wide variety of Store-carry-forward protocols have been anticipated by researchers.

Routing in delay-tolerant networking concerns itself with the ability to route, data from a source to a destination, which is a essential ability of all communication networks must have. In these exigent environments, mostly used or familiar ad hoc routing protocols fail to establish routes. This is due to these protocols first try to establish a complete route and then, once the route has been established forwards the actual data. Still, when immediate end-to-end paths are complicated or unfeasible to institute, routing protocols should take to a "store and then forward" method or approach, where data or a message is moved and stored incrementally all over the network in hops that it will finally arrive at its destination. A general technique used to maximize the likelihood of a message being effectively transferred is to duplicate many copies of the message in hops that one will be successful in reaching its destination.

Delay Tolerant Network (DTN) routing protocols attain enhanced performance than usual ad hoc routing protocols. Over the proposed DTN routing protocols, Epidemic routing is an essential DTN routing solution. In Epidemic routing by vahdat et al[2], messages are forwarded to each encountered node that does not have a replica of the same message. This solution exhibits the finest performance in terms of delivery pace and latency, but it involves abundant resources, such as storage, bandwidth, and energy.

This paper spotlight mainly on efficiency of content discovery and its delivery to the targeted destination. Here we suggest recommendation based discover-predict-deliver(DPD) as efficient and effective content sharing scheme for smart phone based DTN's. DPD suppose that smart phones can hook up when they are in close proximity that is where the Smartphone users reside for a longer period. Earlier studies have shown that Smartphone users stay indoors for a longer period where GPS cannot be accessed.

The objective of our work is to discover solutions to the problems in content sharing and to minimize the energy consumption using sensor scheduling schemes.

2. Related Work

A delay tolerant network (DTN) is a mobile network where an existing source-destination path may not exist amid a pair of nodes and messages are forwarded in a store-carry-forward routing hypothesis [6]. Vahdat et al [2] anticipated Epidemic routing as fundamental DTN routing protocol in which a node forwards a message to each and every encountered node that does not have a replica of the message. The solution shows the finest performance terms of delivery pace and latency but wastes bulk of bandwidth.

A substitute solution was resource based [3], [4], where systems utilize "data mules" as message carriers that

straightly delivers the message to the destination. Next, opportunity-based routing protocols make use of history of encounters to convey a message to the destination [5], [6], [7]. Prediction based schemes [8], [9], make use of complicated utility functions to decide whether to forward a message to the node.

Yuan et al precisely predicted encounter opportunities by means of time of encounters. Pitkanen et al anticipated state-of-the-art content sharing scheme in DTN's. They mainly focused on restraining search query propagation and anticipated several query processing methods.

Chang et al anticipated a process for searching for a node or an object in a bulky network and restraining search query propagation. Here a class or a set of controlled flooding search strategies where query/search packets are broadcasted and propagated in the network in anticipation of a preset TTL (time-to live) value carried in the packet terminates. The objective of our work is to discover the content sharing problem in Smartphone based DTN's involves minimizing energy consumption using sensor scheduling schemes. Content sharing in DTN'S involves the following problems:

2.1 Content Sharing

In this segment we examine the problem of content sharing in delay tolerant networks and depict substitute solutions. As specified in the introduction, we spotlight on mobile opportunistic networking scenarios where the nodes will be communicating using the DTN bundle protocol. A few devices in the network store content which they are ready to share with others. All nodes are willing to assist and provide a restricted amount of their local system resources (bandwidth, storage, and dispensation power) to aid other nodes. Our objective is to permit users to issue queries for content that is stored on the other nodes everywhere in the network and consider the possibility of such a node to acquire the required information. To ease searching, we suppose that nodes are capable to carry out searches on their local storage and uncover the appropriate results for a given query. The content sharing process is characterized into two phases:

The content discovery phase and the content delivery phase. In the content discovery phase, the user inputs or enters in a content sharing application requests for the content. The application initially searches the content it its own or individual database and if not found, the application then creates a query that is forwarded based on the user's request. When the content is found, the content delivery phase is initiated or commenced, and the content is forwarded to the query originator.

