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Indigenous GPS for Location Mapping

Ezhil Vezhian L[1], Adithya S[2], Anoop T George[3], Ravikiran, S E[4], K V Nagalakshmi[5]

B.E Student, Dept. of Electronics and Communication, The National Institute of Engineering, Mysore, India [1234]

Associate Professor, Dept. of Electronics and Communication, The National Institute of Engineering, Mysore, India [5]

ABSTRACT: The main focus of our paper is to get location information in terms of latitude, longitude, altitude, time and accuracy using GPS service with stand-alone device such as mobile phone and send the data to server so that the database can be used effectively to create a map of the users and also display the latest location information of each user at a remote location. It has two main components which uses the client -server model, viz., Client Side Android Application and Server Side - PHP script and Database. As the importance of location information and with fast improving technologies, Smartphone using the Android platform are now a household item, and hence a system was developed using the integration to provide remote location tracking caters to a number of new needs. This also offers effective solution to a number of problems associated with gathering location data dynamically from multiple sources and come up with new products which otherwise would not have been possible.

KEYWORDS: Location tracking, GPS, Android, Smart phone

I. INTRODUCTION

In present day scenario, location data plays an important role in multiple fields such as tracking a person or object, finding the route to the destination using GPS services [1], context aware systems where businesses want users' location data to provide location based services such as advertisements, products specific to the place etc,. Therefore, the need of the hour is to develop systems and applications which provide location data or make use of location information remotely to provide the best services based on the context.

The main focus of our paper is to get location information in terms of latitude, longitude, altitude, time and accuracy using GPS service with stand-alone device such as mobile phone and send the data to server so that the database can be used effectively to create a map of the users and also display the latest location information of each user at a remote location [2] ,[3]. This service doesn't require any extra authentication from users' side for sending the location information and the phone acts as authenticating device which in term adds simplicity of the product.

II. WORKFLOW

The basic workflow is as follows: An Android application [4],[5] which fetches the GPS co-ordinates [6],[7] of the device is installed in the Android phone [8]. The Algorithm which runs the application makes use of various parameters from services like GPS, Wi-Fi, Cellular networks etc., to accurately find the position of the device. The received coordinates are sent to the server if internet connection is available or else the coordinates are stored in the local database of the application. As soon as internet connection is available, the data stored in the local database of the application is sent to the server. The server side application is written using languages such as Python or PHP. The data sent from the mobile device to the server is stored in a database maintained by the server which is accessible to the Web Application. The data inside the database mainly has fields such as Username, User Id, Latitude, Longitude, Accuracy etc. The Web Application makes use of Google Map APIs to render the user data in a nice webpage which shows the user’s movement all through the day. The Web Application is hosted under a URL from which users from all over the world can track the user’s location.

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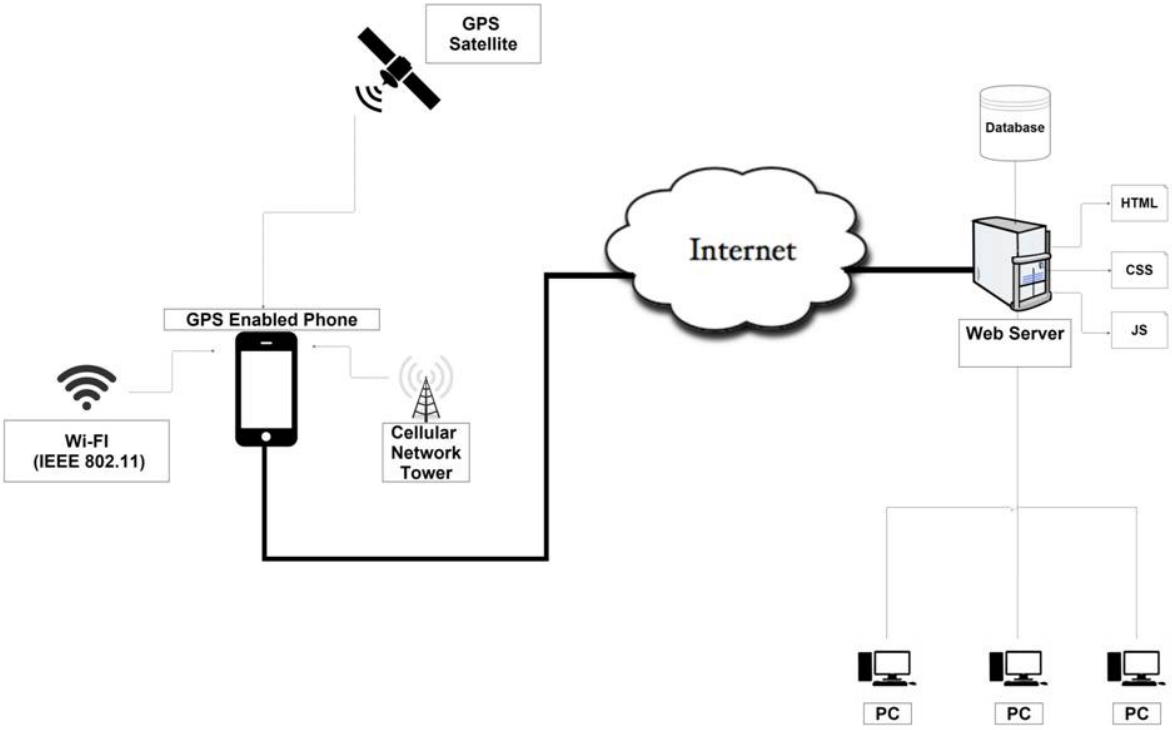

