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Smart Tracking of Human Location and Events Based on WPS using Android Technology

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***Abstract*—** Predicting the human location-based on the current tracking system is inefficient and costly due to data transmission where the cost is based on the usage of data. The aim is to develop an efficient child awareness system which is essential software that uses the asset tracking algorithm to predict the exact location of the child. This tracking system allows the parents to monitor their child's mobile phone to trace the location and the mobile events thereby developing an efficient asset tracking solution to preserve valuable mobile assets by means of location and context awareness route learning techniques. All call events and text content can be seen by the parents and location can be traced (through the utilization of GPS and WPS). This system uses android based smart phones for triggering the software that sends alert to the parent when the child moves out of the geographical zone. The centralized server is used to store all notification and updated information of the child. This paper provides tracking approach to create awareness to the parents about their child's behaviour.

***Keywords*—**Tracking Management, Asset preservation, Context Adaptation, GPS, Location awareness algorithm

I. INTRODUCTION

Mobile computing deals with interaction between computing devices, which involves mobile communication, mobile hardware and software. Mobile assets play a major role in tracking the current location of the human and precisely manage their routing. Tracking the position of the human can be indoor positioning or outdoor positioning. Indoor Positioning System (IPS) is used wirelessly to locate an indoor area through a network of devices. The detection of indoor asset may be active or passive where active detection does not need any manual interaction to send their data whereas passive detection stores all the tracking information in the device memory. Outdoor positioning system covers the location outside the building while travelling or driving long distance coverage. Most of the tracking systems rely on Radio Frequency Identification (RFID), Wireless Sensor Network (WSN), Wireless Local Area Network (WLAN), Global Positioning System (GPS) and cellular network. Predicting the human mobility and events of their mobile device is becoming a tedious task due to the limitations of the earlier tracking systems [1], [2]. Most of the tracking scheme involves GPS tracking unit for fine-grained localization. This system uses the GPS tracking software to identify the RF signals and the essential feature of the GPS unit is to calculate the appropriate coordinates from the received signals. Sometimes, GPS signals may become weaker or the use of GPS puts too much stress on the battery life of the mobile device. The limitations of GPS are overcome by WPS (Wi-Fi positioning system). With the support of Wi-Fi access points, WPS determines the location of the device more accurately. Smart mobile devices are required to perform a multiple tasks that are operated via sophisticated geographical location which enhances the mobile user experience through a wide range of applications.

The three main concepts involved in child tracking system are outlined as follows:

- Location awareness (LA) refers to a device that is used to determine the location in a network with the help of mobile node and navigational instruments (NI) that calculates the latitude and longitude coordinates [4]. It provides notification when there is a change in the location and configuration information.
- Rules are polices or conditions that are set by the user to monitor the behaviour of agents. It is a set of behavioural specifications that are included on every computing device. Each rule consists of a triggering event, which has a set of conditions, set of actions to be performed and the life time of the event [5], [6].
- Context awareness elevates the entities behaviour to be more customized and easier for their users. Within the limited resources of mobile device and communication system it is capable of dealing with dynamically changing environment and smartly exploits the context information

II. PRELIMINARIES

As mentioned in the introduction part, this paper focus on tracking management where smart phones play a

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vital role by utilizing the techniques mentioned as follows:

A. Global Positioning System

GPS is a system that is based on space satellite navigation. It consists of satellites, control and monitor stations and receivers. One of the efficient features of the GPS receiver is that it calculates the coordinates by precisely timing the signals sent by the GPS satellites [7]. The messages that are transmitted by the satellite include the time the message was transmitted and the satellite position at the time of message transmission.

GPS is a constellation of satellites which orbit the earth continuously, which equips atomic clocks, radio signals and time related information. The GPS receiver picks up the radio signals from a satellite that are monitored and corrected by the control stations. To plot the 2D position GPS receiver needs only three satellites whereas to plot the 3D position it needs four or more satellites. The former will not be very accurate but the later is much more accurate. GPS is used in a variety of ways such as:

- To direct from one location to other location.
- To determine the distance between two location points.
- To determine the accurate position by calculating the position and velocity of the space.
- To create digital maps and to estimate the human mobility speed.

B. Wi-Fi Positioning System (WPS)

WPS is used for covering a wide range of services with greater speed and accuracy that operate on a sophisticated geo-location. To deliver these services WPS rely on wireless access points (WAP) for calculating the location coordinates and make use of Media Access Control (MAC) address. MAC address is used for the proper functioning of wireless networks which communicate with each other. To determine the user device location WPS maps the location of WAP that are indexed by their MAC address and comparing it against the access point that are visible to an end user device. WPS uses three topologies that are used for positioning are as follows:

- In network-based topology, the position is determined by the stations and a central server.
- In terminal-based topology, it identifies the position over the terminal or (mobile device).
- In terminal-assisted topology, it is a hybrid form of network-based and terminal-based topologies.

