

Review of Location Based Delivery Management System

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Abstract— An efficient location based delivery management system is occupied with Global Positioning System (GPS) and Unstructured Supplementary Service Data (USSD). The current locations and status of the vehicle can be determined through this system by the client using Google Earth. Through the GPS devices the users can track the position of targeted vehicles and USSD services allow the users to get many services over smart or feature phones. Impossibility of tracking the starting-ending time and the locations of the truck within a planned time frame and monitoring large scale distribution channels are the current issues in the present system. The proposed work is an attempt to monitor the trucks with GPS devices which provide data of the geographical location and time. Users will be able to see the route of the truck when data is loaded on to the google map service. Here, each vehicle record can be uniquely identified and monitored on different time frame. Simultaneously; monitoring, tracking and acquiring various delivery information related to management can be efficiently done with the web app. The new system, helps in decision making, data acquisition, report generating and provides hierarchy of access levels with different authentication. Unstructured Supplementary Service Data (USSD) technology provide pre-defined services such as current location of the truck, time duration, product details etc. The proposed delivery management system can be implemented successfully with GPS and USSD technology in order to fulfil the user requirements.

Keywords— GPS, USSD, GSM.

I. INTRODUCTION

Delivery is the process of transporting goods from a source location to a predefined destination. There are different delivery types. Cargo (physical goods) are primarily delivered via roads and railroads on land, shipping lanes on the sea and airline networks in the air. In the modern commercialized world product delivery is very common. A lot of mishappenings occur on the road every day. Therefore, the need of security and monitoring of the delivery vehicles is essential. GPS and USSD technologies are currently used to maintain an efficient system in the field of consumer product delivery. GPS will receive the coordinates from the satellites among other critical information.

Tracking system is very important in modern world. Which is useful in soldier monitoring, tracking of the theft vehicle and various other applications. USSD provides session-based communication, enabling a variety of applications. It is widely preferred over other existing technologies due to its key attributes. USSD is instead session oriented, unlike SMS, which is a store-and-forward, transaction-oriented technology. This paper presents location based delivery management system which is an improved version of existing GPS tracking system along with USSD technology.

At present there are numerous ways of Delivery management methods used in Sri Lanka. This innovated system can be implemented to large scale distribution channels where they use trucks, containers etc. to deliver consumer products. Once these carriers are left the distribution center it is important keep track on them to make sure whether they cover all the locations (delivery points) required and also in the desired routes. Delivery company's most common problems often include missed or late deliveries. By using a combination of a GPS tracking unit and USSD technology, delivery companies can work towards improving customer satisfaction while decreasing operating costs. If the deliverer is new for the company, he may not have an idea about the location of the delivery points as well as the routes. This proposed system makes their task easier and navigate their location in correct root when they pick the starting locations and destination. These carriers are to be equipped with GPS devices that the company will be able track their movements as a result of GPS technology.

Currently there are no such tracking systems in delivery management that combined with both GPS and USSD technologies. Therefore, there can be many mistakes and errors. Drivers make many mistakes such as missing delivery points, going in wrong routes and wasting of resources. They may intentionally use short routes and surcharge by providing false routes information to the company. The inability of detecting trucks location and provision of insufficient safety are the limitations of the prevailing system. Therefore, they cannot guaranty on the products till the move to the destination.

At present a requirement to solve the above problems is reported as a top concern of distribution agencies in Sri Lanka. Tracking the exact location has become an essential requirement for the distributors, sometimes the information given by the distributors may misleading the company managers. When the delivery items are not reached to the destination at the given period it damages the customer image on the company.

Location tracking is a type of emerging trend in the modern world which has been designed to increasing the security features and to identify exact location of the vehicles (Sathe Pooja, 2013). Real-time tracking method has been seen as the key intelligent feature of the system. Further, GPS tracking system uses USSD, which is faster than SMS and GPRS features. At present, number of tracking systems are available on the context with GPS, GSM, USSD technologies (Abid khan and Ravi Mishra, 2012) ,(Aravind. P, Kalaiarasan.A and D. Rajini Girinath, 2015), (Kotte and Yanamadala, 2013), (Abid khan and Ravi Mishra, 2012), (Kunal Maurya et al., 2013).

Almost everything is monitored by truck GPS tracking systems. The fuel costs and the amount of fuel used can be reduced significantly by maintaining a proper tracking system. Many truck tracking solutions provide speed information and also it provides information when a truck exceeds set speed thresholds. Excessive idling can contribute to high fuel costs for many businesses. Truck GPS tracking can help reduce idling times by alerting when trucks idle longer than a present duration and can take corrective action studies show that tracking the trucks encourages employees to work more effectively and stop utilizing company trucks for personal use. System will inform exactly when employees start work, how long they take for lunches and breaks, and when they stop working for the day, without relying on manual timesheets. Accurate, verifiable timesheets help to avoid paying excessive overtime pay due to timesheet falsification or unintentional errors. The proposed system will minimize most of the issues faced by the modern day distributors and supports administration of the head office.