Fig. 1. Overall workflow of the project

III. SIMULATION AND RESULTS

It has two main components which uses the client -server model:

1. Client Side Android Application
2. Server Side - PHP script and Database

1. CLIENT SIDE ANDROID APPLICATION:

The Android application has a very simple UI consisting of three buttons i.e., Start, Stop and Unsent. The Start button starts the application and starts receiving location coordinates as and when the location of the device changes and the entire process is encapsulated onto a service which can run in the background.

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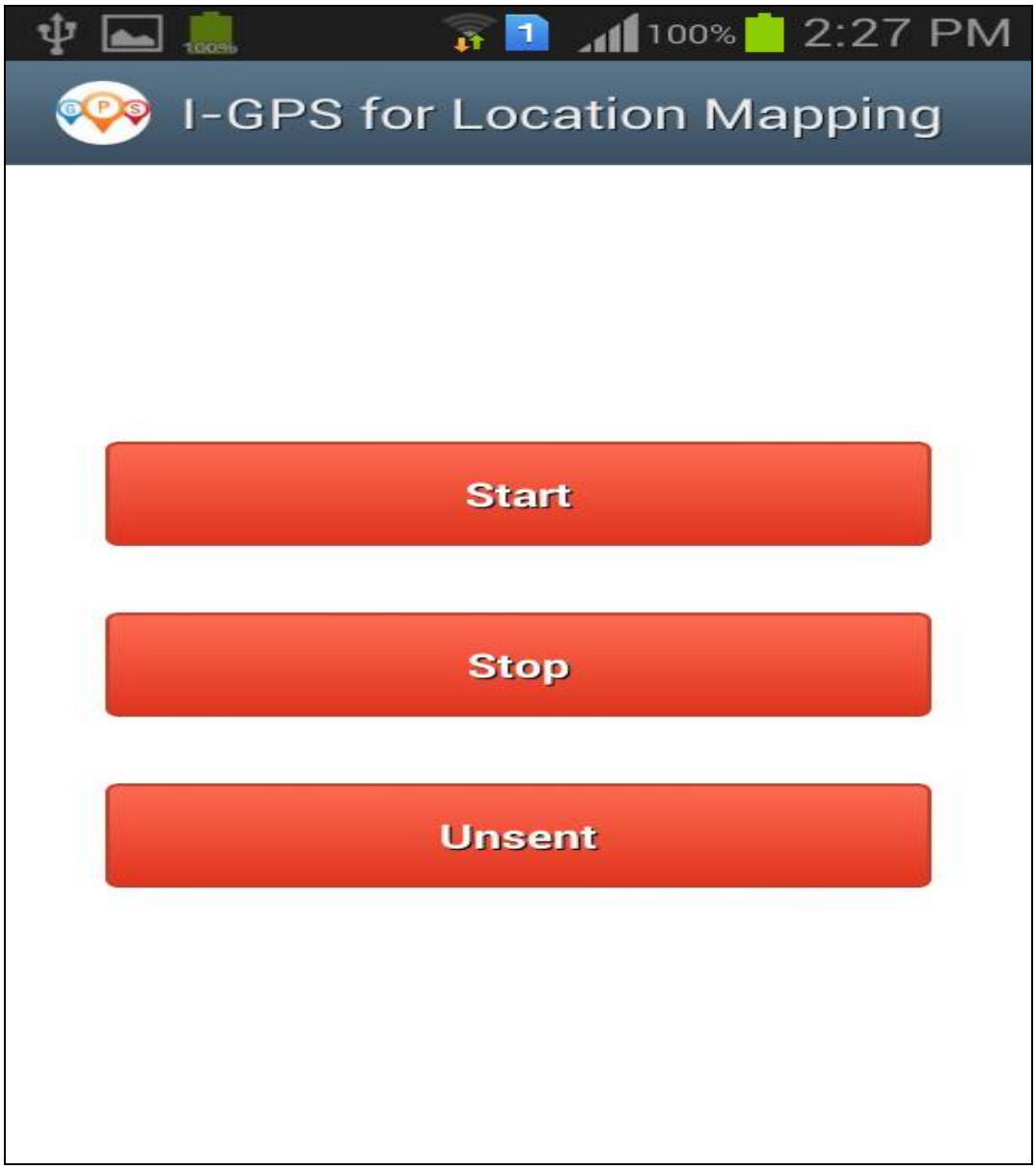

Fig.2. Android Application User Interface

So when the user wants to stop monitoring his location, he has to click the Stop button to stop the application. The Unsent button just shows the data that has not been sent to the server due to the absence of Internet connection. Now, let us dive deeper and look into the detailed workflow of the client-side application.

