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Robust delivery of multimedia over GPS tracking System

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Abstract: Nowadays, GPS is one of most useful technology in all over the world. Current application of GPS is vehicle tracking system. The ability of tracking used for many purpose like for security, track the exact location of vehicle, number of vehicle on road, fleet management, real-time passenger application. This tracking system continuously locating and monitoring the position of vehicle using various devices like GPS, GPRS, GSM modem and etc. The efficiency of google map is used for navigation system. Mobile application is also available for the vehicle tracking system. In this paper, we are going to discuss about how exactly GPS tracking system works, various tracking system currently used, literature survey on the system. The main component used for developing a tracking device are hardware like microcontroller, GPS receiver, GSM modem and for implementing database and backend we required software like web application, NetBeans. We also provide various pros and cons of system, challenging task for that and how to reduce it, what further expansion is possible for improving power energy and lifetime of device.
Keywords: GPS, GSM, Tracking system, microcontroller, NMEA protocol.

1. INTRODUCTION

1.1 General

In our day to day life transportation is very commonly used. So we need security and monitoring of our vehicle. To overcome this problem, we need to design a system using GPS and GSM technologies. Number of vehicle all over the world is globally increased so maintaining and managing of vehicle is difficult. Also nowadays many children kidnapping, criminal attack, car theft occurs. So we design system for various domain specific. For example, application design for car management is not useful for children theft or passenger system. Here the proposed device is cost-effective, reliable and power efficient.

The global positioning system is widely used for developing application of vehicle tracking device. It uses to driver for suggesting its direction on road. Also used for government vehicle and transportation system for checking security. GPS is real time satellite navigation system. It consistsat least three satellite for finding exact location and position. It uses three-dimensional determination. GPS working in three parts: constellation, controlling and user reception. First the set of satellite sending the signal to GPS receiver, then after control system maintaining the signal in its space segment and send the navigation information with time to the user.

1.2 Objective of Study

GPS is one of the technology which is used in most application in today. One of its application is GPS vehicle tracking system, which track the location of your vehicle and keep monitoring it regularly. Therefore, the development of vehicle tracking system using the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) modem is attempted with the aim of enabling users to locate their vehicles with ease and in a suitablemanner. The system will provide users with the capability to track vehicle remotely through the mobile network.

2. Application of GPS tracking System

Real time management and tracking system is currently wide area for researcher. Various research work is done in this area. Various antitheft devices for fleet management, real time passenger tracking, children safety, network tracking system are developed in this area. There are also various technologies available for cellular positioning, for that we use GSM modem, SIM card for sending exact coordinate of device via SMS (short message service). The main purpose of tracking device is targeting and locating the moving object remotely. Most of system has a device which is install in car, vehicle or buses. This tracking system is also work for bike and children system. It is somewhat different form the existing system. There are various devices available for children safety. We are going give detail about it.

2.1 Vehicle tracking system and antitheft system

An antitheft system is used for detecting and preventing unauthorized user to Access device. The system use GPS device and GSM modem for sending message where the vehicle is currently located. Here we use some embedded device like microcontroller, processor. Google earth is used for locating and tracking the position of vehicle. Vehicle tracking system is also based on some social network like Facebook and twitter. We use web interface to identify the location and use it in android application.

2.2 Fleet management system

Fleet management system is one of the application of tracking system. It is widely used in industries. It helps organization to manage efficiency, security of vehicle through resources which are allocated to them. This is also known as intelligent vehicle tracking system which depend on GPS, GSM and web application technologies. It also uses some TDMA for calculating or estimating location of vehicle. It uses front end and back end technology.

2.3 Real time passenger implementation

Intelligent vehicle transport system is currently developing in India. Real time passenger information system is used for public transportation system like buses, train. The system is working like this; the vehicle units give current position of vehicle to center server using global positioning system via GPRS (general packet ratio services). This information use for informing passenger about next station, in how many time it will come. So here we use route certain utility and voice tagging. For further extension we can use some methodology like if any unwanted situation occurs in vehicle like fuel problem or mechanical problem than we provide sensor that sensing about this event and display or ringing alarm for alert message.

2.4 Soldier safety management

In today's world the security of the nation hinges on the enemies' warfare and so the protection of the soldiers is considered to be playing vital role in it. Concerning the soldier's safety there are numerous instruments to check their health status as well as ammunitions on the soldiers. In soldiers' security, bio-sensors systems give various different types of small physiological sensors, Barometric sensors and Oxygen analyzer sensors [2], transmission modules and processing capabilities [2], and can thus facilitate low-cost wearable unobtrusive solutions for health monitoring. GPS used to log the longitude and latitude because of which direction can be known easily. These devices are used in military application, field commander system. It also works for soldier's heartbeat. It checks health.

2.5 Children kidnapping phenomena

Recently many cases of missing children haveoccurred in India. So we propose a system for make your children safe. We use android based solution for security. The proposed system takes advantages of location service system and cellular phone for making communication between parents and child. The architecture of this system is similar to client-server approach. Also we use small devices which we can attach with children's shoe or school bag for them continuous monitoring.

