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An analysis of user movement tracking in a Location based Social networks

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Abstract
Social networking applications have become one of the most significant web services that offer Internet-based platforms for their users to interact with their family and friends. OSNs are increasingly becoming location-aware: they offer the opportunity to share geographic location in order to generate location-tagged information and to search for it. The recent emergence of smart-phones especially contributed for this popularity as they are well packaged with the features of internet & GPS, especially Google Android Phone by allowing a user to track the location to arrange a meeting or event, when friends are around and by providing the ability to make new friends. This paper analyzes some of the user movement tracking systems through GPS or GSM cell and also Location Based Social Networks (LSBN).

Keywords: GPS, LSBN, LBS, GPRS

1. INTRODUCTION

Today, mobile applications are used for significant objectives. The fact that mobile devices are extensively used by virtually everyone on this planet makes mobile apps more useful & powerful with unique & unimaginable capabilities. Technology assumes the most significant place in our lives today. Whether it is the aspect of security or entertainment, one cannot imagine tasks simply without the use of technology. As the technology has evolved, a conscious effort has been made to impart its benefits to everyone. GPS trackers provide an excellent way to keep track of where your young kids or teens are travelling. Through the use of a small device and a simple software application on your Windows PC, laptop or smartphone,you can trace their location from anywhere. These GPS navigators are handy and easy to install and use, and will show you an updated, time-stamped location of your child, teen or even a pet that tends to runaway. It will also keep a note of where they've been, and some products can even tell you if your teen has been driving over the speed limit.

There are certain limitations of using GPS even though it is considered an almost standard feature in mobiles. The GPSworks by triangulating the signals from satellites orbiting around the earth and satellite signals cannot be receivedinsidebuildings ,tunnels etc., its usage would be a problem .Hence, tracking mobile phone position by GPS alone is not enough. Other technologies are then combined to enhance GPS such as GPRS,Wi-Fi etc.

The *General Packet Radio Service (GPRS) [28, 29]* is a new service that provides actual packet radio access for Global System for Mobile Communications (GSM) and Time-Division Multiple Access (TDMA) users.

The unique applications that will be developed with GPRS will appeal to a broad base of mobile subscribers and allow operators to differentiate their services. In addition to providing new services for today's mobile user, GPRS is important as a migration step toward third-generation (3G) networks. GPRS will allow network operators to implement IP-based core architecture for data applications, which will continue to be used and expanded upon for 3G services for integrated voice and data applications.

1.1 LSBN (Location Based Social Networks)

A *location-based social network* (LBSN) mean adding a location to subsisting social network so that people in the social structure can share location integrated information, and also it consists of the new social structure made up of individuals connected by the interdependency derived from their locations in the physical world as well as their location-tagged media content, such as texts, photos, and videos. Here, the physical location consists of the present location of person at a given timestamp and the location history that an individual has gathered in a certain timeperiod. Location-based social networking systems existing previously focuses on some specific services, which include sharing geo-tagged messages [11] and supporting privacy preserving buddy search [12, 13]. The work [11] allows users to submit geo-tagged messages to the

system and enables the users to get the geo-tagged messages within their proximity, where the proximity is determined by the system based on the capacity of their mobile devices. The privacy-preserving buddy search systems allow users to find their friends within a certain area without revealing their locations to the system. In a location-based social network, users can not only track and share the location-related information of an individual via eithermobile devices or laptops, but also can take advantage of collaborative social knowledge learned from user generated and location-related content, such as GPS trajectories and geo-tagged photos.

Unluckily, none of existing location-based social networking applications is atomistic system nor equips database management systems to support scalable location-based social networkingservices. Existing applications that provides location-based social networking services can be broadly categorized into three folds: geo-tagged-media-based, point location-driven and trajectory-centric. Also, Location-based Mobile Social Networks are growing rapidly as one can find almost each and every person on these Networks (OSNs), such as twitter. The recent emergence of smart-phones especially contributed for this popularity as they are well packaged with the features of internet & GPS, especially Google Android Phone by allowing a user to track the location to arrange a meeting or event, when friends are nearby and by offering the ability to make new friends.

