Mobile User Localization Techniques A Survey

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Abstract-**This paper presents an literature survey on grey prediction technique in wireless sensor network and employ wireless LAN medium. This paper focuses on mobile localization techniques and their uses in real time applications. As mobile is adhoc network so mobile users locations changes at irregular rate. So it becomes important to distribute range of mobile towers in such a way that all mobile users stay in the range of mobile towers. The grey prediction define the tendency of RSSI (received signal strength indicator), and also Dynamic triangular (DTN) location method is utilised in this work to determine the location of user.**

Keywords: **Dynamic Triangular Algorithm**

I. INTRODUCTION

Mobile User localization [1] – [5] refers to the attaining of the current position of a mobile phone, stationary or moving. Localization may occur either via multi-literation of radio signals between (several) radio towers of the network and the phone. "The process of estimating the physical location of a wireless device is called localization."

Mobile localization [1], which includes location based service that discloses the actual coordinates of a mobile phone bearer, is a technology used by telecommunication companies to approximate where a mobile phone, and thereby also its user (bearer), temporarily resides. The more properly applied term locating refers to the purpose rather than a positioning process. Such service is offered as an option of the class of location-based services (LBS).

Today is a massive demand for location-based mobile services worldwide [2], according to the findings of a new TNS report, which found that the services are the most sought after by mobile users across the globe. Localization-Based Systems can be broadly divided into:

a. **Network-Based:**

The accuracy of network-based techniques varies, with cell identification as the least accurate and triangulation as moderately accurate, and newer "Forward Link" timing methods as the most accurate. The accuracy of network-based techniques is both dependent on the concentration of base station cells, with urban environments achieving the highest possible accuracy, and the implementation of the most current timing methods.

b. **Handset-Based:**

Handset-based [3] technology requires the installation of client software on the handset to determine its location. This technique determines the location of the handset by computing its location by cell identification, signal strengths of the home and neighboring cells, which is continuously sent to the carrier.

c. **SIM-Based:**

Using the SIM [3] in GSM and UMTS handsets, it is possible to obtain raw radio measurements from the handset. The measurements that are available can include the serving Cell ID, round trip time and signal strength. The type of information obtained via the SIM can differ from what is available from the handset.

d. **Hybrid:**

Hybrid [4] positioning systems use a combination of network-based and handset-based technologies for location determination. The core of the process lies in getting the location of the mobile device. The location [5] information is collected with the existing telecom infrastructure which makes it easier for the network operator to use the same network to locate nodes in network, and for users to use their devices without needing any special hardware upgrades.

The recent growth of interest in pervasive computing and location-aware systems and services provides a strong motivation to develop techniques for estimating the location of devices. In parallel with the increased interest in location estimation, we observe that future mobile wireless systems are expected to consist of heterogeneous wireless access technologies.

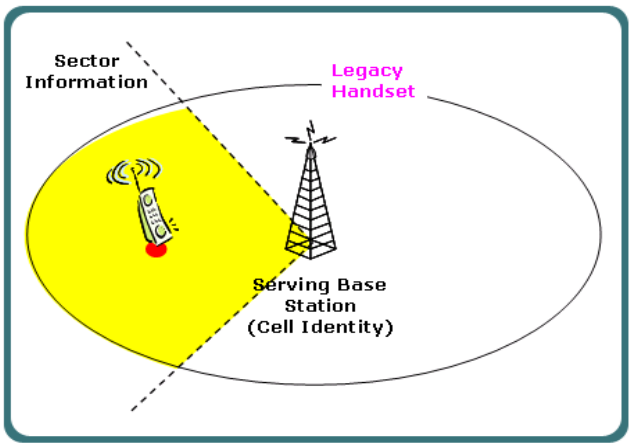

Fig. 1 Mobile user localization (adapted from [1])

In fact, user terminals that combine cellular as well as wireless LAN technology, or multiple wireless LAN technologies, are available or expected soon. A phone's location can be uploaded to a common website where one's friends and family can view one's last reported position. Newer phones may have built-in GPS receivers which could be used in a similar fashion, but with much higher accuracy.

II. LITERATURE SURVEY

T. Mantoro [1] has introduced the mobile user location determination using extreme learning machine. There has been a rapid convergence to location based services for better resources management. This is made possible by rapid development and lower cost of mobile and handheld devices. Due to this widespread usage however, localization and positioning systems, especially indoor, have become increasingly important for resources management.

Yuanguo Cheng and Shaochang Chen [2] have researched on Indoor User Location Estimation Method in Wireless Sensor Networks. Aiming at improving both performances including accuracy and real time on the application of Wireless Sensor Networks (WSN) user location estimation, a localization approach that employs Gauss Mixture Model (GMM) to analyze received signal strength is proposed in this study. This approach consists of an offline training phase and a real time localization phase.