C. Service Set Identifier (SSID)

Service Set Identifier (SSID) is often referred to as network name that acts as an identifier for each wireless LAN to establish communication with each other. It also facilitates to provide Wi-Fi access to end user device. This SSID is included in management beacon. Management beacon contains the entire network's information. It communicates with all the nearby devices to provide network information. Transmission of beacon frame is done periodically to ensure presence of WLAN. The beacon frame comprises the major components as follows:

- Timestamp states the local clock time of all the stations.
- Beacon interval is the time interval between the beacon transmissions. It is expressed in Time Unit (TU). It also contains the information about the routing. It reduces the clustering overheads.
- Capability information has 16-bit field which contains the information about the capability of the device or network.

III. RELATED WORK AND DISCUSSION

A realistic approach to track mobile assets plays a vital role in day-to-day life that involves areas of tracking such as vehicle tracking, employee tracking, etc. The motivation is to develop such application for the diversity involved in interconnected devices, cellular applications and GPS – aware environments. Most of the asset tracking systems does not enable adaptivity and context utilization because this process can be inefficient over wireless data transmission systems and the cost is based on data rate that is being sent that is high in cost. To forward location information, fixed data flow technique may utilize more or less resources than the actual resources required. Instead of GPS, if RF signal is used to calculate the node position results in distance error. Implementing the above infrastructure, results in complexity due to overhead in Wireless Sensor Network.

The above discussion depicts the balancing technique which is essential to mitigate the resource usage with the mobile asset availability. The most successful tracking system with GPS results in inadequate coverage for positioning the outdoor mobile asset because of conjunction with WSN. To obtain high-resolution data of close interaction between the users requires WSN technology. However, this method need additional effort to distribute the sensor network nodes and it is restricted in covering a wide area. This technique does not consider rules, contexts and probability of correctness.

One of the important applications of pervasive computing would be to use Radio Frequency Identification (RFID) technology that supports low cost, long-lived and continual tracking of mobile assets [1]. RFID is used for automatic detection and tracking of assets which is attached with a RFID tags. This tag contains the electronic stored data that are powered by and read at short distance through magnetic field. RFID

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can also be implemented using tags (chip less) without any microchip that covers a longer distance and can be automated unlike barcodes that needs the human work for interrogation. It has some problems even though they are used widely and has some advantage. The problems are Ghost tags, security concerns, vulnerable to damage and high cost.

An alternative method to investigate user movement can also be done through Universal Mobile Telecommunication System (UMTS) which mainly make use of Global System for Mobile Communication (GSM) [8]. The feature of GSM in tracking system is to cover an indoor area that is achieved by using an indoor picocell base station (BS) or an indoor repeater. To determine the location of mobile phones GSM localization is used to multilateration the user location. Here the multilateration is a technique that measures the difference between the distances of two or more stations at known location. The above technique used in various applications to accurately locate the distance by measuring the Time Difference of Arrival (TDOA) and it can also be used by single receiver to locate itself by measuring TDOA.

The techniques that are used in the existing asset tracking system which has some defects are as follows:

- Tracing the human location based on the mobility speed does not produce the accurate results.
- Exact location is not detected due to weaker signals of GPS.
- Gasping of base stations, where coverage area shrinks under load.

The rest of the paper explains the proposed system and the system model that are mentioned in preliminaries which describes the location tracing and context framework techniques to monitor the message received and sent by the child.

IV. LOCATION AND EVENT TRACING SYSTEM

This paper proposes the smart tracking of the child location and thereby creating the awareness to the parents about their children's activities through smart phones. The essential components involved in tracking are as follows:

- GPS Satellite Tracker.
- Android phones
- Centralized Server.
- GSM service provider.

GPS Satellite Tracker is a device which is used by Global Positioning System that sends the data to mobile device. Android phone are used to track the current location with the help of GPS and WPS. These android mobile offers smart features such as location sharing, supporting Google Maps and OpenStreetMap and map integration for private home networks. GSM service provider used to track the mobile location and events triggers during the mobile usage. The weaker signals due to GPS are overcome by Wi-Fi Positioning System.

