Social Interaction and Content Sharing in Mobile P2P Environment using Tamil Language

L.Libin Lougine and M.Vijayalakshmi
Department of Information Science and Technology, College of Engineering Guindy, Anna University, Chennai
slibinlougine@gmail.com, vijim@annauniv.edu

Abstract- Adaptation of mobile phones from simple phones and SMS capable devices into smartphones made Mobile Peer-to-Peer communication an easily achievable one. In recent year’s smartphones users have increased in large number and because of this impact, social interaction and content sharing is possible among those users. Using smartphones, users can share their opinion rating, information or comments about the nearby places, restaurants etc which may be unknown to other users. This paper proposes social interaction in Tamil language that allows the user to message, rate, share information and multimedia data to nearby smartphones when they are in range. Thus smartphone Tamil users can get useful information which makes the users to take important decisions and plan their activities. A protocol called Bluetooth Device-Discovery protocol is implemented for the discovery of smartphones in the environment that comes in range and to communicate between users. An efficient content sharing scheme in Tamil language is proposed in Mobile P2P smart phone social network by using Discover-Predict-Delivery protocol (DPD). Collaborative Filtering is applied to sort the attraction based on the rating.

Keywords- Mobile Peer-to-Peer communication, Bluetooth device-discovery, Discover-predict delivery, Social network

I. INTRODUCTION

Mobile Peer-to-Peer communication is an advanced technique in Mobile Computing that can be used in real time applications. The major limitations in this environment are user mobility, limited battery power of the device, scarce bandwidth and frequent disconnections. Mobile Peer-to-Peer communication is a one in which every node act as server and client. The main advantage of this Mobile Peer-to-Peer environment is that there is no centralized or distributed server to control the mobile devices. Hence mobile nodes can connect to each other whenever they think they need to connect and there will be no server shutdown, busy server, server unavailable kind of things. This Mobile Peer-to-Peer communications are easily achievable one in today’s environment, because of the development and usage of new technologies such as Bluetooth and Wi-Fi.

Nowadays number of smartphone users has rapidly increased. Because of this increase in smartphone usage, content sharing becomes popular among smartphone users and Mobile Peer to Peer environment takes social networking into a new form. The main advantage of social networking in Mobile Peer-to-Peer environment is that there will be no server and so it is not required to upload or download the contents to or from centralized servers. Ad-hoc networks can be easily constructed using smartphones as they are equipped with various network interfaces, such as Bluetooth and Wi-Fi. But the connectivity between smartphones is expected to be disconnected frequently, due to the movement patterns of carriers and the signal propagation phenomena.

Torrents are the real-time best examples for the successful Mobile Peer-to-Peer environment. Facebook is the best example for social networking, but with servers. Introducing social interaction along with content sharing among smartphone users without using any centralized server is successful, if smartphone users co-operate with one another and communicate in their native language. Detection of mobile devices that comes in range is done by using Bluetooth device discovery protocol. Content sharing between smartphone users in Tamil language is done efficiently by implementing Discover-Predict-Delivery protocol. The proposed Mobile Peer-to-Peer system, employ mobile nodes which can send contents to another node, when those nodes are in range. Every node in range can receive the content from another node, only if both nodes are interested in communication. Communication between nodes for content sharing and social interaction is done by using Tamil language.

The rest of the paper is organized as follows. Literature survey done for this work is reviewed in Section II. Section III, describes the concepts and overall architecture of the designed system. The evaluations of the designed system are reported in Section IV. Section V concludes with a summary and a discussion about future work.
II. RELATED WORK.

In recent years, the existing idea of proximity sensors is used to share information with neighbouring users. The best example for above idea is the Hummingbird project, [10] which used RF-enabled GameBoy. It is a device to alert users when others are near so as to support social awareness and collaboration, thus social interaction made possible. Another one technique is SocialNet [14], in which mobile devices are equipped with RF-communications for the detection of neighbouring users. In MobiTip [4], user will share their history and other information in peer-to-peer environment, when they are met. Social Serendipity [15] is the advanced technique, which use Bluetooth technology. In this method users will carry a Bluetooth-enabled mobile phone that detects neighbouring users and then user will be triggered spontaneous face-to-face interaction with those who have similar user profiles. The two systems mainly used for listening music in mobile are tuNA [1] and SoundPryer [13], but interestingly that system transformed into something called social experience, by synchronizing the listening to music between neighbouring devices. Another such system PushMusic [8] and PushPhoto [16], they are mobile music and also a photo sharing systems, where users automatically receive songs/photos that are already recommended by neighbouring players.

The last among these systems is the system that enables user to express their ratings/credits about the unknown places or attractions or point of interest in the environment. These rating/credits are exchanged among the smartphone users in a social networking manner. These networking are done through mobile peer-to-peer environment. In this social network [17] sharing is proactive, there is no need for the user to aware about the device that is crediting/rating out. The above described system is closely related to our work.

For content sharing in Delay Tolerant Networks [6], existing works use epidemic routing as the solution for the problems. Epidemic routing can achieve highest delivery rate and lowest latency rate. Mobile prediction algorithm [6] is to predict the contact information for smartphone users. Contact information tells about the mobile nodes that have higher possibility of connection with the host smartphones.