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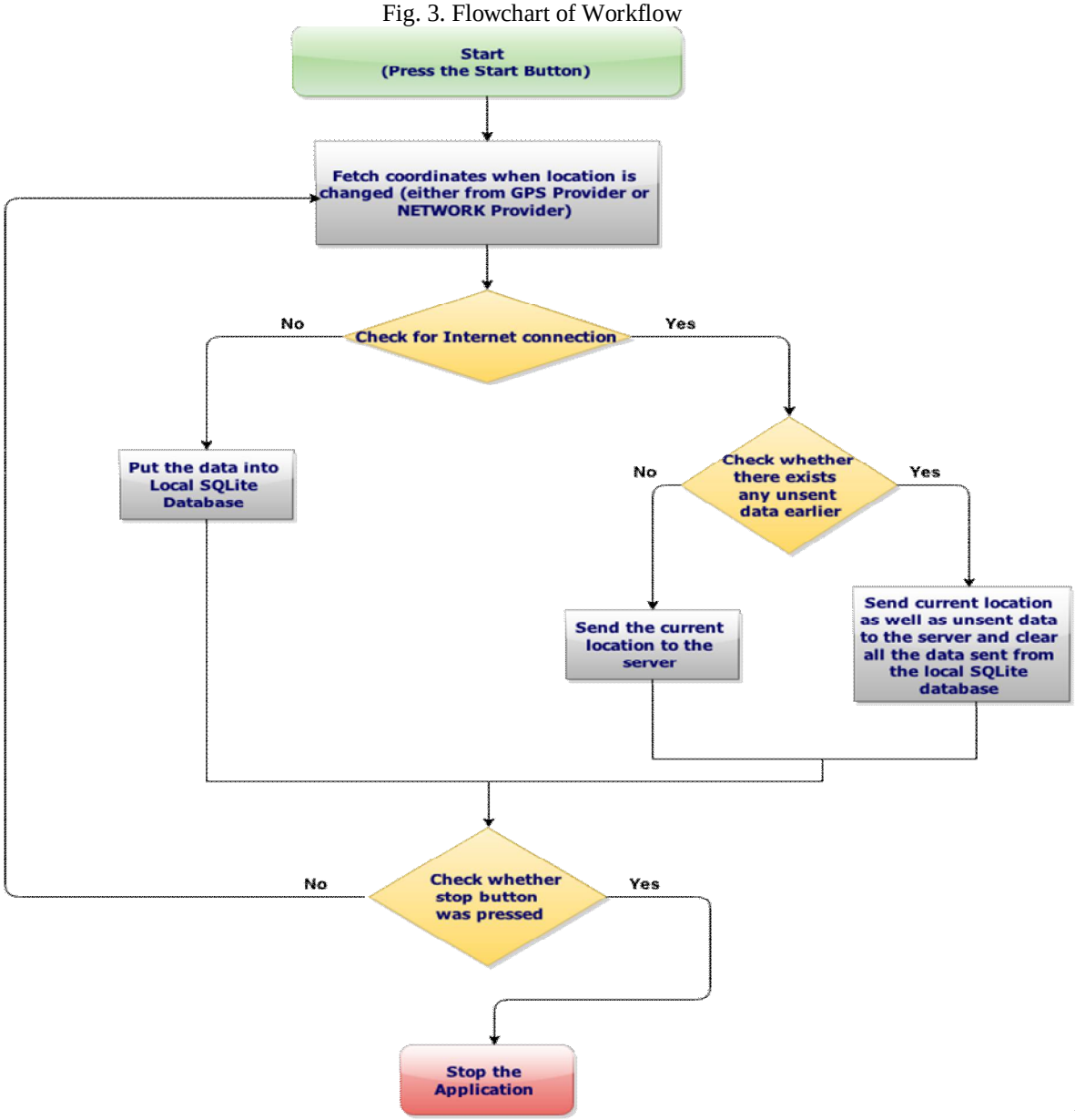
Fig. 3. Flowchart of Workflow



o f Client-side Application

The application starts by the user clicking the Start button. Now, the application starts GPS and other providers such as NETWORK provider to fetch the user's current location coordinates. Here, we make use of NETWORK provider which is fast, but not that accurate. However, this is used for the first fix of the user's current location. Later, we start using GPS provider which provides more accurate information and fetch data whenever the device's location changes. After receiving the coordinates successfully, we check for the Internet connection and sent data such as latitude, longitude, time, speed, MAC ID etc to the server if available or else, the data is put inside the local SQLite database of the application and as soon as Internet is available, the data in the local database is sent to the server [9]. If the user wants to quit the application, click the Stop button to remove all background services that are used for monitoring the location changes of the device. Hence this provides the detailed information of the client-side application. Now let see how the data sent by the Android application is handled by the web-server.