The rest of this paper is organized as follows. Section 2 describes overview of some existing tracking systems and their behaviors. Section 3 reports brief note on tracking system with GPS and USSD technologies. Section 4 gives design and implementation of the system. Then section 5 demonstrates how system in action. Finally section 6 concludes the paper with a note on further work.

II. SURVEY OF THE RELATED WORK

The term 'tracking' has become most popular at present. Millions of people are using the devices which embedded

tracking systems, for security purposes and to make day to day tasks easy. The interest of using tracking devices has become increased and many research papers have been published. Some of them has discussed technology, issues, highlighted the features and analyzed usages etc. Real-time tracking and management of vehicles has been a field of interest for many researchers and a lot of research work has been done for tracking system. Recently the various anti-theft modules like steering wheel lock equipment, network tracking system and traditional electronic alarm are being developed along with client identification and real time performance monitoring.

A. Technologies

(i) GPS:

GPS vehicle tracking system is employed by ShitalMohol, Amit Pavanikar and Ganesh Dhage. The project is on automotive localization system using GPS and GSM-SMS services. System provide the locations to the owner through SMS at his request. (Shital Mohol et al., 2014) Currently there is no single system that integrates all tracking and tracing of any moveable object. This application is a low cost solution for automobile position and status. It is also very useful in car theft situations and for monitoring adolescent drivers. Moreover, this system can be applied for the child, if they lost or wander.

Although several studies are investigated on tracking systems using GPS, none of them have concerned on locking system which is embedded with GSM and GPS system. According to the research employed by Dr. N.SuthanthiraVanitha the systems Global Positioning system (GPS) and Global system mobile communication (GSM) are used for vehicle identification, implies when the application identifies the vehicle and the location it send SMS to the microcontroller, then microcontroller issue the control signals to stop the engine motor. (R.Ramani and S.Valarmathy, 2013). This system puts the vehicle into the sleeping mode handled by the owner or authorized persons; otherwise goes to active mode. The mode of operations can be changed by persons or remotely. This is an effective solution for the current context.

(ii) GSM:

According to several investigations this paper is based on GPS vehicle tracking/navigation system. This is done by fetching the information of the vehicle like location, distance, etc. In this paper GPS based vehicle tracking/navigation system is implemented and system has used GPS and GSM technologies. This transmitted information is displayed on the display unit by using the google earth to display vehicle location in the electronic google maps. Theft attack has increased and people need a technological method to track the vehicle location and find out the stolen vehicles (Dinesh Suresh Bhadane et al., 2015).

As a result of these problems very efficient system in proposed which uses the GPS and earth maps to help the driver in navigation by robust display of the current position of the vehicle.

(iii) USSD:

This article elaborates the use of the unstructured supplementary service data (USSD) protocol for use in ticket reservation system in any designated stop-point for public transit system. While several studies are investigated on GPS and GSM this bus tracking and ticketing system has used USSD technology. Unstructured Supplementary Service knowledge, a protocol employed by GSM cellular telephones to speak with the service provider's computers. System collect the location, seat vacancy status, traffic patterns and then the algorithms designed ascertain the need for stop-skipping and rerouting (Siddhartha Sarma, 2014). New bus arrival time prediction algorithm that combines GPS data with real-time estimates of inter-stopping points travel speeds.

As a result of study several papers this real time tracking is needed in several aspects of life like tracking vehicle fleet for optimized use of resources, tracing a stolen objects. Unstructured Supplementary Services knowledge (USSD) could be a GSM service that enables high-speed interactive communication between the subscribers and applications across a GSM Network. the first edges of USSD area unit that it's cheaper than existing strategies and allows for in no time communication between the user and an application giving the system real-time characteristics. A.Dabas and others has proposed a unique real-time tracking method with its architecture using USSD and GPS system on mobile station which works in VPLMN. This employed system has been implemented using GPS GSM and AJAX technologies. (Aniket Dabas and Chetna Dabas, 2013).

(iv) RFID:

Research conducted by K.Chaturvedula implemented RFID based embedded system. This paper aims to know the advantages of RFID technology potentialities to scale back the accidents on Indian roads (Kumar Chaturvedula, 2012). The worldwide System for Mobile Communications (GSM) has been an excellent success in providing each voice and low speed information services. the improved Circuit Switched information on GSM (ECSD) is one amongst the most important biological process steps to serve real time high speed information services.

