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Accurate Energy-Efficient Localization using Radio Database Compression and Clustering Technique

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Abstract- Location based service is a positioning method that exploits the already existing infrastructures such as cellular networks or W-LANs. Increasing Demand for Energy efficient networks, we are proposing a clustering technique for compressing the radio database in Login Systems. The aim of the proposed technique is to reduce the computation cost and transmission load in the mobile-based implementations using Global Positioning System (GPS). The presented method is Block-based Weighted Clustering (BWC) technique, which is applied in a concatenated location-radio signal space, and attributes different weight factors to the location and radio components. The Experimental Architecture will be produced to evaluate the results and the efficiency of the BWC technique. Also, it improves the performance of standard k-means and hierarchical clustering methods.

Keywords- W-LANs, (GPS), (BWC)

I. INTRODUCTION1

In the recent years, the mobile service providers have deployed commercial Location-Based Services (LBS). The Global Positioning System (GPS) is the most effective positioning technology in the outdoor open environments. However, it has drawbacks such as poor performance in built up areas and high power consumption. These drawbacks led to the development of positioning techniques based on wireless networks. Location finding is a positioning method that exploits the already existing infrastructures such as cellular networks or WLANs. Location finding systems may be implemented by either a network-based or a mobile-based approach. In a network-based approach, the radio database resides in the network; hence, localization is done on the network side. In a mobile-based approach, localization is performed on the mobile side thanks to an on-board radio database. In Location finding systems, the size of the radio database is an influential factor in regards to issues such as computation and transmission loads.

In mobile-based systems, the computation load issued from the positioning algorithm is of great importance, since it affects directly the terminal autonomy and the CPU computing load. Regarding the recent demand for energy efficient networks and the emergence of issues like green networking, reduction of the computation load may be a figure of merit in location finding systems.

Moreover, in a mobile-based approach, the radio database and its updated versions are transferred to the terminal through the cellular network. Three-tier client-server architecture will be used. It enables an application from client machine to send commands to database through use of middleware service. The database processes command request and then sends a response to the middleware service which then forwards the reply to client. Efficient as application server of the architecture handles the data processing operations between client and database server.

II. LITERATURE SURVEY

We studied the first paper of Azin Arya, Philippe Godlewski, Marine Campedel, and Ghislain du Che´ne in year 2013, Titled Radio Database Compression for Accurate Energy-Efficient Localization in Fingerprinting Systems. The Evolution Approach of this paper is to Propose a clustering technique to compress the radio database in the context of cellular fingerprinting systems. The next paper of Yunye Jin, Wee-Seng, Mehul Motani, and Wai-Choong Wong in year 2013, Titled A Robust Indoor Pedestrian Tracking System with Sparse Infrastructure Support. The Evolution Approach of this paper is to Propose a tracking system that comprises of a Dead reckoning(DR) subsystem implemented on a mobile phone and a ranging subsystem with a sparse infrastructure.

The next paper of Kaishun Wu, Jiang Xiao, Youwen Y, Dihu Chen, Xiaonan Luo, and Lionel M. Ni in year 2013, Titled CSI-Based Indoor Localization. The Evolution Approach of this paper is to Propose a novel approach called FILA, a novel cross-layer approach based on orthogonal frequency division multiplexing (OFDM) systems (OFDM) for indoor localization using WLANs, which leverages the channel state information (CSI) to build a propagation model and a fingerprinting system at the receiver. The next paper of Kejiong Li, John Bigham, and Laurissa Tokarchuk in year 2013, Titled Validation of a Probabilistic Approach to Outdoor Localization. The Evolution Approach of this paper is The proposed scheme retains accuracy by not losing the substantial RSS correlations in each cluster, but also accommodates the different RSS distributions in each cluster. In this letter, present an adaptive mobility map construction scheme for large-scale Wi-Fi mobility tracking in indoor areas which does not require any off-line fingerprinting effort or deployment of landmarks.

