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Real Time and Offline GPS Tracker Using Arduino

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Abstract*: In this paper we describe the design and implementation of real time and offline GPS tracker using Arduino. Previously real-time and offline GPS tracker system were implemented separately. When user makes a call on the number which is registered on the GPS-GSM shield attached to Arduino then user receives the location coordinates and data will get stored continuously on SD card at the same time. This work has significant application for vehicle security, salesman tracking.*

Keywords*: Global Positioning System(GPS), Global system for mobile communication(GSM), Arduino, Storage card(SD). SIM908 Shield.*

1. Introduction

This paper gives emphasis on creating a GPS tracking device that helps to track the location real-time as well as offline. The GSM module will be activated only when a call is made by registered mobile number and for offline tracking geographical location will be stored in memory device.

A good example is that of salesmen visiting all the places assigned to them. As per the task the salesman will visit the assigned places and all this data of the traversed path will get stored in the memory card after equal interval of time and this data can be viewed on Google maps by connecting the memory card to laptop. In case if the salesman doesn't return in stipulated time the admin can track his real-time location by making a call which in return will send an SMS indicating the current latitude and longitude.

2. Literature Survey

Paper published by El-Medany, W.; Al-Omary et al shows that by using GM862 cellular quad band module real-time tracking of vehicle is possible. Here by using Microsoft SQL and ASP.net they have tried to view the proper location of a vehicle on map. In the paper, information is also given on the vehicle speed and mileage [1]

Fleischer, P.B.; Nelson et al describes development and deployment of GPS and GSM based Vehicle Tracking and Alert System. Transport companies can track their vehicles in real-time and provides security from robbery and accident occurrences by using this system. [2]

The paper Arduino-Uno Based Mobile Data Logger with GPS Feature, TELKOMNIKA, Vol.13, No.1, March 2015, pp. 250~259 presents the development of mobile data logger device which records temperature, humidity, and location coordinates. This system uses Arduino-Uno board. The device developed here is only used offline. The collected data, which were automatically saved in the SD card, can be retrieved and analyzed using a computer [3]

The Emerging Ethics of Humancentric GPS Tracking and Monitoring Katina Michael, Andrew McNamee, MG Michael School of Information Technology and Computer Science, University of Wollongong, Australia.

The aim of this paper was to explore current commercial services based on GPS technology, with a view to identify the emerging ethical concerns and developing an ethical framework. [4]

Gannan Yuan, Zhi Zhang and Wei Shang Guan have proposed a system named GIS based Vehicle Tracking. The system transmits the coordinates data through GPRS by a GPS device after every interval of 2 minutes [5]

3. Components

In our proposed system when the registered user makes a call to the GPS module, it will connect with the satellite through the antenna which is connected to the board and then send the exact position of it in the form of latitude and longitude through an SMS.

Apart from tracking in real time it will also simultaneously store the data of the traversed path in the memory card. The data which is stored in the memory card is extracted in a excel sheet and uploaded in Google Fusion Table to view in Google Maps.

The system contains three modules: Arduino Mega 2560, GSM-GPS-GPRS SIM908 Shield, GPS Antenna.

3.1. Arduino Mega Board

The GSM enabled GPS enabled pins are held HIGH, then both the pins are held LOW. Now GSM enabled pin is held HIGH

AT+CGPSPWR=1 (turn on GPS power supply)

AT+CGPSRST=1 (reset to GPS mode)

The above commands are run.

Now GSM pin is kept low and GPS pin is turned HIGH. This is the process to turn on the GPS tracker. GPS starts collecting location data, this data is sent in form of SMS. Also text file on memory card is open and location data is written on it after few seconds. GPS module cannot perform all these activities on its own. That's how Arduino coordinates of GPS tracker controls its functioning.

3.2. GSM-GPS-GPRS SIM908 Shield

This shield that is mounted on the Arduino board will track the location with its antenna, and send the data of the location to the Arduino board through Serial Communication and finally send the information in the form of text message on the registered mobile number on receiving a missed call from it.