1.2 LBS(Location Based Services)

Also, Location Based Services (LBS) are regarded as a key feature of many future mobile applications. GPS serves well for most outdoor applications but its dependence on satellites makes it ineffective for indoor environments. Location based services can be broadly classified as shown in fig1 [30] below:

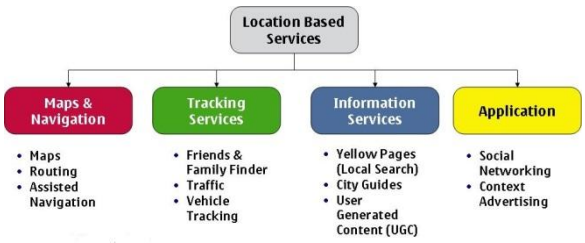

Fig. 1: Location Based Services

The growing availability of location-acquisition technology (for example GPS,GPRS and Wi-Fi) allows users to add a location dimension to an existing online social networks in a variety of ways. For example, users can upload location-tagged photos to a social networking service such as Flickr [2], comment on an event at the exact place where the event is happening (for instance, in Twitter [5]), share their present location on a website (such as Foursquare [3]) for organizing a group activity in the real world, record travel routes with GPS trajectories to share travel experiences in an online community (for example GeoLife [7,8,9,10]), or log jogging and bicycle trails for sports analysis and experience sharing (as in Bikely [1] and [5]).

2. REVIEW ANALYSIS

Over the past few years, there has been lot of research going on in the field user movement tracking in location based social networks (LSBNs).A lot of mobile user applications have been developed for movement tracking making use of various technologies such as GPS,GPRS etc.

A research by Ratsameethammawong [22] introduced the latest method of tracking and locating of client-based mobile phone which eliminated the limitation of the build-in GPS phone. It has been known that GPS usage is limited in buildings and places unreachable by satellite signal. In order to find better and more accurate results, the method of integrating Wi-Fi signal, cell locations and vector calculation to track and locate mobile phone whereabouts were introduced. Furthermore, it had also been beneficial to develop this method to be applied with other utility programs e.g. delivery truck tracking system or personal locating system via mobile phone. The combined methods suggested by this research have made the tracking and locating of moving mobile phone more accurate and more effective despite the fact that GPS signal was not available. These combining methods could also be adapted to be applied vertically as well to cope with the growing numbers of high rise buildings. Tracking and locating moving mobile phone floor by floor has been possible. Moreover, more efficient devices and applications to collect the data of GPS and Wi-Fi signals have also reduced the inaccuracy. In a paper by Chen et al. [23] proposed a trajectory simplification algorithm (TS), which considers both the shape skeleton and the semantic meanings of a GPS trajectory. The heading change degree of a GPS point and the distance between this point and its adjacent neighbors were used to weight the importance of the point. They evaluated their approach using a new metric called normalized perpendicular distance. As a result, our method outperforms the DP (Douglas-Peuker) algorithm, which was regarded as the best one for line simplification so far. At the same time, the TS combined the strategies of local and global processing during line simplification. Therefore, with a better efficiency than the DP algorithm, TS was more effective in simplifying trajectories in LBSN systems where people expect to share and follow others travel routes. Two features consisting of the heading change and the neighbor distance were used to weight the importance of a point. They evaluate their TS algorithm using 335 trajectories collected by 62 users over 2 years and a new metric called normalized perpendicular distance. As a result, our method outperforms baseline with a 10-times Correct Rate beyond baseline. Meanwhile, according to mean normalized perpendicular distance, their method only had 41% deviation of the baseline with a 4.5-times faster efficiency. In a paper by Wang, L. et al. [27], motivated by the observation on user behavior of uploading GPS tracks onto Web applications, they proposed a flexible spatio-temporal indexing scheme, CSE-tree, to help system effectively manage large volume of GPS tracks and provide fast retrieval service for Web users. A model that simulates such user behavior had been proposed based on stochastic process theory as well as statistical analysis on the data collection uploaded by users in real world. Over the synthetic data generated by the model, CSE-tree is compared with SEB-tree and R-tree. Experiments show that CSE-tree incurs slightly more node access than SEB-tree for query but requires less index size and cost less node access for insertion. CSE-tree also requires less index size than R-tree and cost less node access for both insertion and query than R-tree.

Location-based social networking systems existing previously focuses on some specific services, which include sharing geo-tagged messages [11] and supporting privacy preserving buddy search [12, 13]. The work [11] allows users to submit geo-tagged messages to the system and enables the users to get the geo-tagged messages within their proximity, where the proximity is determined by the system based on the capacity of their mobile devices.

