MOBILE USER LOCALIZATION

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*Abstract-***This paper is survey on grey prediction technique in wireless sensor network and employ wireless LAN medium. This research work focuses on mobile localization problem. As in mobile is adhoc network so mobile users locations changes irregularly. 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.**

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.

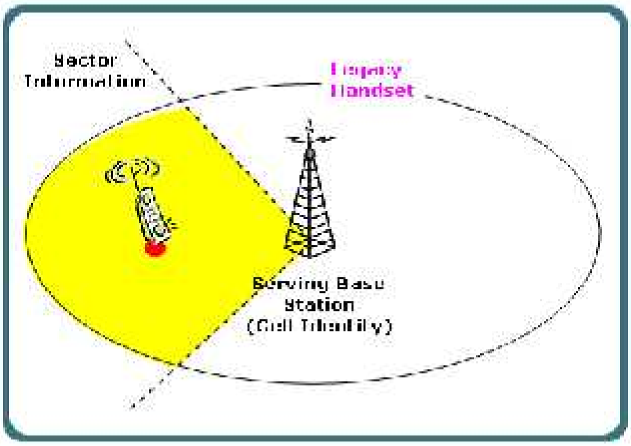

Fig. 1 Mobile user localization

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. This requires information devices to have context awareness and determination of current location of the users to adequately respond to the need at the time.

There have been various approaches to location positioning to further improve mobile user location accuracy. In this work, the author examine the location determination techniques by attempting to determine the location of mobile users taking advantage of signal strength (SS) and signal quality (SQ) history data and modeling the locations using extreme learning machine algorithm (ELM). The empirical results show that the proposed model based on the extreme learning algorithm outperforms k-Nearest Neighbor approaches.

Yuanguo Cheng and Shaochang Chen [2] are illustrating on An 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.

In the offline phase the signals came from many training locations were recorded and the GMM parameters were calculated and in the real time phase this GMM was employed to match the received signal strength patterns against the training patterns. The signal strengths were modeled by GMM can improve model precision in the training phase and further increased accuracy of location estimation in the localization phase. Experiment results demonstrated that the proposed method had better performances on both accuracy and real time of WSN user localization.

Isaac Amundson and Xenofon D. Koutsoukos [3] are studied on a survey on localization for mobile wireless sensor networks. Over the past decade [3] have witnessed 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.

Among these, the need for position estimation is perhaps the most important. Not only is localization required to understand sensor data in a spatial context, but also for navigation, a key feature of mobile sensors. In this paper, it presents a survey on localization methods for mobile wireless sensor networks. This is provides taxonomies for mobile wireless sensors and localization, including common architectures, measurement techniques, and localization algorithms. This paper is concluded with a description of real-world mobile sensor applications that require position estimation.

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. Author is interested in outdoor localization particularly in cellular networks of mobile nodes and presented a localization method based on cell and user location information.

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.

In reality, a cellular network has to serve many competing search requests sharing a limited bandwidth. The system develops a novel method of maximizing the expected rate of successful searches under delay and bandwidth constraints. An approximation algorithm is proposed, that is optimal for most probable cases, and nearly optimal for the worst-case condition. The proposed optimized search strategy outperforms a greedy search strategy, which considers only the users' location probabilities and ignores their deadline constraints.

Under certain conditions, the expected rate of successful searches generated by the proposed method is twice the equivalent rate generated by the greedy search strategy. In addition, the proposed search strategy outperforms a simple heuristic algorithm that searches around the user last known location. Author's work is differs from previous work in that he tackle the problem of people location and tracking using the widely available RF-based wireless LANs.

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.

Authors observe that only a fraction of users' files contain sensitive information. In addition, the majority of users' accesses to these sensitive files occur while in a trusted location those malicious parties are unable to access. Rather than protecting all of the user's files, they secure user designated sensitive files that are rarely accessed outside of specified trusted locations. Our approach is to use information and services available only in a trusted location to assist in key derivation without user involvement and without authenticating the laptop to any outside service.

They study two settings: home use where zero management overhead is needed (i.e., a "plug-and-play" solution) and a corporate setting where staff management of a whitelist of acceptable devices allows a higher level of security. The authors have implemented both systems and found automatic key derivation introduces a five second delay during the initial access to sensitive files.

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.

Author discussed a fingerprinting based localization technique using neural networks and ultra-wideband signals (UWB) is presented as an alternative. The fingerprinting database is built with signatures extracted from channel impulse responses (CIR) obtained by processing an IR-UWB indoor propagation measurement campaign. The construction of the neural networks and the adopted approach are described. Positioning performances are evaluated with different selected signatures and different sizes of the fingerprinting database.

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. Femtocell extends network coverage and delivers high-quality mobile services inside residential and business buildings through broadband network i.e. ADSL. Femtocell access point (FAP) or home base station (HBS) intends to serve small number of users i.e. 4 users and covers about 30 meter square similar to existing WiFi access points.

However, femtocell [8] introduces new challenges to the telecom industries in terms of handoff between femto and macrocells, interference management, localization and synchronization. Among all of these challenges, synchronization is considered corner stone for proper working for femtocell. The problematic issue in femtocell synchronization is that all the data and control traffics travel through IP broadband network. The IP broadband network is usually owned and managed by third party and not by the mobile operator, which is complicated the synchronization. Unsynchronized FAPs may cause harm interferences and wrong handover dictions. In this study, this paper investigate and overview the current femtocell synchronization techniques and compare between them.

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.