3.3. GPS Antenna

GPS stands for Global Positioning System, which requires unobstructed line-of-sight and four satellites to function. All GPS satellites constantly transmit the signals indicating the current position above the earth. GPS antenna is used to collect device co-ordinates through satellite. This co-ordinate are forwarded to SIM908 Shield.

4. Methodology

In this system two SIM cards come in contact with each other, one SIM card is in the mobile of registered user and other SIM card is placed on the GPS-GSM module. The tracker unit consist of GPS module attached to the Arduino board with two separate batteries. This tracker is hidden in the car. When the car is moved in an unauthorized manner, registered user gives miscall on the trackers mobile number. When the call is disconnected, tracker obtains longitude and latitude and send the detailed information in the form of SMS to the caller. At this time tracker starts writing location information on the memory card after every 10 seconds. The data which is stored on memory card can be extracted on excel sheet and uploaded in google fusion table to view in google maps. The figure given below shows architecture of the real-time and offline GPS tracker.

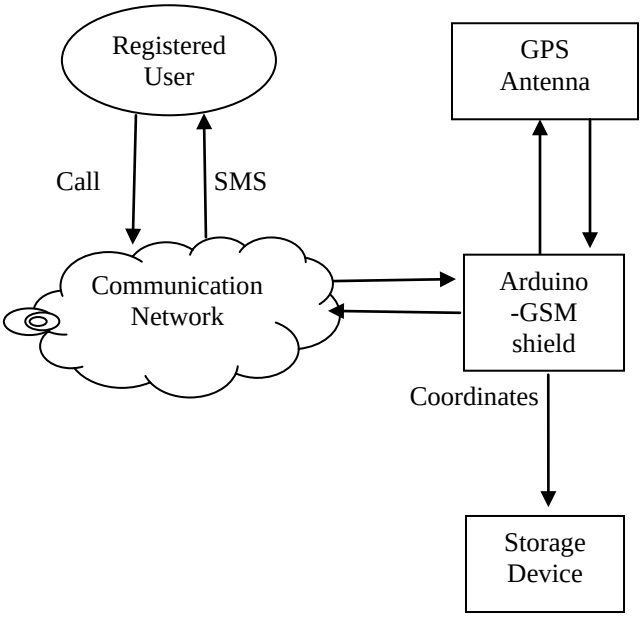

Fig.1. Architecture of Real-time and offline GPS tracker

5. Work Flow

The workflow for Real-time and offline GPS tracker in given below.

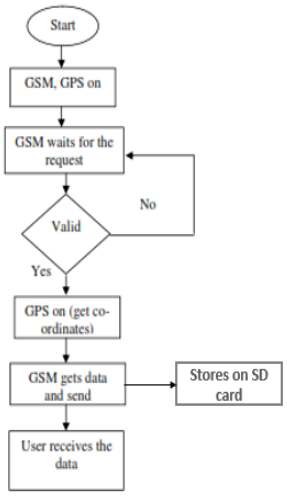

Fig 2. Work Flow of System

6. Conclusion

In this paper, we have discussed the implementation of real time and offline system on the same hardware, which tracks user's location in real-time when connected to GSM network through GSM-GPS shield by sending the coordinates and when the device is not in network it will store the coordinates in storage device.

7. Future Scope

In future the system can also be modified for

1. Security for children
2. When child is kidnapped, to hear the conversation of thieves/ kidnappers, the microphone can listen their conversation and transmit audio to registered user who can listen to conversation.
3. It can be used as a substitute to mobile phone as it has speaker and microphone to have real-time conversation
4. Integrate with camera for real-time use
5. Fire services and department of police.

8. Reference

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3 Arduino-Uno Based Mobile Data Logger with GPS Feature TELKOMNIKA, Vol.13, No.1, March 2015, pp. 250~259

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7 Exploring Arduino- A book by Jeremy Blum

8 Website: https://www.arduino.cc/ A complete guide to Beginners.