Advanced Vehicle Tracking System with Display Unit

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Abstract— In mobile communication system, GSM and GPS plays a major role. Global Positioning System (GPS) is used for implementing vehicle position tracking and Global System for Mobile Communication (GSM) is used for transmitting information about the vehicle’s position between user and the vehicle. The vehicle tracking system consists of two modules namely: vehicle unit and receiver unit. The vehicle unit consists of GPS receiver to receive the vehicle position from GPS satellite and also provides LCD to display the information. A receiver unit receives information about vehicle’s position and also transmits messages to the vehicle unit. Here mobile phone acts as a receiver unit. These modules are implemented using code vision AVR compiler. This provides higher efficiency compared to other existing techniques.

Key words: GPS, GSM, Tracking, Vehicle, Receiver, SIM, SMS

I. INTRODUCTION

Global positioning system (GPS) based tracking system is a real-time system, which is useful for monitoring and tracking the vehicle’s position in a particular location. GPS technology is widely used for tracking the location of an object or a vehicle carrying goods. For example, tracks the vehicle for an international transportation of products to other countries. This system provides positioning and navigation to all users in the world in all other conditions like weather, day, night and anywhere on the Earth. This Bus Tracking System is more efficient and convenient because it satisfies passenger’s commands and identifies bus location in real time [1]. The GSM modem provides an effective communication from user to vehicle and vehicle to receiver. This paper describes the advantage of wireless technologies used in bus system and make it more reliable. The main objective of this paper is to do a research on the use of tracking system using wireless technology, making it more efficient, reliable and less expensive. This system enables the users to effectively use the transport system and provide communication using GSM. The user should use mobile phone or LCD display to receive messages and send messages through it. The GSM modem connected to the bus can be used by the user to access the same data wirelessly through mobile phone.

II. PROPOSED WORK

The main objective of this project is to make a system, which is capable of monitoring the path of the vehicle with help of GPS application on mobile and to display data on LCD with high accuracy for long distance. GPS system receives signals from satellites and information about vehicle’s position can be received by GPS receiver. These data can be processed using controller and it can be transmitted to the receiver unit using GSM modem. Reset signal can be used to restart the microcontroller. LED indicator is used to indicate the messages receiving in the system. Receiver unit (Mobile phone) will receive information about vehicle’s position from GPS transmitter via GSM modem and it also acts as a transmitter for sending data to the vehicle unit.[2]

![Fig. 1: Block diagram of Vehicle Unit](image1)

![Fig. 2: Structure of Receiver](image2)

The vehicle system consists of the following components are as follows: [2]
- GPS receiver
- GSM modem
- LCD Display
- Microcontroller unit

The microcontroller circuit and other hardware will be powered by a supply. GPS sends the location (latitude and longitude) of the vehicle to the microcontroller. Interfacing unit acts as an interface between two blocks, which acts as a transceiver (both transmitter and receiver) for interchanging the signals and provides communication between them.

The microcontroller sends this information as a message text via GSM modem. All this information can be send to receiver using GSM modem. Likewise, receiver can also send information to the vehicle unit. The transmitted messages from receiver can be received with help of GSM service. This information will be noticed by LED indicator in the vehicle unit.[3]
A. GPS Operation:

Initially GPS receiver is ready to receive the signal from the GPS satellite. If the GPS receiver receives the vehicle’s signal from the GPS satellite, then the latitude and longitude position is identified. These latitude and longitude position of the vehicle will display on the LCD display of the vehicle. If it occurs, then the process gets stop. [4], [5]

III. TECHNICAL DESCRIPTION

A. GPS:
A GPS receiver calculates vehicle position by timing the signals sent by GPS satellites above the Earth. Each satellite continuously transmits messages that include
- The time at which the message was transmitted
- Position of satellite during message transmission

The receiver uses the receiving message to find the transit time of every message and using the speed of light, it computes the distance to each satellite. A sphere can be defined by each of these distances and location of satellite’s. If the distances and the location of satellites are correct, the receiver can be placed on the surface of these sphere. Using the navigation equations, these distances and satellites’ locations computes the location of the receiver. Now this location includes latitude, longitude and altitude can be displayed. [6], [7]