(v) GPRS:

GPS and GPRS Based Tele monitoring System for Emergency Patient Transportation is employed on the emergency patients, this transportation systems uniquely require transmission of data pertaining to the patient, vehicle, time of the call, physiological signals (like ECG,

blood pressure, a body temperature, and blood oxygen saturation), location information, a snap shot of the patient, and voice. System is very useful for the emergency patient transportation begin undertaken by organizations like Emergency Management Research Institute (K. Satyanarayana et al., 2013). Is system has been built around ARM 9/11 microcontroller based module exclusively designed for this purpose and integrated with commercially available GPS and GSM modules and physiological signal acquisition systems like Medicaid and GSM phone with Blue Tooth (BT) facility.

B. Functions

Most of the system are embedded with GPS, GSM and USSD technologies. At the present systems that are with GPS technology used to track the vehicle and peoples' locations.

(i) Vehicle Tracking:

The paper presented by P. Verma describes the real time tracking system that provide accurate user friendly Google map based tracking system. Application monitors the location and route of the vehicles and this observation can be done in any remote location. System has used Global Positioning System (GPS) which will receive the coordinates from the Satellites among other critical information. The system is microcontroller based that consists of a global positioning system and global system for mobile communication (GSM) (Pankaj Verma and J.S Bhatia, 2013). This can be useful in soldier monitoring, tracking of the theft vehicle etc. It is difficult to get the location of the vehicle in critical situations, keep monitoring of the vehicles and select the shortest path available are the current problems that the system face.

(ii) Passenger monitoring:

Numerous work has focused to develop the systems that are embedded with GPS technology. The real time bus monitoring and passenger information system is a standalone system that display locations of the buses in city. Developer intent was to develop a system that display bus stops with expected time of arrival in real time, web based interfaces for control room to monitor buses in real time and mobile application for end user to find out bus schedules. This research serves the needs of passengers, vehicle drivers and administrators of the transport system. With the advent of GPS and the ubiquitous cellular network, real time vehicle tracking for better transport management has become possible (Swati Chandurkar et al., 2013).

III. LOCATION BASED DELIVERY MANAGEMENT SYSTEM
Tracking system has been designed and developed through PHP and also with the help of latitude, longitude and altitude positions that are received through GPS

devices. This section briefly describes tracking system and its usage. With GPS and USSD technologies the proposed system has able to keep the real time up to date truck locations in a map. The data is frequently sent to the database and it updates with the GPS location which is more important for the company. The company fleet manager will able to get the exact location of their trucks and also be able to assume the duration and distance. Finally with the help of these data, company will be able to have a data mining process and predict on the profitable seasons, areas and as well as it is easy when making the salary calculations of the drivers.

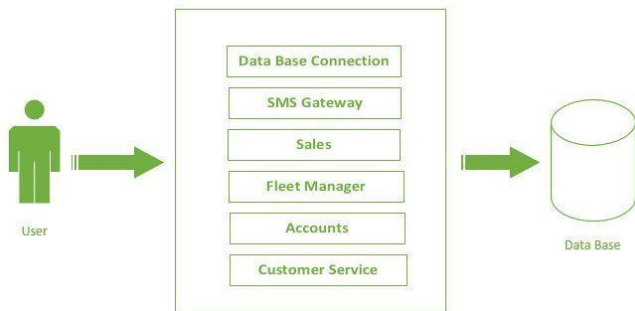


Figure 1: Design of Location Based Delivery Tracking System
Source: Author

Product ordering is done by Sales module. It checks the customer demands and the ordering procedure is based on the requirements. Sending details to the stock department is handled by the sales module and more over it controls the delivering procedure as well. It keeps the details of the delivery trucks and updates them with the processes.

Fleet management module adds the devices to the database and stores all required data of the devices. The new module will be able to add, delete, read or update the devices and also monitoring too can be done. Truck location can be handled by the fleet management module. Analysing, fleet monitoring, graphs processing and reporting are the sub modules that can be seen in the fleet management module.

Customer module keeps the comments, complains and feedback for the company and also it provides login for the system to make their purchase as well. When the customers receive the products they will leave a notification for the company.

The Account module handles all the account processes. So that data gathering company will be able to do a data mining process as well. With this procedure company will be able to identify the profit, loss as well as it is easy when calculating salary for the employees. Account module is the section that use this information in datamining. SMS gateway is the module that handles process that run with USSD technology.