P. Aksenov [9] works presents an approach that models the capabilities of localisation systems and then uses this model to build a unified view on localisation, with special attention paid to uncertainty coming from different localisation conditions and its presentation to the user. The author discuss technical considerations, challenges and issues of the approach and report about a user study on users' acceptance of the suggested behavior of an application based on the approach. The results of the study showed the feasibility of the approach and revealed users' preference towards automatic but yet informed changes they experienced while using the application.

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. This paper proposes a method allowing an accurate mobile user's location in time-varying channels when it is difficult or impossible to collect measurements.

The system [10] has the ability to generate, from a measured reference database, a new database corresponding to a new channel state. This is done by using measurements of few reference points in conjunction with a tree model data mining technique. The technique uses a regression analysis to learn the temporal predictive relationship between the received signal strength values of the mobile and the reference points in order to generate a new database at a different time state. After generating several databases, corresponding to several time states, an artificial neural network is used for location estimation. Results show low degradation, compared to a static channel, of approximately 7% and 11% at 3 meters in 2D and 3D dynamic environments, respectively.

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.

Mole employs [11] several new techniques, including a new statistical positioning algorithm to differentiate between neighboring places, a motion detector to reduce update lag, and a scalable “cloud”-based fingerprint distribution system. Mole’s localization algorithm, called Maximum Overlap (MAO), accounts for temporal variations in a place's fingerprint in a principled manner. It also allows for aggregation of fingerprints from many users and is compact enough for on-device storage. It shows through end-to-end experiments in two deployments that

MAO is significantly more accurate than state-of-the-art Bayesian-based localizers. It also shows that non-experts can use Mole to quickly survey a building, enabling room-grained location-based services for themselves and others.

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 Techniques (LDT) with the availability of the cellular system in the network. However, the accuracy of the localization estimation is subjected to the types of LDT used such as Time-of-Arrival (TOA), Enhanced Observed-Time-Difference (E-OTD), Time Difference-of-Arrival (TDOA), and signal hearability.

This S. Bohanudin [12] has analyzesd appropriate LDT and proposing 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. In single layer cellular network system, the simulation is also used to evaluate and compare various LDT techniques under different mobility models. While in multilayer cellular network system, the simulation has been implemented to evaluate the proposed hybrid algorithm and compare it with time-based LDT techniques considering the accuracy of location estimation measurements. The simulations have shown that the location estimation error for hybrid technique is better as compare to TDOA and E-OTD at 67% and 95% of the cumulative density functions (CDF).

Xi Wei [13] is describing the exploiting the associated information to locate mobile users in ubiquitous computing environment. Although GPS is deemed as ubiquitous outdoor localization technology, this paper is still far from a similar technology for indoor environments. Though a number of techniques are proposed for indoor localization, they are separated efforts that are way from a real ubiquitous localization system. Our real-world experience from In Space, a pervasive computing system with wireless devices to provide intelligent services to users, shows that locating mobile users remains very challenging due to various interfering factors.

It analyzes 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. His models are simple to use, capturing important system parameters and measurement noises, and quantifying how they affect the accuracies of the localization. Given that there have been many indoor localization techniques deployed; an MS may receive simultaneously multiple co-existing estimations on its location.

Equipped with the understanding of location errors, it then investigates how to optimally combine, or fuse, all the co-existing estimations of an MS's location. Author has presented computationally-efficient closed-form expressions to fuse the outputs of the estimators. Simulation and experimental results show that our fusion technique achieves higher location accuracy in spite of location errors in the estimators.

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 ($x_1+d_1\cos\theta$, $y_1+d_1\sin\theta$).

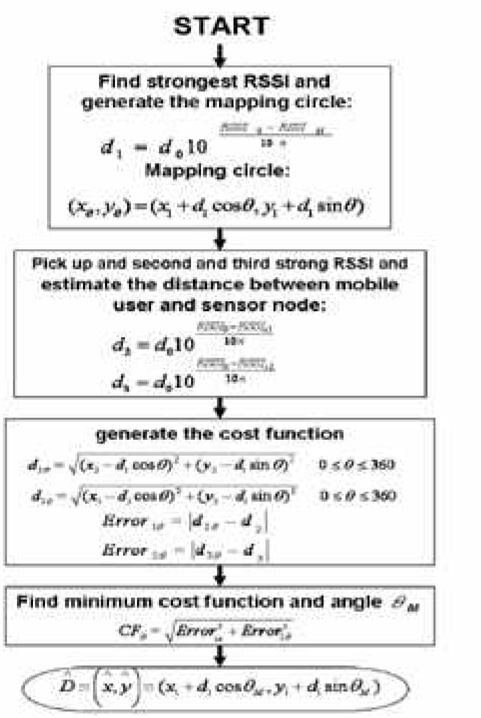

Fig. 2 Procedure of DTN location algorithm

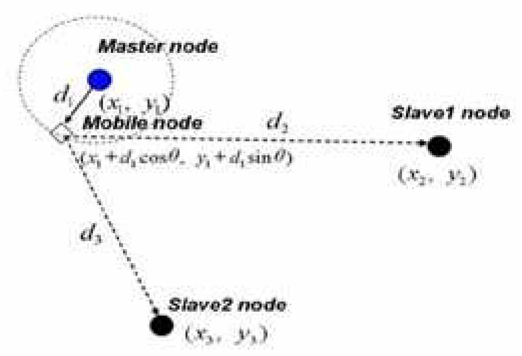

Fig. 3 DTN location algorithm

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 role 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 presents a literature survey of various techniques and it is found that the Gray prediction algorithm can be extended to improve the functionality of DTN.

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