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2. SERVER SIDE WORKING:

After getting the location data, it is either sent to the database on server (if internet connection is available) or is stored on a local database to be sent later when internet becomes available. The fig 4 is used to describe the working of the server side part of the project.

Fig. 4. Request and Response from server

When, once the internet becomes available, the background service which is running continually in the phone will detect successful connection to server at http://103.21.59.166/ and encapsulate the data inside a JSON object which contains Latitude, Longitude, Time stamp, Speed and the MAC ID of the user device for authentication. This JSON object is encoded into URL at http://www.vinkle.com/cordinates.php using POST REQUEST method of HTTP protocol and sent to the server. The server side PHP script has the code to log this data on to the MySQL database which has two tables viz., users and coordinates, which contains user's data and location data respectively. If the data store is successful then a positive response is sent back to the user's device which acts as handshaking. At the first launch of the app the username is recorded along with the device's MAC ID and sent to the database and then user data can be fetched using one of the available providers. To display the location data, PHP page is written which makes use of Google's JavaScript API to display the markers with location (co-ordinates, time and speed) of all the users in the system and also links are provided to see the data of each user individually on a dedicated Google Map.

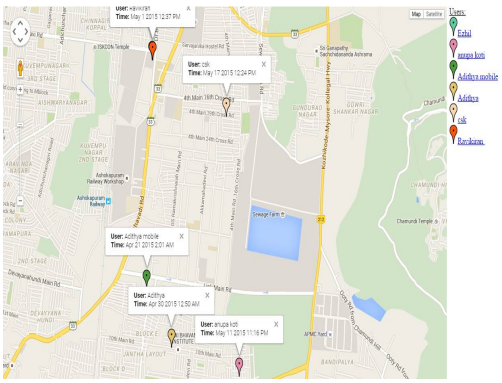

Fig . 5. Realtime positioning of all users

Fig. 6. Detailed tracking of a user

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IV. APPLICATION

Indigenous GPS for location mapping has numerous applications in diverse fields [9] but we need to adapt it based on our requirement for each application. Some of these are:

- It can be used by colleges to track its staff and students and also by offices to track its workers within the campus.
- Can be used in public domain like, passengers waiting for bus can track the exact location of bus if GPS device is present on the bus using mobile phone and make a decision regarding his travel. (Used in some BMTC buses)
- Can be used to track various things like van carrying money for ATM's, school van carrying children, tracking train routes since its generally difficult to establish contact with train because of unavailability of mobile network.
- Can be used by parents to track their children and ensure their safety using only their mobile devices.
- Can be used by administrators of bus services such as KSRTC, BMTC to track all the buses where they are moving in the state/city.
- Disaster Management - At the time of natural calamities, the precise location of the area could be found and precious lives can be saved.
- Vehicle Tracking and fleet management and integration with mobile phones - The timely and secured transportation is ensured which in turn enforces the business and travel.
- It can be used in disaster management systems to route individuals to safety.

V. CONCLUSION AND FUTURE WORK

The location mapping system which we have accomplished is a handy application which can be put to use in many diverse fields. As we have realized the importance of location information and with fast improving technologies, Smartphone using the Android platform are now a household item, and hence a system developed using the integration of the two to provide remote location tracking caters to a number of new needs which are coming up. This also offers effective solution to a number of problems associated with gathering location data dynamically from multiple sources and come up with new products which otherwise would not have been possible. A few possible future implementation of our project would be in these fields:

- Services such as OLA Cabs, Meru Cabs want to get real time location data from its users and its cab drivers network so that it can make an effective system of cab services using the location information and users get quick access to cabs and can reach their destination as early as possible and also cab drivers can maximize their revenue. Our location tracking application can be implemented in such services.
- KSRTC and BMTC bus services are trying to implement costly GPS systems into their buses to track them which are moving across the state. If they can use our application which runs on Smart phones and are available everywhere, then they can save on the costs associated with a dedicated GPS system.
- Nowadays, most of the students are having mobile phone while going to schools/colleges and parents would want to know where their children are. Under these circumstances, if their phones are equipped with our application then their parents can easily get to know where they are present remotely.

VI. ACKNOWLEDGEMENT

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