Unstructured Supplementary Services knowledge (USSD) is a GSM service that permits high speed interactive

communication between the subscribers and applications. It's the same as SMS within the approach that it permits to send and receive short text messages. it's totally different in the approach that it's session minded. Since USSD is session oriented, it offers a really short delay between causation the question and receiving the response. This makes it ideal to question info from the network and to produce text content as a service. An USSD gateway may be a platform that permits Operators to introduce electronic messaging services with USSD because the bearer, enabling quicker response times. The platform is complementary to SMS service associated an SMS entree. An USSD gateway acts as an entry between applications and therefore the GSM network and helps you to deliver USSD messages of up to 182 characters on a network between mobile stations and applications.

Along with the USSD technology, the innovated system informs the company users and customers with the details. The details contain the current location of the truck, departure and arrival times, distance they travelled etc. And also when the products are reached to the destination customer will be able to send an email letting them about the arrival of the products. PHP is used to code the USSD functions and the application (fig:2). This online application provide access with hierarchy of authentication levels for the company team and customers.

```

26 // Select all the rows in the tarcklocation table
27
28 $query = "SELECT * FROM tarcklocation WHERE currenttime >= CURDATE( )";
29 // $query = "SELECT * FROM tarcklocation WHERE 1";
30 $result = mysql_query($query);
31 if (!$result) {
32     die('Invalid query: ' . mysql_error());
33 }
34
35 header("Content-type: text/xml");
36
37 // Start XML file, echo parent node
38 echo '<markers>';
39
40 // Iterate through the rows, printing XML nodes for each
41 while ($row = @mysql_fetch_assoc($result)){
42     // ADD TO XML DOCUMENT NODE
43     echo '<marker ' .
44         'id="' . parseToXML($row['id']) . ' ' .
45         'diviceid="' . parseToXML($row['diviceid']) . ' ' .
46         'locationname="' . parseToXML($row['locationname']) . ' ' .
47         'address="' . parseToXML($row['address']) . ' ' .
48         'lat="' . $row['lat'] . ' ' .
49         'lng="' . $row['lng'] . ' ' .
50         'type="' . $row['type'] . ' ' .

```

Figure 2: Development in PHP
Source: Author

Apart from the above main modules, tracking location is a main module in this system. Here the location is received through three satellites and the GPS device sending data into the database. GPS device is used to track the location of the truck and it sends longitude and latitude of the truck position to the data base. The company will be able to monitor the location of the trucks through that data. These GPS data loads on to real time map as well. USSD technology provide services for the company and customers. This technology is

compatible with smart phones and feature phones as well. Through dialling codes, they are able to connect with various services. This technology works with a SMS gateway. Real time map loading with the location is a main feature of the system. Data is received from the database and according to the location truck position is pointed in the map. The proposed system maintains web based online system that has main modules for sales, accounts, fleet management and customers. Login is given through the company and it allows the login for the users who are connected with the company. Company user management done by the top level admin here able to do create, read, update and delete the user accounts of the users.

Company allow the access for customized users by entering proper username and password. Users registration doing through filling main details and system has the ability to detect their access level with the main details. Web application contains the all details of the company as well their product details. Customers have separate login that do not allow to access for the company modules. Customers are allow to leave comments and they able to preview the map with truck location. This solution helps company to maintain their user trustworthiness and satisfaction. Proposed solution can access at any time. System has the ability to add/edit/delete details of company, truck details, map details etc. System have the ability to record and stock details, capture the GPS locations and load a map so on.

Following figures illustrates some of the interfaces of the proposed solution.

Express Delivery Company



Monitoring

User Handling

All Rights Reserved Country Wide Delivery ©

Figure 3: Top admin module
Source: Author

Express Delivery Company



Order Products

Product Delivery

All Rights Reserved Country Wide Delivery ©

Figure 4: Sales module
Source: Author

With an in-depth analysis of data that were gathered and the results that were gained by introducing this system, the mentioned hypothesis can be easily proved. Proposed system have been used in real production company environment and customers comments were proved that Users of the system can easily access through the web application with minimum errors and mainly overcome the existing problem of the system. The quality of the system was in a high with compared to manual system. Customers and the company users who connected with the service can easily access the details that they need. As a whole, Transfusion can be achieved by providing a great chance to the company by product delivery with security and accurately.

VI. CONCLUSIONS AND FURTHER WORKS

This paper presented design and implementation of the improved Location Based Delivery Tracking system. The system has been designed with GPS and USSD technology through PHP, XML and database with MYSQL. Mainly system consist with two main parts, they are online web based application and the SMS gateway with USSD technology. Web based application mainly contain four modules and each of them contains sub modules as well. Location Based delivery management system has been implement as a PHP application and successfully tested with the laboratory environment.

This version of truck monitoring system consists of limited capabilities of the semantics processing. Therefore, android mobile application is essential to enhance the system efficiency and updating functions also essential to enhance the system intelligent.

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