A. Static Interval Algorithm

The algorithm is derived from the functionality of GPS. As the algorithm name describes the data sent to the centralized server after every fixed interval of time. It uses two variables; one is to keep track of change in time and another one for the frequency. One of the important functionality of this algorithm is that it keeps on reporting the last point and the next point. The device sends the data to the server when the predefined time is larger than the calculated time interval, otherwise it discards it. The static algorithm is mainly used to overcome the theoretically noted complexities of the updated interval.

B. Radius based Distance Algorithm

The radius algorithm is mainly related with the distance points between the traced locations. It deals with points which are within the radius from the device. It calculates the distance between the previous position and the current position of the device and sends the alert notification to the server and to the parent's mobile. (i.e.) when the child moves out of the geographical zone, immediately the alerts are sent to the parents. The direction algorithm reports the change in the direction of the mobile asset. The current location is calculated based on continuous observation of information sent to the server. The device sends the accurate point to the database server with the Minimum_Radius in meters.

C. Speed Algorithm

This algorithm reports the change in speed in the mobile asset. Change in speed results in change in frequency of the data sent to the centralized server. The speed algorithm involves the current and last speed, low and high interval variables. The predefined speed is compared with last speed report to calculate the threshold value. When the speed is high, the data rate transmission is high where as in low speed data rate is low in transmission. Adjustment of data update interval when the counter reaches the threshold level. (i.e. Hi_spupdate or Lo-spupdate). After adjusting the updated value, the mobile asset follows the new interval of current location.

D. Event Tracing Algorithm

In this paper, we utilize a context distributed approach. This algorithm is based on target requirements, we utilize geographically referenced in the predefined characteristics in the form of context profiles to increase the transparency while monitoring the context from the device by using the time stamps. The timestamps is used to group the characters which describes the action that as

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occurred in the mobile device. (i.e.) the call log details of the child mobile phone. The algorithm not only used for triggering the calls and also for tracing the messages of the mobile device.

V. SYSTEM MODEL

The system model for child tracking system consists of the following requirements:

- Android smart phones that is mainly used as the communication device between the child and the parent. It provides all the enhanced features that are user-friendly to the end-users.
- It uses Android Development Tool (ADT) plug-in to create new events.
- Geo-tracker helps to broadcast the location and finds the time interval between the previous and current point.
- WPS Receiver receives the signal from different satellite that operates at same time. Signals that are received are estimated for finding latitude and longitude position of the user.
- Centralized server is used for storing all the alerts (which are stored as notification), events (Incoming and outgoing calls), text (SMS and MMS) and the location details of the child.

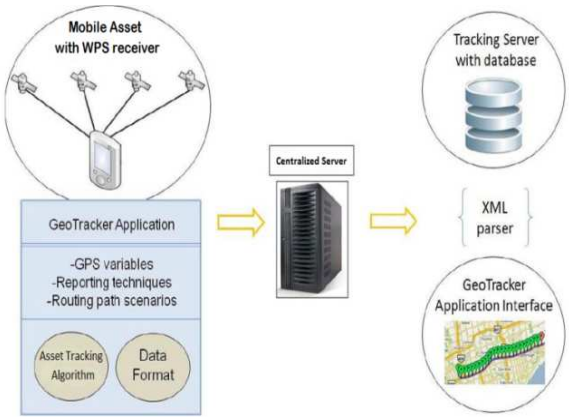

Figure 1 Tracing System Model

The above figure.1 represents the implementation of asset tracking system where the user uses the mobile device for tracing the route. Here the Geo-tracker utilizes the GPS for tracking the human mobility by estimating the trace points. In case the GPS faces the problem due to weaker signal, the Wi-Fi system helps to overcome the problem in tracking. The centralized server keeps track of all the notification that is sent from the child's mobile phone which allows the parents to monitor by logging into the server. This technique provides a cost-effective system because data transmission rate is reduced and data's are transmitted as SMS to the parents.

VI. WATERFALL STRATEGY

The above mentioned algorithms can be selected by the mobile user of the asset. This existing tracking system results in high cost and not efficient where the cost is based on the data sent.

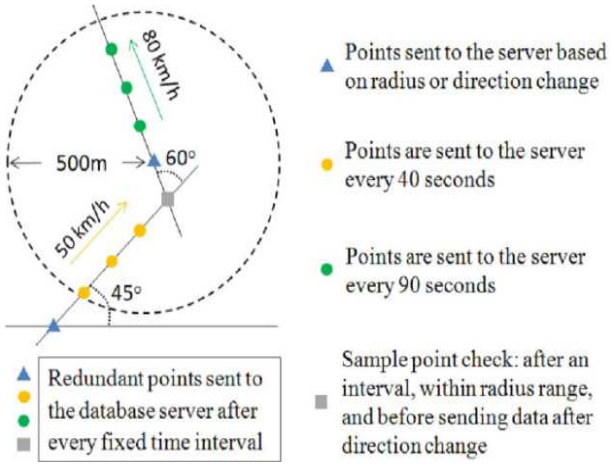

Figure.2: An example schema of the Waterfall Strategy.

