International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2017 IJSRCSEIT | Volume 2 | Issue 6 | ISSN : 2456-3307

Real Time Tracking and Monitoring System for any Mobile Applications

Basanta Mahato, Deepak Sahu
Department of Electronics & Communication Engineering, IIMT College of Engineering, Greater Noida, Uttar Pradesh, India

ABSTRACT

A real time tracking and monitoring unit is a revolutionary thing in security of people, developed in this field but this is Real Time Monitoring Unit (RTMU) modify form of all the technology because till now we can use tracking unit in vehicle only but we can use RTMU in all the security place with eco-friendly as well as easily operated by user. RTMU is totally operated on user control and easily send data and store data as per requirement. This paper is proposed to design a Real time Tracking and Monitoring Unit using GPS and GSM technology, which cheapest source of tracking and it would work as anti-theft system. Microcontroller based tracking and monitoring system has been investigated in this paper, whose hardware boards use 8-bit RISC processor, GSM-GPSR Technology and data logger with cell phone. The novelty of this system is fully user controlled so that he can operate and trace path as per his necessity.

Keywords : GPS, GSM, Kalmet Filter, Microcontroller, Deadrecoking & Data logger.

I. INTRODUCTION

Everyone want to safe and secure life which is major concern nowadays we can use RTMU which is size similar to mobile phone or less (in case of vehicle we can use in built tracking system and for banks and building it is some larger because it consist control panel). For tracing we have control room which is totally microcontroller and programming based so easily operated and automatically update and to taking action Police and team easily trace and workout. Generally this system is meant to be installed for the four wheelers but for country like India where majority of the people using two wheelers, here is the cheapest source of RTMU. Tracking Systems are commonly used by fleet operators for fleet management functions such as routing, dispatch, on-board Information and security. Other applications include monitoring driving behaviour, such as an employer of an Employee, or a parent with a teen driver.

The rest of the paper is as follow. We review related technology in section II. In section III we proposed the design of tracking system and implementation. We conclude our work, advantages of device and future scope in section IV.

II. RELATED TECHNOLOGY

A. GPS Technology

The Global Positioning System (GPS) is the only fully functional Global Navigation System (GNSS). The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals that enable GPS receivers to determine their location, speed, direction, and time. A GPS receiver receives the signals from at least three satellites to calculate distance and uses a triangulation technique to compute its two dimension (latitude and longitude) position or at least four satellites to compute its three dimension (latitude, longitude and altitude) position.

Therefore GPS is a key technology for giving device its position. GPS was developed by the United States Department of Defense. Its official name is NAVSTAR-GPS. It is originally used in military services but later allowed the system available free for civilian use as a common good. Since then, GPS has

become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, and scientific usesIn This device we use a GPS receiver of HOLUX GR-213 series.

Figure 1. GPS

GPS parameters and specifications are given below.

- Builds on SiRFstarIII chipset with embedded ARM7TDMI CPU available.
- 20 parallel satellite tracking.
- Support NMEA 0183 v2.2 data protocol.
- Built-in hardware Tracking Loop Processor WAAS/EGNOS Demodulator.
- Built-in repeatable and rechargeable Lithium-ion battery for Time-to-first-Fix(TTFF).
- For Car navigation, marine Navigation, Fleet Management, AVL and Location Based.

III. GSM Technology

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. GSM (Global system for mobile) uses a process called circuit switching.

This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed.GSM networks consist of thee major systems the Switching System (SS), The Base Station(BSS) and the Mobile station(MS).

B. The Switching System

The Switching system is very operative system in which many crucial operations are conducted, SS systems holds five databases with in it which performs different functions. If we talk about major tasks of SS system it performs call processing and subscriber related functions. These databases from SS systems are HLR, MSC, VLR, AUC and EIR. The MSC in cooperation with Home Location register (HLR) and Visitor location register (VLR), take care of mobile calls and routing of phone calls. Authentication centre (AUC) is small unit which handles the security end of the system and Equipment identity register (EIR) is another important database which holds crucial information regarding mobile equipments.

C. Base Station System (BSS):

The base station system have very important role in mobile communication. BSS are basically outdoor units which consist of iron rods and are usually of high length. BSS are responsible for connecting subscribers (MS) to mobile networks. All the communication is made in Radio transmission. The Base station System is further divided in two systems. These two systems, they are BTS and BSC. BTS (Base Transceiver station) handles communication using radio transmission with mobile station and BSC (Base station controller) creates physical link between subscriber (MS) and BTS, then manage and controls functions of it.

D. Mobile Station (Subscriber):

MS consist of a mobile unit and a smart card which is also referred as a subscriber Identity Module (SIM) card. This card fitted with the GSM Modem and gives the user more personal mobility. The equipment itself is identified by a unique number known as the International Mobile Equipment Identity (IMEI).

Figure 2. GSM SIM900D

The GSM modem used in this device is SIM 900D.The parameters and specification of our GSM modem is given below.