III. SYSTEM DESCRIPTION.

Mobile Peer-to-Peer environment use short-range wireless technologies for mobile communication. The range duration for these short-range technologies is from 10 to 100 meters.

![System Architecture](image)

Figure 1. System Architecture

One peer will detect another peer, if their distance is smaller than their transmission range. As long as the two peers stay in the range, they can exchange information. Also peer will get information directly from its neighbours or indirectly from remote peer by multi-hop transmission technique. By using these techniques social interaction and content sharing is made possible in this type of environment. The overall system architecture for the proposed system is shown in Figure 1. This proposed system includes five managers such as Interface Manager, Location Manager, Recommendation Manager, Data Manager and Communication Manager that are described as follows.
E. A. Interface Manager

This manager allows the user to interact with the mobile device in Tamil and through this manager user can control all the other managers. User will control the managers by giving set of instructions, which may be differing from text [Tamil], graphics, and images to any other multimedia format. First step is user can enter the input as text format as well as other formats like images video, graphics and so on. These inputs are sent to other managers like an instruction. Smartphone users can also use this manager to enter their credits/ratings information of an unknown places or attractions, which will be exchanged among the nearby users later. The architecture for interface manager is shown in Figure 2.

![Figure 2. Architecture for Interface Manager](image)

F. B. Location Manager

The Location manager will take care of location detection and tracking of other mobile nodes as well as for the fixed landmarks. For detecting user’s location GPS id employed. This technology is available with all smartphones to identify the user’s location. This manager communicates with Recommendation Manager and Interface Manager. User will not have direct contact with Location Manager. Detected location information of the host, nearby nodes and other attractions will be sent to the Recommendation Manager as and Interface Manager. Recommendation Manager uses this information for the rating purpose. Interface Manager uses the same information for visualisation purpose. The architecture for Location Manager is shown in Figure 3.

![Figure 3. Architecture for Location Manager](image)

C. Communication Manager

The Communication Manager uses short-range wireless technologies for Peer-to-Peer communication rather than broadband wireless technology. Notable Mobile Peer-to-Peer communication technologies include Bluetooth and Wi-Fi. Newly developed mobile phones are equipped with these Mobile Peer-to-Peer communication technologies. The simulation of this system is done using the Bluetooth technology; because of the cost and the availability of Bluetooth package in Java 2 Micro Edition.

The Communication Manager is responsible for the social network formation. This manager uses Bluetooth connections to
communicate with each other. This manager will communicate with Data Manager, Interface Manager and with other smartphone users. The Communication Manager finds out other nodes which have similar interest and group these nodes to form a social network. Then this manager converts the information received in Tamil into Unicode which will be a reverse for neighbor’s content and stores the content. This network makes it possible for the connected smartphones to interact socially and also share the contents, opinions and ratings from Data Manager with other nearby users. For exchange of contents to other nodes, Communication Manager will search for nearby devices using Bluetooth device-discovery protocol. The architecture for Communication Manager is shown in Figure 4.

![Figure 4. Architecture for Communication Manager](image)

**G. D. Data Manager**

The Data manager communicates with Recommendation Manager, Interface Manager and Communication Manager. User will control this manager indirectly by controlling the Interface Manager. The Data manager handles user’s own credits/ratings for attractions and also the credits/ratings given by other users. Data manager will store the rating data in the opinion rating database directly, in which the ratings about the attraction are saved during his/her visit. When two users are within the communication range and they are staying long time, then they may exchange some opinion ratings. The user’s own rating list and the rating lists of other users obtained though data exchange are stored in the opinion rating database.

Data Manager shares the content in Tamil to other nodes through communication manager. This manager will convert each and every Tamil symbol into Unicode and vice-versa for the purpose of exchange. Content sharing is categorised into two phases, they are content retrieval phase and content delivery phase. In content retrieval phase, mobile nodes first search for the contents in its local cache. If content is discovered then content delivery phase will be initiated. In content delivery phase, it will deliver the content to the query sender. Content sharing is made possible by using Discovery-Predict-delivery protocol [6].

Mobile learning and prediction is the next technique used in this data manager. This method also consists of two phase, mobility learning and mobility prediction. Mobility learning is based on the mobile user, which stay long in certain areas and exchange information with nearby users. Mobile user’s movement/path information is tracked for the mobility learning purpose. And in mobility prediction phase, it predicts the contact information of the user based on certain location. When a mobile user reaches any location they will check for some previous records about connectivity. Based on the previous record they can find the contact information of other users in their proximity and suggest this information to the user. Then the host users can choose the appropriate devices from the contact information for the connectivity. Discovery-Predict-delivery protocol is used for the prediction of the mobile nodes for the contact information. The architecture for data manager is shown in Figure 5.
E. Recommendation Manager

Recommendation manager has connections with Location Manager, Interface Manager and Data Manager. This manager will look after the opinion rating database for sufficient number of ratings. If the rating is sufficient in number then score for the unvisited attraction is computed and put in the list of rating table. It then collects all the credits/rating and sort the attraction based on the rating. This sorting is done using Collaborative Filtering algorithm.