In the study by Rodolfo Gonzalez[14], proposed an approach to geotag Twitter users based only on the content of their posts. These data can later be used for local sentiment analysis, emergency detection, finding a missing person, and other novel location-based purposes. Their approach carried out a semantic analysis of tweet content to infer where in the globe particular user would be located at a given time.In a similar way, Cheng [15] focus on a probabilistic framework capable of identifying a person's hometown, based solely on what that person tweets. The words and expressions found in the tweets were used to create a corpus, and then associated to certain geographical locations. Additionally, their work was concerned in finding only the user's hometown independently of any time constraint.In a paper,Chi-Yin Chow [16] presented GeoSocialDB; a holistic system providing three location-based social networking services, namely, location-based news feed, location-based news ranking, and location-based recommendation. In GeoSocialDB ,their aim was to implement these services as query operators inside a database engine to optimize the query processing performance . In general, within the framework of GeoSocialDB, it identified four major research challenges that need to be addressed to accomplish the realization of a scalable and practical database system for location-based social networking services. These research challenges were: (1) designing location and/or rank-aware query operators that take into account both the spatial and social aspects, (2) investigating how to utilize materialization techniques to reduce system overhead and improve query response time, (3) supporting continuous queries that were ubiquitous in mobile environments and (4) providing privacy-aware query processing to preserve user location privacy.Ina paper, Yu Zheng et al. [17] introduced a social networking service, called GeoLife, which aims to understand trajectories, locations and users, and mine the correlation between users and locations in terms of user-generated GPS trajectories. GeoLife offers three key applications scenarios: 1) sharing life experiences based on GPS trajectories; 2) generic travel recommendations, e.g., the top interesting locations, travel sequences among locations and travel experts in a given region; and 3) personalized friend and location recommendation.In a paper,Scellato et al. [18] presented a graph analysis based approach to study social networks with geographic information and new metrics to characterize how geographic distance affects social structure. The authors apply analysis to four large-scale OSN datasets: their results show that there was a vast portion of users with short-distance links and that clusters of friends were often geographically close.Marco Anisetti et al. [19] proposed a technique that provided geo-location and mobility prediction both at network and service level, does not require any change to the existing mobile network infrastructure, and was entirely performed on the mobile network side, making it more robust than other positioning systems with respect to location spoofing and other terminal-based security threats.In his study, Al-Suwaidiet al. [20] proposed an application "Locating Friends and Family Using Mobile Phones with Global Positioning System (GPS)" based on client-server architecture that helps the users to locate their family members and receive alerts when their friends are nearby. This paper presented a mobile application based on providing location based services (LBS) using Global Positioning System (GPS) as a location provider. The main objective of this work was to design and implement a client server system that helped users to locate their family members and receive alerts when friends were nearby. But the average location accuracy of the application is only about couple of meters.In a paper, Mao Ye [24] proposed the research issues in realizing location recommendation services for large-scale location-based social networks, by exploiting the *social* and *geographical* characteristics of users and locations/places. Through their analysis on a dataset collected from Foursquare, a popular location-based social networking system, they observed that there exist a strong social and geospatial ties among users and their favorite locations/places in the system.In a similar way,Cho. E [25] investigated patterns of human mobility on three large but very different datasets: two sets of location-based social network check-in data spanning the whole planet and also cell phone location data. Even though location-based social networking services are very different from cell phone tower location data, they found many common patterns of human mobility across the datasets. Most surprisingly, they found that humans experience a combination of strong short range spatially and temporally periodic movement that would not be impacted by the social network structure, while long-distance travelled would be more influenced by the social network ties.In a paper, Sadilek, A [26] explored the interplay between people's location, interactions, and their social ties within a large real-world dataset. They present and evaluate Flap, a system that solves two intimately related tasks: link and location prediction in online social networks. For link prediction, Flap infers social ties by considering patterns in friendship formation, the content of people's messages, and user location. The authors show that while each component is a weak predictor of friendship alone, combining them results in a strong model, accurately identifying the majority of friendships. They evaluate Flap on a large sample of highly active users from two distinct geographical areas and show that it (1) reconstructs the entire friendship graph with high accuracy even when no edges are given; and (2) infers people's fine-grained location, even when they keep their data private and we can only access the location of their friends.

3. CONCLUSION

Under the existing systems, location based social networks and GPS technologies play a very vital role. With the onset of the smart phones, the usages from various perspectives have increased exponentially. With the increase in requirements, the need for secured application has risen. For ex: Under the existing systems, tracking plays a vital role. The existing systems always inform about the current location point of the user while movement. We analyzed this situation and will propose a solution by the virtue of which, a user could be tracked in the real time from his / her movement trail which is the need of ours in today's world i.e. It would fortify the users to use their social networking app. by locating the users on globe in a real time fashion. It would enable the users to track the movement and precise geographical coordinates on Google Maps which would enhance the experience of using the social networking application by remaining in contact with the friends and colleagues in a real time environment.

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