3. System Architecture and it works

For developing GPS tracking system, we required various hardware and software components.

3.1 HARDWARE and Software components

Hardware design of system in shown in figure.

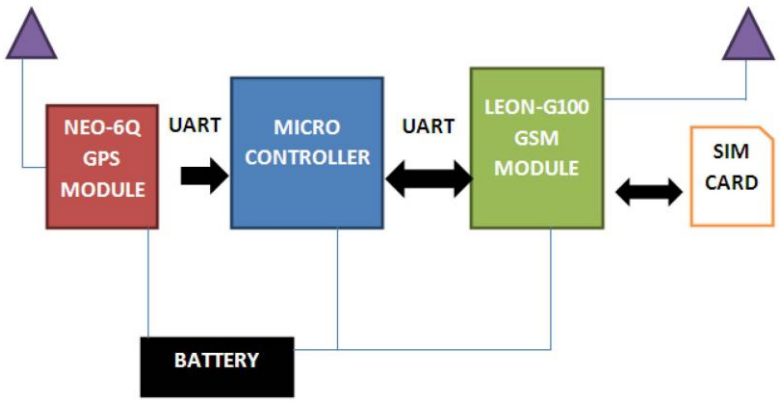

Figure 1. System architecture

Component used in GPS tracking system are listed below

- **GPS receiver**

GPS provide robust delivery of location and time in all atmospheric condition. GPS is used for continuous monitoring of moving vehicle with real time positioning and time. It works in 2-D dimension. It takes coordinates of vehicle using latitude and longitude and send it to the user. GPS receiver module is main hardware which is used by system. Generally, we use u-blox NEO-6Q GPS.

- **GSM module**

It is used for making connection between remote server and device which is in vehicle. Here a SIM300 is used sending message to user. GSM is used for transmitting and sending data. Also we can use GSM/GPRS for getting information in some interval of time. If there is no GPRS data available, then we can also track vehicle using network operator of SIMcard through IMEI number.

- **NMEA protocol**

NMEA stands for national marine electronics association standard 0183. It used for making latitude and longitude in human readable format. The output of GPS receiver is in ASCII form which is set of comma, delimited. It is in sentence format. In order to extract information related its position, time, recommendation we use various identifier which are discuss below.

- $GPALM[1] - GPS almanac data
- $GPGGA[1] - GPS fix data
- $GPGLL – GPS antenna position data
- $GPGRS[1] - GPS range residuals
- $GPGSA[1] - GPS DOP (dilution of precision) and active satellites
- $GPGST [1]- GPS pseudo range statistics
- $GPGSV[1] - GPS satellites in view
- $GPMSS - Beacon receiver signal status
- $GPRMC [1]- Recommended minimum specific GPS Data
- $GPVTG - Course over ground and ground speed
- $GPZDA - GPS time and date

Each identifier has its own field like latitude, longitude, north/south direction, checksum, base station id. We have to convert the value of dd(decimal decimal) to ddmm(degree minutes) format. It is done as below.
e.g. for decimal degree:

dd.ddddd= dd+mmmm/60

for seconds:

ssss=hh*3600+mm.60+ss

- **ARM processor**

It is based on RISC instruction set.

A. Microcontroller

Microcontroller is combination of USB and various small chip. It uses 8-bit microcontroller. It has flash memory, ROM, EPROM.

B. Server design/monitoring unit

Monitoring unit consist of GSM module and database. For server, it has mainly three task: receive information from GPS module and store it in database. For database design we can use MYSQL or any PHP tool. This information about latitude and longitude is display on user mobile using GSM module. Here server is web application based. For that we required some software programming to convert NMEA format, taking latitude and longitude. Here in figure, the complete flow chart of vehicle tracking system is shown below. How each step works.

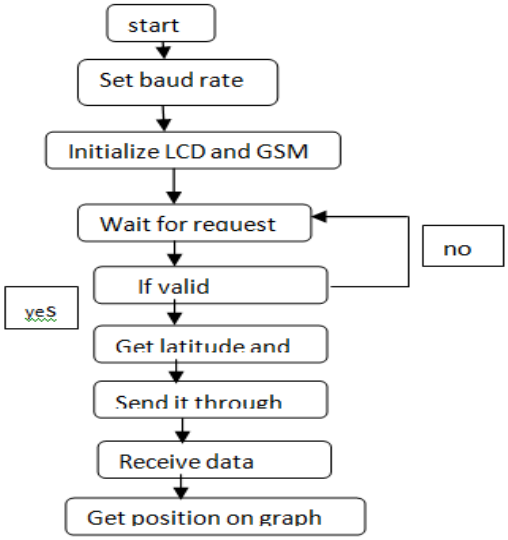

Figure 2. Flow chart of GPS tracking system

4. Various tracking system on GPS technology

4.1 Advance bike security system

It is deal with theft control system. It based on GSM control system. It is used for security system. Main objectives of it is to get co-ordinate of bike using GPS and send it to mobile via SMS. It also removes the physical presentation of person for security. The flow of system is shown in figure. In this when vehicle is start the ignition start and device located in bike ask the person for enter username and password. If it is correct then bike start otherwise it sends message to the owner of bike that something wrong is going on and send location of that vehicle.