GPS measurements shows only a position. It neither shows speed nor direction. However, from two or more position measurements, GPS units can derive velocity and direction of movement automatically. The disadvantage of this principle is that only by using a delay, changes in speed or direction can be computed. During the distance effect, the derived direction becomes inaccurate. In this GPS operation, to obtain an accurate result, two or more satellites can be used. Four sphere surfaces do not interfere with it. Because of it, the solution gives the receiver’s position along with the difference between the time on receiver’s clock and the time-of-day. In order to find the intersection, these navigation equations can be solved. The advantage of this GPS is cheap and accurate timing. Some of these includes traffic signal timing, time transfer and synchronization of cell phone base stations. [5], [8]

B. GSM:

GSM is a standard used by mobile phones to describe protocols for second generation digital cellular network, which means that by searching for cells in the immediate area, mobile phones can connect to it. There are five different cell sizes used in a GSM network. They are macro, micro, pico, femto and umbrella cells.[9],[10]

When the base station antenna is installed on a building above average roof top level, it can be regarded as macro cells. When the antenna height is below the roof top level, it can be named as micro cells; they are used in urban areas. The coverage diameter of pico cell is a few dozen metres. Hence they are termed as small cells; they are used in indoors. The cells which covers the smaller cells shadowed regions and fills a gap between these cells is named as umbrella cells .SS-the switching system, BSS-the
base station system, and OSS—the operation and support system are the three major systems of GSM network. GSM networks can operate in number of varied carrier frequency ranges. 2G GSM networks operating in the range of 900 MHz or 1800 MHz bands. Instead of these bands, the 850 MHz and 1900 MHz bands were used.

According to the implementation environment, the coverage area of each cell varies. The modulation used in GSM is Gaussian minimum-shift keying (GMSK). It is a kind of continuous-phase frequency shift keying technique.

In GMSK, first the signal is modulated with carrier and is smoothed with a Gaussian low-pass filter. Then it is fed to a frequency modulator, which reduces the adjacent-channel interference.

1) Features: This GSM modem has some important features include:
- It supports voice, integrated TCP/IP stack, GPRS, data/Fax and SMS.
- Commands can control it.
- It uses 12V/1A dc voltage using ac/dc power adaptor.

C. SIM:
GSM has a main feature called Subscriber Identity Module (SIM), commonly known as a sim card. Using sim card only, SMS can be transmitted from one mobile phone to other [11]. The SIM is a smart card which contains the subscription information of user and phone book. After switching handsets, it allows the users to retain their information. Alternatively, the user can also change operators simply changing the SIM. Some operators provide only single SIM, hence they will block this by, or only a SIM issued by those operators; this method is known as SIM locking. [12], [13]

1) Phone Locking:
Sometimes mobile network operators restrict other handsets for their own network. This is called locking. It is implemented by a phone’s software feature. A subscriber may usually use the following ways to remove the lock: [14]
- Contact the provider for a fee
- Use private services
- Use of free or fee-based software
- Websites.

D. LCD:
A liquid crystal display (LCD) is a thin, flat display device. It is made up of monochrome pixels arrayed in a light source or by any number of colour. This type of displays are used in digital watches and portable computers. LCD display has a sheet of polarizing material and a liquid crystal solution between them. Each pixel consists of liquid crystal molecules which is suspended between two transparent electrodes, two polarizing filters and the axes of polarity. The axes of polarity is placed perpendicular to each other.

The sheets without the liquid crystals make the light passing through one sheet will block the other. The liquid crystal varies the light polarization entering one filter can pass through the other. By controlling the colour of light, LCD can display images. An LCD monitor’s brightness can be provided by backlight. Main advantage in LCD’s is to reduce liquid crystal cell response times. [15]

IV. EXPERIMENTAL RESULTS
In this research, GPS system is used to track the object with GSM modem for communication. Thus the design and implementation of an efficient tracking system is proposed and developed. The shown images display the latitude and longitude position of the vehicle.

V. CONCLUSION
This paper presents a tracking system, which is able to track the position of an object using GPS and GSM devices. The receiver can get the current location of the vehicle using mobile phone. Thus this system provides reliable tracking and efficient communication with reduced system complexity.

REFERENCES