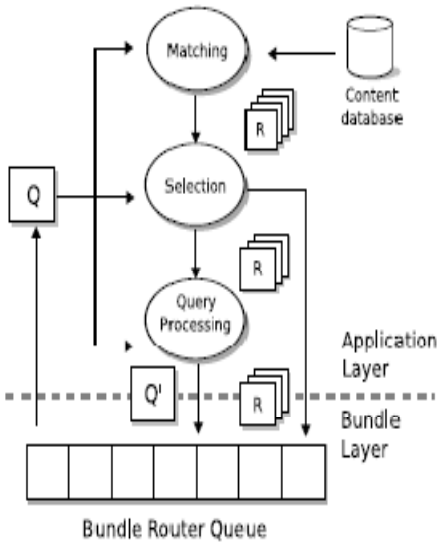

Figure 1: Processing of incoming query

2.1.1 Content Discovery

In content discovery, mainly systems spotlight on how to formulate queries, that depends on assumptions about the format or layout of the content to be discovered. A common protocol should sustain various types of queries and content, but we abstract or summarize from the actual similar or matching process in order to spotlight on discovering content in the network. The easiest strategy to discover and deliver the contents is Epidemic routing [2]. But, due to resource limitations, Epidemic routing is often extravagant, so we have to consider methods that limits the system resources used up on both content discovery and delivery. Preferably, a query should only be forwarded to neighbours that hold on the matching contents or those are on the path to other nodes having matching content . Different nodes should return no overlapping responses to the requester. As total knowledge or active coordination is not an alternative in our scenario, each node can only make autonomous forwarding decisions. These autonomous forwarding decisions should attain a fine trade off amid discovery efficiency and necessary resources. Analogous limitations pertain to content delivery. A few methods anticipated by Pitkanen et al. may be used for restraining the distribution of queries. Additionally, we study two substitutes for restraining the distribution of queries: a split query lifetime limit and a query distance limit. We employ the controlled replication-based [9] routing scheme that performs a single-copy scheme. This single-copy scheme turn both query lifetime and distance limits into random walk, and the scheme is not effectual when content-carrier nodes (i.e., destinations) are not well-known. By distinguishing, the controlled replication-based scheme dispenses a set of message replicas and evades the excessive spread of messages.

2.1.2 Content Delivery

When the query matching content is discovered, the content carrying node should transmit only a subset of results. This constraint is needed to limit the amount of resources utilized both locally and globally for sending and storing the responses, and to eliminate potential copies . The query originator sets a limit for both the number of replications or

duplicates and the amount of content that should be produced. When nodes require to forward a query message, the limits incorporated in the query message are used to make the forwarding decision. If the amount of the content go beyond the response limit, the node wants to select which ones to forward.

2.2 Mobility Prediction

Numerous studies have largely specified another problem of content sharing: mobility learning and prediction. Beacon Print discover meaningful places by constantly determining constant scans for a time period. Place Sense senses the arrival and exit from a place by utilizing invasive RF-beacons. The system uses a radio beacon's retort rates to attain vigorous beacon conclusion. EnTracked is a position tracking system for GPS-enabled devices. The system is configurable to recognize different tradeoffs amid energy consumption and heftiness.

Mobility prediction has been extensively studied in and out of the delay-tolerant networking area. Markov-based schemes, make the problem as a Hidden Markov or semi-Markov model and probabilistic prediction of human mobility. In contrast, neural network based schemes try to match the observed user behaviour with earlier observed behaviour and estimate the prospect based on the experimental patterns.