The location-tracking algorithm is further refined and dynamically selected based on waterfall strategy (see Fig.2), which checks the current location information and selects the different tracking algorithm. The static and radius algorithm is selected first and depending upon its conditions the speed algorithm is followed. If the condition becomes true, the data is transmitted otherwise it is rejected. If the mobile asset stops moving, the reporting result is temporarily cancelled. Thus, the data transmission rate is considerably reduced.

VII. CONCLUSION

In this paper we discuss the child awareness system which is a real-time monitoring system that allows the parents to monitor their children. Parents are able to predict the current location of the child by using the android smart phones. There are many tracking system available in recent years, but only few of them are suitable for real-time tracking. The goal of this paper is to make use of these smart phones that are integrated with the enhanced GPS geo-tracking service that utilizes the satellite space for estimating the accurate route learning approach. This approach is used for increasing the productivity, improving and conserving valuable mobile asset utilization and visibility. Additionally the context-awareness algorithm is been used to trace the call logs details and the messages sent and received by the child through smart phone notification. This results in reporting and generating rigid traces which are more realistic and cost effective scheme. The main contribution of developed application is to protect the children from unwanted practices and to provide awareness to the parents about their child activities.

VIII. REFERENCES

[1] G.D. Bhanage, Y. Zhang, Y. Zhang, W. Trappe, and R.E. Howard, "RollCall : The Design for a Low-Cost and Power Efficient Active RFID Asset Tracking

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System," Proc. Int'l Conf. Computer as a Tool,pp. 2521-2528, Sept. 2007.

[2] N. Rajendran, P. Kamal, D. Nayak, and S.A. Rabara, "WATS-SN: A Wireless Asset Tracking System Using Sensor Networks," Proc.IEEE Int'l Conf. Personal Wireless Comm., pp. 237-243, Jan.2005.

[3] Yanying Gu, Anthony Lo, Senior Member, IEEE, and Ignas Niemegeers, " A Survey of Indoor Positioning Systems for Wireless Personal Networks" vol-3 , No.1, First Quarter, 2009.

[4] A.K. Dey and G.D. Abowd, "Towards a Better Understanding of Context and Context-Awareness," Proc. Conf. on Human Factors in Computing Systems, Apr. 2000.

[5] G. Gehlen, F. Aijaz, S. Muhammad, and B. Walke, "A Rule Based Publish/Subscribe Context Dissemination Middleware," Proc.Wireless Comm. and Networking Conf., pp. 2541-2546, Mar. 2007.

[6] G. Chen and D. Kotz, "Policy-Driven Data Dissemination for Context-Aware Applications," Proc. IEEE Third Int'l Conf. Pervasive Computing and Comm., pp. 283-289, Mar. 2005.

[7] Dineshbalu Balakrishnan, Member, IEEE, and Amiya Nayak, Senior Member, IEEE, "An Efficient Approach for Mobile Asset Tracking using Contexts", vol-23, No.2, Feb.2012.

[8] Meng-Hsun Tsai, Student Member, IEEE, Yi-Bing Lin, Fellow, IEEE, and Hsiao-Han Wang, "Active Location Reporting for Emergency Call in UMTS IP Multimedia Subsystem", Vol-8,No.12, Dec-2009.

[9] D. Balakrishnan, A. Nayak, and P. Dhar, "Adaptive and Intelligent Route Learning for Mobile Assets Using Geo-Tracking and Context Profiles," Proc. IEEE/IFIP Seventh Int'l Conf. Embedded and Ubiquitous Computing, Aug. 2009.

[10] D. Balakrishnan, A. Nayak, P. Dhar, and S. Kaul, "Efficient Geo-Tracking and Adaptive Routing of Mobile Assets," Proc. IEEE 11th Int'l Conf. High Performance Computing and Comm., June 2009.

[11] G.H. Truelove, M.A. Foster, V.K. Kohli, and T.G. Raslear,"Real-Time Asset Tracking and Monitoring Using Low-Cost Cellular Networks," Proc. IEEE/ASME Joint Rail Conf., pp. 315-318, Apr. 2006.

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