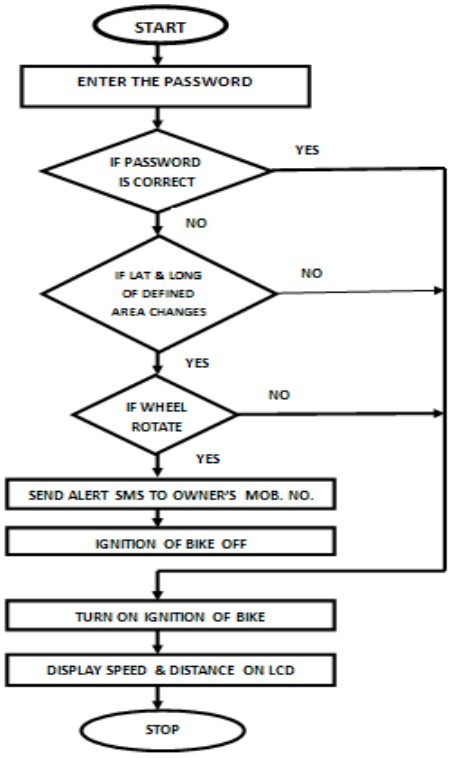

Figure 3. Flow chart of bike system

4.2 Children kidnapping phenomena

This project is used for finding out the best system for children safety. How to track children, how to make secure him. This system uses same equipment which are used for GPS vehicle tracking device. It uses GPS system for locating and

navigating children, use GPRS for use google MAP. GSM modem to send message to parents mobile. It easily locates the missing children. Location is presented using real time high definition resolution google maps.

There are some android application and devices which already exist for children safety. Some of them are discussed below.

A. Children safety using smartphone

It is work as client-server paradigm. There is one cellular tower used for sending SMS to parent's mobile using SIM. Architecture of system is given in figure. It automatically updateslocation of children.

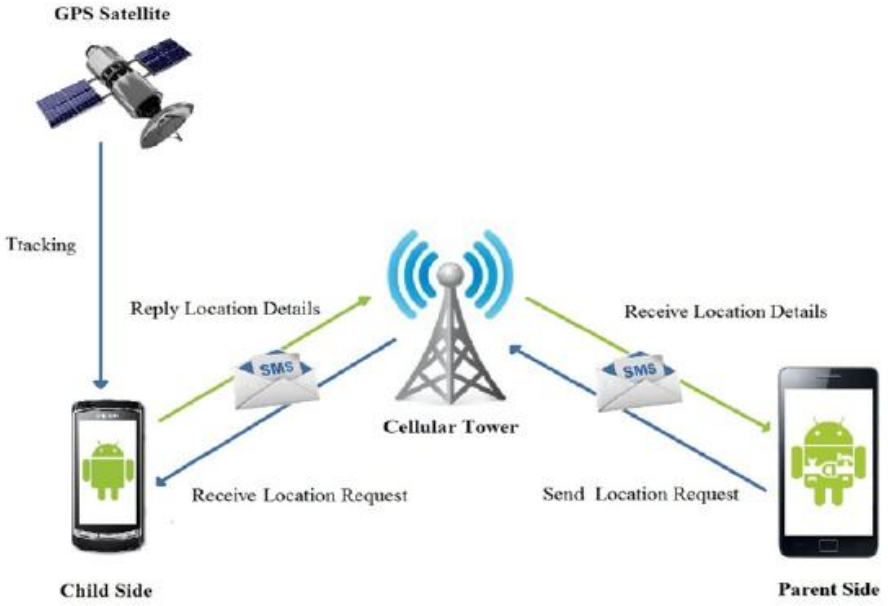

Figure 4. System design

B. GPS tracking child's shoes

In this system, the device is attached with children shoe or put it in his bag. So it continuously locating children's status. Also we can put an alarm system for sensing. If children go beyond the limit of some fixed distance that the alarm is ringing and give alert message to parents.

C. The Toddler Tag Child

This device is used for locating and finding children in crowd and public place. It is small as like key-chain so we can use it easily and carry out anywhere. It is easily attached in shoe and children pocket. Its transmitter range is 30 feet.

5. Future Work and Conclusion

5.1 Future work

For GPS tracking system, power supply is main issue. More energy is required for continuous monitoring. So we can use devices like rechargeable battery. Also use solar energy, store the energy and use this in large equipment.
For children tracking we can fit device in bicycle of child, and make a system like whenever it starts cycling the energy is generated and battery being charge. So it will be also cost-effective so everyone can use it. Also make system for animal theft is currently running.

5.2 Conclusion

In this paper, we summarize all the tracking system which are already existing and scope of it. Also make some new ideas for future expansion. This paper describes the technology use for implementing and developing the tracking system. It givesreal-time delivery of data. Here we have use vehicle geographic co-ordinates and id number. The reliability and stability of system is improved by making some relevant changes and make it more useful for day to day life.

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