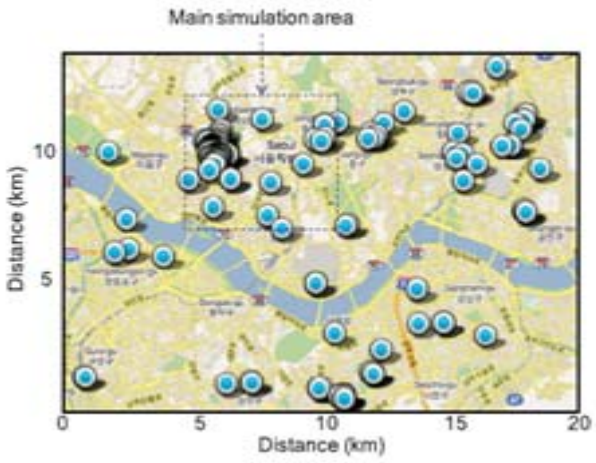

Figure 2: collected meaningful places and the simulation area

Markov based schemes are suitable for resource- restricted devices, like smartphones, owing to their low computation overhead and reserved storage requirements. In our work, we have to develop a mobility learning and prediction method. This method has been built to offer coarse-grained mobility information with a less computation overhead. When the difficulty of mobility learning and prediction scheme can be mistreated, the schemes specified in can be worn to offer fine-grained mobility information.

3. Problem Definition

In the existing system, the energy consumption is more so the battery lifetime will be reduced. By using sensor scheduling mechanisms energy consumption can be reduced and can increase the lifespan of the batteries.

4. Proposed System

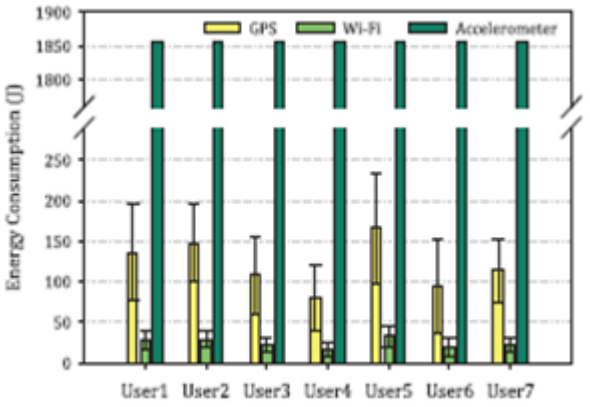

Figure 3: Mean energy consumption in a day

Figure 3 shows the daily energy utilization outline, which is calculated using the composed stationary and movement time from seven different users in four weeks . The scrutiny does not comprise the energy utilization of content swap as it mainly rely on the volume and communication pace of the nodes. The typical energy consumptions of GPS, Wi-Fi, and the accelerometer varies. The accelerometer do have the maximum energy consumption as it is used endlessly over 24 hours. Wi-Fi energy utilization is observed and owed to the scanning of neighbour APs for place recognition. GPS has a huge discrepancy in energy consumption as this may not be available in all places.

In order to minimize energy consumption or utilization we use sensor scheduling schemes or mechanisms [10]. Sensor systems have an wide-ranging diversity of prospective, functional and important applications. In any case, there are questions that have to be inclined for prolific procedure of sensor system frameworks in right applications. Energy sparing is one fundamental issue for sensor systems as most of the sensors are furnished with no rechargeable batteries that have constrained lifetime. To enhance the lifetime of a sensor set up, one vital methodology is to attentively schedule sensors' work sleep cycles (or obligation cycles). In addition, in cluster based systems, grouping heads are usually selected in a way that minimizes or reduces the aggregate energy utilization and they may axle among the sensors to fine-tune energy utilization. As a rule, these energy productive scheduling components or mechanisms (furthermore called topology arrangement components) required to accomplish certain application requirements while sparing energy. In sensor arranges that have various outline requirements than those in conventional remote systems. Distinctive instruments may make characteristic suspicions about their sensors together with identification model, sense zone, transmission scope, dissatisfaction or disappointment model, time management, furthermore the capability to get area and parting data.

5. Results

5.1 Learning Accuracy

Learning accuracy demonstrates how capably and exactly the places were identified. The accuracy of place learning influence the evaluation of encounter opportunity amid two nodes. For example, if two distinct places are recognized as identical ones, we may improperly estimate that two nodes will encounter each other when they visit two distinct places. Also, the accurate computation of and rely on the geographical location information of the nodes.