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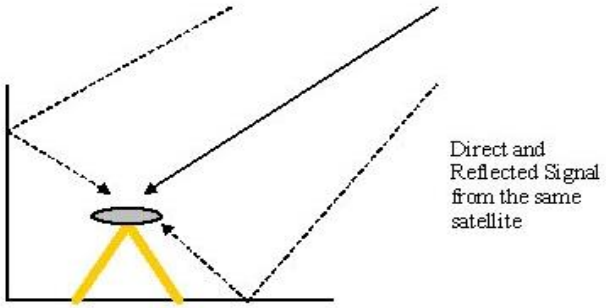
III. PROBLEM DEFINITION

An Efficient system is required to find the location of the Device the Wi-Fi or GSM Network is used for the Network Connectivity. Currently, the Global Positioning System (GPS) is the most effective positioning technology in the outdoor open environments. How-ever, it has drawbacks such as poor performance in built-up areas and high power consumption. These drawbacks led to the development of positioning techniques based on wireless networks. A GPS uses the earth's coordinates to zero in on a location. So when looking up an address, it must convert address information into coordinates. Since addresses change, GPS devices often need to be updated frequently to keep track of the information. Updates can be expensive depending on the brand of GPS, but failing to update the database can cause inaccuracy. Sometimes even when a GPS system is properly updated, it can also be inaccurate, so depending on your GPS system completely might be problematic. Multipath is caused by GPS signals being reflected from surfaces near the GPS antenna that can either interfere with or be mistaken for the signal that follows the straight line path from the satellite. In order to get an accurate measurement from a GPS satellite, it is necessary that the signal from the GPS satellite travels directly from the satellite to the GPS antenna. If the signal has been reflected off of another surface prior to being received at the antenna, its length will be greater than was anticipated and will result in positioning error. Multipath is difficult todetect and sometimes hard to avoid.



A. Other Sources of Error in GPS

1) Signal Delay caused by the Ionosphere
2) Signal Delay caused by the Troposphere
3) Orbit Errors (GPS satellite position inaccuracy)
4) Receiver Noise

IV. OUR PROPOSED SYSTEM

A. Objectives

Here I will try to reduce the computation cost and transmission load in the mobile-based implementations to find the location and increase the efficiency by proposing the new Block based Weighted Clustering (BWC) Technique. On the behalf of the latest technology I will try to propose a new framework to trace the location without using Global Positioning System and saved in database using the low radio frequencies to save computation cost as well as transmission loads. Today, RSS Localization is the most widely used approach, since it does not require any additional hardware neither on the network nor on the terminal side. We note that in cellular systems, RSS measurements are performed on a broadcast channel that is not subject to the power control process (BCCH in GSM and CPICH in UMTS). Location Localization systems may be implemented by either a network-based or a mobile-based approach. In a network-based approach, the radio database resides in the network; hence, localization is done on the network side. In a mobile-based approach, localization is performed on the mobile side thanks to an on-board radio database. In a privacy point of view, mobile-based localization solutions are advantageous w.r.t. network-based methods, since in the former case, the position of the terminal is neither computed nor stocked on the network side, and hence the mobile user conserves a higher degree of privacy. In Localization systems, the size of the radio database is an influential factor in regards to issues such as computation and transmission loads. In mobile-based systems, the computation load issued from the positioning algorithm is of great importance, since it affects directly the terminal autonomy and the CPU computing load.

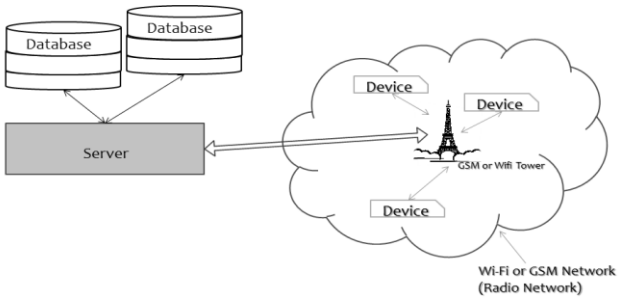


Fig. **Accurate Energy-Efficient Localization using Radio Database Compression and Clustering Technique**

B. System Architecture

The Wi-Fi or GSM Network is used for the Network Connectivity. This enables an application to fetch the data from Devices to send commands to database through use of middleware service where the Algorithms and system for Radio Database is defined. The database stores the required information for location and user details. Middle tier (application server) handles the data processing operations between Device and database server to provide the accurate Trace.