Isaac Amundson and Xenofon D. Koutsoukos [3] has conducted a survey on localization for mobile wireless sensor networks. Over the past decade the evolution of wireless sensor networks, with advancements in hardware design, communication protocols, resource efficiency, and other aspects. Recently, there has been much focus on mobile sensor networks, and it has even seen the development of small-profile sensing devices that are able to control their own movement. Although it has been shown that mobility alleviates several issues relating to sensor network coverage and connectivity, many challenges remain.

Yasir malik and Kishwer abdul khaliq et al [4] are informing regarding the mobile node localization in cellular networks. Location information is the major component in location based applications. This information is used in different safety and service oriented applications to provide users with services according to their Geolocation. There are many approaches to locate mobile nodes in indoor and outdoor environments.

K.Sankar and N.Prakash [5] are studying on optimized searching technique for locating mobile users in cellular network. Cellular telephony systems, where locations of mobile users may be unknown at some times, are becoming more common. Mobile users are roaming in a zone and reports its location only if it leaves the zone entirely. Due to search bandwidth, delay constraints and very often the potential locations of different users overlap, the problem of a concurrent search for many users is different from the problem of searching for a single user.

Ahren Studer and Adrian Perrig [6] are giving information on the Mobile User Location-specific Encryption (MULE) Using Your Office as Your Password. Data breaches due to stolen laptops are a major problem. Solutions exist to secure sensitive files on laptops, but are rarely deployed because users view them as inconvenient. This work examines how to provide an unobtrusive system to securely encrypt files on laptops.

Yu Lei [7] has worked on the fingerprinting localization based on neural networks and ultra-wideband signals. In this paper, Fingerprinting techniques have been proved as effective techniques for determining the position of a mobile user in an indoor environment and in challenging

environments such as mines, canyons, and tunnels where common localization techniques based on time of arrival (TOA) or received signal strength (RSS) are subject to big positioning errors.

M.K. Hasan [8] has introducing an investigation of femtocell network synchronization. Currently, Femtocell technology emerged for cellular wireless networks, which has rapidly engrossed cellular industry. The principle of femtocell to the mobile operators is to reduce cost and improve signal quality in indoor coverage which is also considered a possible path to the fixed-mobile convergence (FMC) goal.

P. Aksenov [9] has studied the unified scalable model of user localisation with uncertainty awareness for large-scale pervasive environments. Localisation has become a standard feature in many mobile applications. Numerous techniques for both indoor and outdoor location tracking are available today, providing a diversity of ways positioning information can be delivered to a mobile application (e.g., a location-based service). Such factors as the variation of precision over time and covered areas or the difference in quality and reliability make the adoption of several techniques for one application cumbersome.

L. Hamza [10] is informing about the neural network and fingerprinting-based localization in dynamic channels. In a harsh indoor environment, fingerprinting localization techniques perform better than the traditional ones, based on triangulation, because multipath is used as constructive information. However, this is generally true in static conditions as fingerprinting techniques suffer degradations in location accuracy in dynamic environments where the properties of the channel change in time. This is due to the fact that the technique needs a new database collection when a change of the channel's state occurs.

J. Ledlie [11] has discusses on the scalable, user-generated wifi positioning engine. He has describes the design, implementation, and evaluation of Molé, a mobile organic localization engine. Unlike previous work on crowd-sourced WiFi positioning, Mole uses a hierarchical name space. By not relying on a map and by being more strict than un-interpreted names for places, Mole aims for a more flexible and scalable point in the design space of localization systems.

S. Bohanudin [12] has introduced the hybrid localization techniques in multilayer heterogeneous network under low hearability. In wireless communication, heterogeneous network is a group of networks that can be utilized to provide particular services. Mobile positioning is one of the most important services that can be offered by heterogeneous networks. Location of the mobile user can be determined by using Location Determination.
S. Bohanudin [12] has proposed a hybrid algorithm for multilayer heterogeneous network under low hearability condition. In this research, simulations have been done to identify the low hearability condition in single layer cellular network system and multilayer cellular network system.

Xi Wei [13] has analyzed real traces of mobile phones carried by users and find that mobile users exhibit temporal-spatial stability and neighborhood relativity. Motivated by this observation, this paper develops a Mobile Boundary Localization approach, MBL, to exploit the associated information to locate mobile users. This localization approach uses different treatment in different conditions and lets each mobile phone try to estimate its possible location range.

Zhuo Weipeng [14] has given information about the error modeling and estimation fusion for indoor localization. There has been much interest in offering multimedia location-based service (LBS) to indoor users (e.g., sending video/audio streams according to user locations). Offering good LBS largely depends on accurate indoor localization of mobile stations (MSs). To achieve that, author, first model and analyze the error characteristics of important indoor localization schemes, using Radio Frequency Identification (RFID) and Wi-Fi.