- High Quality Product (Not hobby grade)
- Quad-Band GSM/GPRS
- 850/ 900/ 1800/ 1900 MHz
- Built in RS232 Level Converter
- (MAX3232)
- Configurable baud rate
- SMA connector with GSM L Type
- Antenna.
- Built in SIM Card holder.
- Built in Network Status LED
- Inbuilt Powerful TCP/IP protocol stack
- for internet data transfer over GPRS.
- Audio interface Connector
- Normal operation temperature: -20 °C to
- +55 °C
- Input Voltage: 5V-12V DC

IV. ARDUINO BOARD

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

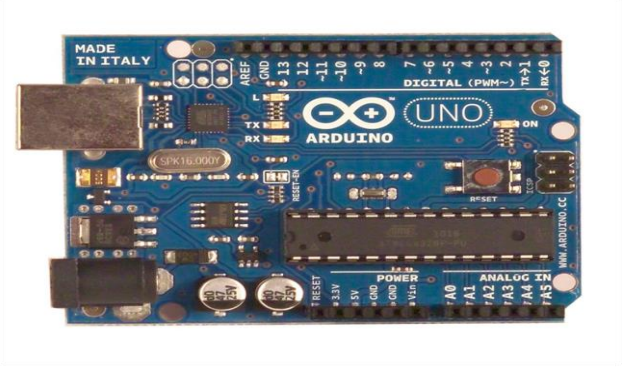

Figure 3. MICROCONTROLLER BOARD

Microcontroller	**ATmega328**
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input	Pins 6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB of which 0.5 KB used by boot loader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

TABLE I. MICROCONTROLLER BOARD SPECIFICATION

E. KALMAN FILTER

The Kalman filter is a set of mathematical equations that provides an efficient computational (recursive) means to estimate the state of a process, in a way that minimizes the mean of the squared error. The filter is very powerful in several aspects: it supports estimations of past, present, and even future states, and it can do so even. When the precise nature of the modeled system is unknown.

F. DEAD RECKONING

In navigation, dead reckoning is the process of calculating one's current position by using a previously determined position, or fix, and advancing that position based upon known or estimated speeds over elapsed time, and course.

Dead reckoning is subject to cumulative errors. Advances in navigational aids which give accurate information on position, in particular satellite navigation using the Global Positioning System, have made simple dead reckoning by humans obsolete for most purposes. However, inertial navigation systems, which provide very accurate directional information, use dead reckoning and are very widely applied.

By analogy with their navigational use, the words dead reckoning are also used to mean the process of estimating the value of any variable quantity by using an earlier value and adding whatever changes have

occurred in the meantime. Often, this usage implies that the changes are not known accurately. The earlier value and the changes may be measured or calculated quantities.

G. DATA LOGGER

By interfacing of SD card with microcontroller for the data transfer in raw format as well as in FAT32 format. It started with raw data transfer, sending some data to any block of the microSD, reading a block of it, reading and writing multiple blocks, erasing multiple blocks. We used RS232 for viewing the data read by microcontroller from SD card. The microcontroller sends the data to HyperTerminal. Similarly, to write data to card, the data was fed thru HyperTerminal, by typing some text.

Once raw data transfer achieved, I formatted the card with windowsXP (FAT32) and loaded it with some text files, directories and other files (all stored in root directory of the card). After that I wrote the FAT32 routines to read files, get file list (using HyperTerminal again), finding the total/free memory of card. All this data is sent to HyperTerminal by the microcontroller.

V. DEGIN AND WORKING

In this paper it is proposal to design an embedded system which is used for tracking and monitoring of any movable or non-movable thing and person by using GPS and GSM. In this device ATMEGA-128 microcontroller is used for interfacing to various hardware peripheral.

In RTMU we used different sensor for different application which is interference with microcontroller as per application.

First of all, sensor give interrupt to microcontroller as per user instruction and in case of two way communication the instruction is give to microcontroller through receiver or through DTMF circuit. After that the microcontroller flow the command as per user requirement and send GPS for location of object then that data from GPS is sends to the user through GSM module. For doing so an ATMEGA-128 microcontroller is interfaced serially to a GSM Modem and GPS Receiver. A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the object. The GPS modem gives many parameters as the output, but only the NMEA data coming out and sent to the mobile at the other end from where the position of the vehicle is demanded. When the request by user is sent to the number at the modem, the system automatically sends a return reply to that mobile indicating the position of the vehicle in terms of latitude and longitude.

Apart from this we can add KALMAN FILTER and DEADRECOKING but by using this cost of RTMU is increased so that we can minimized the component of GPS and GSM as per used.

For data storing on controller side we can use DATA LOGGER v3.2 so that we can store maximum data.
The code is written in the internal memory of Microcontroller i.e. ROM. With help of instruction set it processes the instructions and it acts as interface between GSM and GPS with help of serial communication of ATMEGA-128. GPS always transmits the data and GSM transmits and receive the data. GPS pin TX is connected to microcontroller and GSM pins TX and RX are connected to microcontroller serial ports. Microcontroller communicates with the help of serial communication. First it takes the data from the GPS receiver and then sends the information to the owner in the form of SMS with help of GSM modem. GPS receiver works on 9600 baud rate is used to receive the data from space Segment (from Satellites), the GPS values of different Satellites are sent to microcontroller ATMEGA-128, where these are processed and forwarded to GSM.

At the time of processing GPS receives only $GPRMC values only. From these values microcontroller takes only latitude and longitude values excluding time, altitude, name of the satellite, authentication etc. E.g. LAT: 1728:2470 LOG: 7843.3089 GSM modem with a baud rate 57600.GSM is a Global system for mobile communication in this device it acts as a SMS Receiver and SMS sender. The power is supplied to components like GSM, GPS and Micro Control circuitry using a 12V/3.2A battery .GSM requires 12V, GPS and microcontroller requires 5V with the help of regulators we regulate the power between three components.

VI. CONCLUSION

By using RTMU we can make our surround safe and secure. Now we can make this more applicable and cheaper so that this device is in range of all users because safety is more matter. And for this we don't want that any one will not use this device due to money matter.

RTMU is also used for this purpose like in below given case.

- Track Suspected terrorists
- Convenience
- Parents tracking children
- Police used to track a suspected criminal or terrorist

There are many advantage of RTMU rather than disadvantage and we also work on to minimize the disadvantage and cost.

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