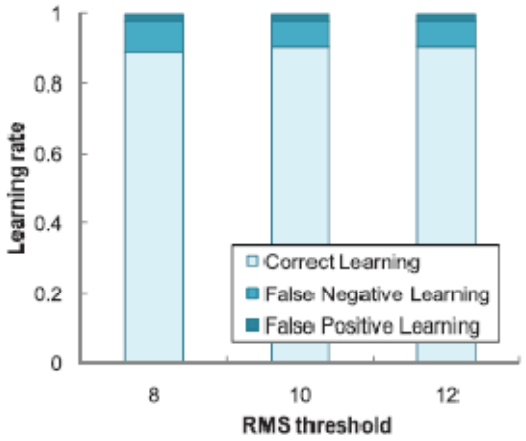

Figure 4: learning accuracy

5.2 Discovery Efficiency

The ratio of discovered contents to the generated queries within a specified period or time is discovery ratio or efficiency. DPD's discovery performance is skewed to the two forwarding. In Epidemic routing , queries are forwarded to each and every node. In hops-10 and hops-5, a query message is then forwarded till its hop count achieve 10 and 5, correspondingly. When a query matching content is accessible only on a small number of nodes, the discovery methods illustrates a low discovery speed. With an rising query lifespan, both DPD and Epidemic demonstrate a high discovery ratio since with a longer time, each query is forwarded to more number of nodes.

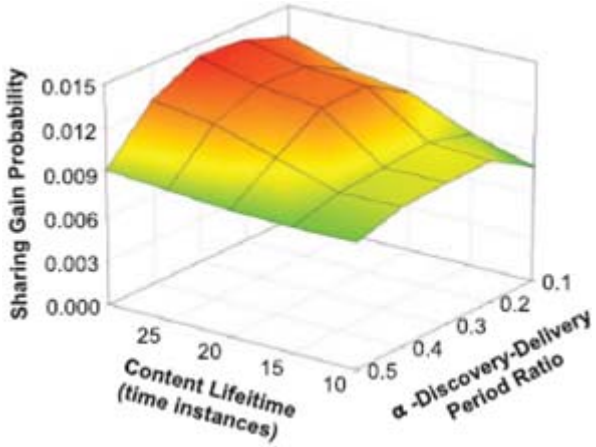

Figure 5: Discovery Efficiency

5.3 Prediction accuracy

Mobility prediction is a main aspect in the estimation of utility function. Here, we estimate our prediction process according to trajectory deviation, prediction duration, and learning period, as shown in the figure below. Trajectory deviation specify the abnormality of a user's mobility. For this assessment, we mutate the existing mobility information with noise data. Thus, 10, 20, and 30 % of the meaningful places are chosen at random locations for trajectory deviations of 0.1, 0.2, and 0.3, correspondingly. So as the trajectory deviation raise, the prediction accuracy drop off. Prediction accuracy is calculated as the ratio of accurately predicted locations to the overall predicted locations.

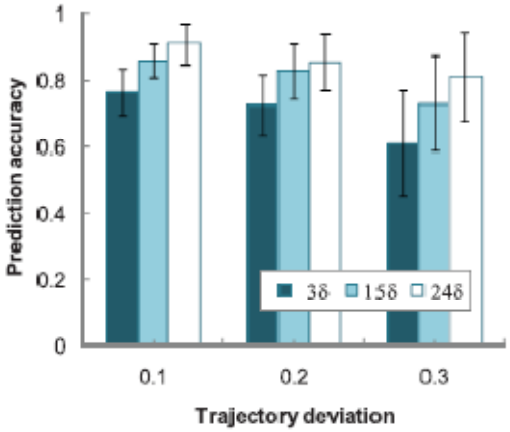

Figure: Prediction accuracy

6. Conclusion

In this paper we have proposed an proficient content sharing scheme for Smartphone based DTN's. In this we have anticipated discover-predict-deliver as a effectual content sharing method which is capable of discovering the content and delivers it to the appropriate destination. The scheme also present the mobility information of individuals. We made an try to make use of the availability and communication technology of current Smartphone. We have also compared our proposed scheme with traditional schemes. In this paper we have also proposed sensor scheduling schemes to enhance the lifespan of a battery. By the effectiveness of the sensing in sensor scheduling we can reduce energy consumption of the smart phones. Finally, our system has still has room for improvement by considering the privacy issues.

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