Collaborative Filtering (CF) algorithm technique is used in this manager. This algorithm will use all collected rated value to form a sorted list of attraction based on rating. This sorted list of attraction will be send to the data manger later for the further process. Collaborative filtering has two way of character. They are narrow filtering mode and a general filtering mode. In general filtering mode, collaborative filtering will filter based on information or patterns. The architecture for recommendation manager is shown in Figure 6.

These five managers are combined together to form social interaction along with content sharing and mobility prediction in a Mobile Peer-to-Peer environment, where no centralised or distributed server is present.

IV. Evaluation.

Extensive experiments are done to evaluate the performance of this approach. These experiments show that this approach is good for smartphone users in real-time Mobile Peer-to-Peer environment. Evaluation is mainly concentrated on two important factors. They are discovery-delivery period ratio and accuracy analysis. The first parameter checks whether the content discovery and content delivery is proper with user’s query. The second parameter checks the accuracy of requests satisfied in social networking. The following section discusses about the simulation setup and the evaluation parameters.
A. Simulation Setup

The experiments are modelled based on a typical scenario of smartphone users, which are moving and communicating between one another inside a city or in any other tourist spots. Smartphones are simulated using Sun’s Java 2 Mobile Edition [J2ME] package. And the city is simulated in this J2ME emulator. Movement of every smartphones are simulated by varying the longitude, latitude, altitude values of each device emulator. J2ME has the option of varying the latitude, longitude, altitude values in external event option, which is in MIDLET menu bar. Random movement of the smartphones is simulated by adding a script in XML that can change the location and speed of the devices continuously.

Nearby devices to the host device are found by using Bluetooth package in J2ME emulator. GPS can be simulated using the longitude, latitude and altitude values that are mentioned above. Using these values we can fix the position of smartphones and also the location of the attractions. From this simulation setup social networking with content sharing is established.

B. Evaluation Parameter

Content Delivery Ratio and Accuracy analysis are the two performance metrics, used to evaluate the performance of this framework. They are describes as follows.

H. Content Delivery Ratio ($\alpha$): The content delivery ratio is the ratio of the number of successfully received contents to the number of generated contents.

\[ \alpha = \frac{(T-Q)*q}{T} \]  

I. Where ‘$T$’ refers to Time taken, ‘$Q$’ refers to Content delay and ‘$q$’ refers to Probability of nodes joined for content sharing.

K. Accuracy analysis: Total number of request satisfied through social networking within given period of time. The Accuracy analysis is computed as follows.

\[ A_a = \frac{1}{n} \sum A_a (Q_i, t)/ ((E_i-S_i)) \]  

L. Where ‘$A_a$’ refers to Accuracy analysis, ‘$Q_i$’refers to Number of active Queries, ‘$E_i$’ refers to Starting time of query and ‘$S_i$’ refers to End time of query.

C. Result

Extensive experiments are done to evaluate the performance for this approach. These experiments show that this approach is good for smartphone users in real-time mobile peer-to-peer environment. Evaluation is mainly concentrated on two important factors. They are content delivery ratio and accuracy analysis. First one will check whether the content discovery and content delivery is proper with user’s query. Second one will check about the accuracy of requested satisfied in social networking. The experiments are evaluated based on the two main ideas. They are as Content Delivery Ratio v/s Number of nodes and Accuracy analysis v/s No. of Participants for Social Networking.

Content Delivery Ratio V/S Number of Nodes

The content-delivery ratio is used in the forwarding decision process of content delivery. When a user requires receiving content in a given period (which is a query lifetime), a fraction of the lifetime is used for content discovery, and the remaining fraction is used for delivering the content. When the forwarding decision is terminated earlier (i.e., is higher), the sharing overhead is reduced due to a decrease in unnecessary query spread.

Figure 7. Content Delivery Ratio v/s Number of nodes
In this experimental result, accuracy analysis is evaluated based on the number of participants in social network. Figure 8 shows the values of accuracy analysis for epidemic algorithm and Delivery-Predict Discovery algorithm based on the number of participants in social network. It shows the improvement in the accuracy analysis value for DPD algorithm, when compared with epidemic algorithm.

Figure 8. Accuracy Analysis V/S Participants in Social Networking

V. CONCLUSIONS

The proposed system performs social interaction along with content sharing using Tamil language in Mobile Peer-to-Peer environment. This system is made possible, because of the advantages of recent smartphones (i.e., availability of advanced wireless technologies like Bluetooth, Wi-Fi and GPS). The system allows the user to express their own opinions about the unknown places. This information will help the nearby user to know about their surroundings. Smartphones in one area can form a group and create a social network without any server’s support. Smartphones can share contents as text or as image formats in their native language and as a result of social interaction. tourists will receive right information and contents at right time.

Future enhancement can be done in several directions. First, the present system allows only text format and image formats as contents to share among the smartphones during social interaction. These formats can be extended with more multimedia formats. Second, grouping of smartphones is only possible with nearby users. It can be extended to support more number of users; hence we can spread social networking in wider range. Finally, it would be perfect if some security policies are developed for content sharing.

REFERENCES