C. Proposed Plan of Work

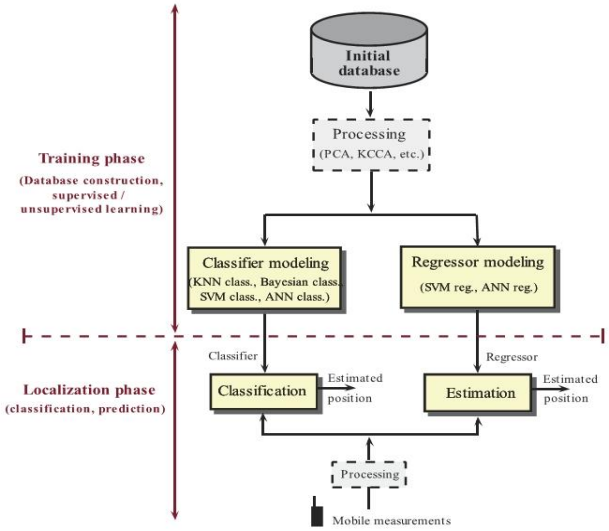


Fig. 1. A schematic overview of learning-based methods for location

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In this method, at first during a **training** phase, a radio map is constructed over the area where the mobiles are to be located. Afterwards during the localization phase, a mobile terminal is localized by matching its received signal to the radio map entries. The stored signal information in the radio map may be the Received Signal Strength (RSS), signal time delay, channel impulse response or any other location-dependent information. Today, RSS Localization is the most widely used approach, since it does not require any additional hardware neither on the network nor on the terminal side. In Localization systems, the size of the radio database is an influential factor in regards to issues such as computation and transmission loads.

In mobile-based systems, the computation load issued from the positioning algorithm is of great importance, since it affects directly the terminal autonomy and the CPU computing load. Regarding the recent demand for energy efficient networks and the emergence of issues like green networking, reduction of the computation load may be a figure of merit in Localization systems. Moreover, in a mobile-based approach, the radio database and its updated versions are transferred to the terminal through the cellular network. Regarding the above issues, some methods have been proposed in the literature of location Localization systems, which aim to compress the radio database the compression quality in this context is evaluated by the resulting positioning error. As the database statistical properties may depend on the underlying radio system, one may expect different methodologies for different radio networks. One suggested approach for database compression, especially in the context of WLAN Localization, is to reduce the dimension of the radio feature space. Various techniques such as Principal Component Analysis (PCA) and Kernel Canonical Correlation Analysis (KCCA) have been proposed to implement this approach. An alternative solution might be envisaged by reducing the number of records, i.e., to reduce the database density. One simple way to reduce the database density (used in the context of cellular systems), is to cover the considered area by a uniform grid, and to perform an averaging function over all the measurements which fall in the same grid zone. The grid resolution is defined as the length of a side of each square zone. In this work, we propose a clustering technique for radio database compression, which takes into account both the location and the radio components of the recorded measurements. Here, we define the concept of feature types in association with database records. A feature type is defined as all the stored parameters in a record that belong to the same nature. Based on this definition, a Block-based Weighted Clustering (BWC) scheme is proposed, which imposes equal weights to blocks of components belonging to the same feature type, in the clustering cost function; the weight factors associated with feature types are optimized during the clustering process.

V. MODULE PROPOSED

a) Design Module (Including Android App.)
b) Network Module (Setup Network System)
c) Classification Module (Classify The Location)
d) Prediction Module (Predict The Location)
e) Database Construction Module (For Storing Values and Compression)
f) Supervised Learning.

VI. ADVANTAGES

a) Uses of Private networks have more security.
b) In our network we can use this system for storing the information and maintaining the database and tracking the location of the device and monitor the truth (Problem) organization or persons without internet.
c) We can avoid the use of the unnecessary overheads of the previous system which slows the data transmission.
d) The system can be useful at the time of emergency to find the accurate path of that location.
e) Security Aspects make the system to keep threats (Network) away.

VII. CONCLUSION

Here, this System will save transmission Time as well as reduce Transmission Load.

Few Conclusions are given below:

1. The Packet Size of Average Data Transmission is 17kbits for BWC(Block weighed Clustering Technique. According to Azin Arya, Paper Radio Database Compression for Accurate Energy-Efficient Localization.
2. There is very less Deviation in transmitted signals in troposphere, i.e. Above 5 to 10 km above earth's surface. And hence no atmosphere affects transmitted signals in ionosphere.
3. Transmission Load is as well as time increases by Multiplier (0.2) with addition of new device.
4. The Transmission is not affected by the multiple reach to the single device. As the algorithm is intact and the calculated value of each device will be same each time.
5. The Average Data Transmission Time is max 4s. As Radio Transmission Required in GSM for Call Communication is less than 4 sec. (Provided the Carrier is same.)
6. There is very less Deviation in transmitted signals in troposphere, i.e. Above 5 to 10 km above earth's surface. And hence Propagation Delay is avoided.

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