III. DYNAMIC TRINGULAR ALGORITHM

Improved DTN [6] algorithm requires at least three sensor nodes to approximate the location of mobile user. Four sensor nodes are used for verification of proposed algorithm. Improved algorithm discards the worst RSSI which measure by the sensor nodes and uses the other sensor nodes to estimate location.

Improved algorithm chooses the sensor node which receives greatest RSSI to take as master node, and assumes the mobile user's location in mapping circle of master node. The mapping circle is the estimation distance d1 between mobile user and master node. Improved algorithm finds the angle θ on mapping circle by using a cost function to pick one that best matches the observed

distance. DTN comprise the following step:

A. Generation of mapping circle**:** DTN finds possible locations of mobile user ($x_1+d_1\cos\theta$, $y_1+d_1\sin\theta$)[10] on the mapping circle by using the possible distances ($d_{2\theta}$ and $d_{3\theta}$) between mobile user and Slave nodes.
B. The distance of mobile user estuation**:** DTN[9] Find the error between estimation distances (d_2 and d_3) and possible distances ($d_{2\theta}$ and $d_{3\theta}$).
C. The coordinate of mobile approximation: DTN [8]calculates the cost functions at each angle θ and the θ increase

Improved algorithm search the minimum cost function, and the θ of minimum cost function is estimation angle on the mapping circle. The Angle θ on mapping circle is the estimation location of mobile user. Figure 2 describes the Procedure of DTN location algorithm. At last shift is required the local coordinate of user and find the global coordinate of mobile user ($x_1+d_1\cos\theta$, $y_1+d_1\sin\theta$).

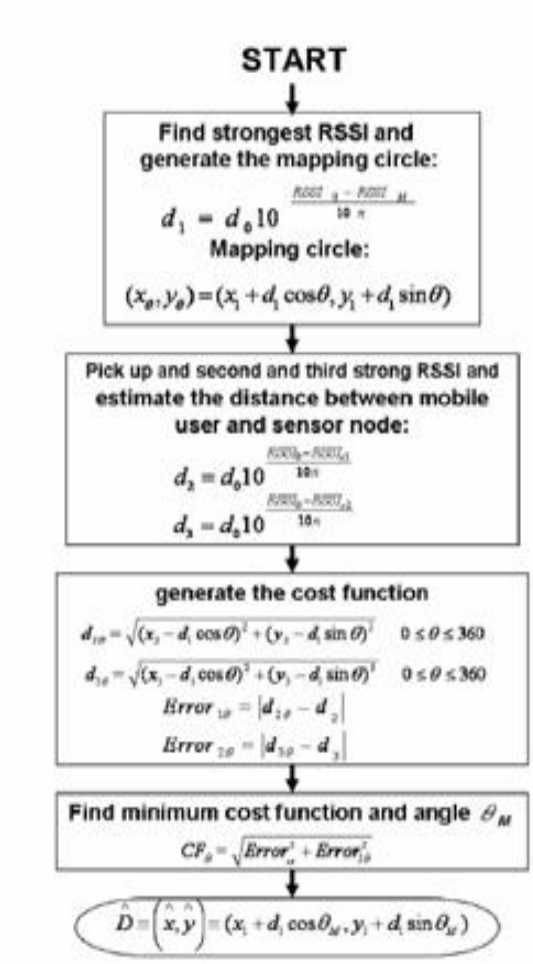

Fig. 2 Procedure of DTN location algorithm

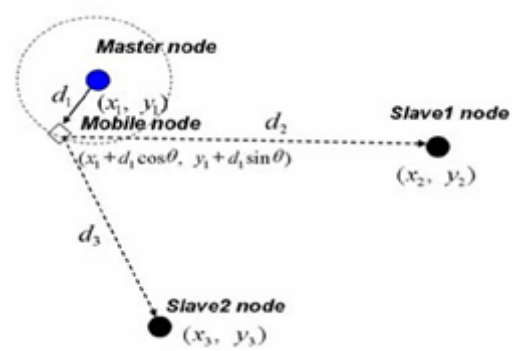

Fig. 3 DTN location algorithm

The mean square error (MSE)[7] is used to determine the performance of grey prediction system, and at the Run-time stage put the measured of RSSIs which generated from mobile user to the grey prediction system, and then get the predicted RSSI.

IV. CONCLUSION

Determining the position of mobile user is a significant application for location services in the building. The benefits of wireless sensor network are low power, low cost and low complexity. With these functions, wireless sensor network have great potential to develop indoor position system. This paper has presented a literature survey of various techniques and it is found that the Dynamic triangular localization is providing the better results. In near future we will modify RSSI in such a way that it give more better results.

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