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Personal Handy System Based Vehicle Tracking and Mobile Locking

Ashwini S[1] Gagan G[2] Gauthami Keshav[3] Keerthi S[4] Prof.S.Sowndeswari[5]

[1,2,3,4,5] *Department of Electronics & Communication Engineering*
[1,2,3,4,5] *Sambhram Institute of Technology, Bangalore-97, India.*

ABSTRACT

Global Positioning System (GPS) is a satellite navigation system used to determine the ground position of an object. They can be used to map forests, also helps farmers to harvest their fields and navigate airplanes on the ground or in the air. Sometimes, the GPS signals are not accurate due to some obstacles such as buildings, trees and by extreme atmospheric conditions. To overcome these limitations, we propose Personal Handy System (PHS) for vehicle tracking and locking facility from a remote end of users. In case of vehicle theft, "Personal Handy System" (PHS) is an alternative technology for Global Positioning System (GPS). In Personal Handy System (PHS), vehicles are positioned with the help of low earth orbit satellites constantly. The vehicle tracking unit in PHS makes use of RF frequency to assist the RTO, Cargo Companies, Police Department and Public Transport to know the position of vehicles and it is locked using locking unit.

Key words: Personal handy system (PHS), GPS, GSM.

1. INTRODUCTION

The Global Positioning System is used to track the vehicles using Low Earth Orbit Satellites continuously in present scenario. But if the vehicle moves beyond the network area, it will not be possible to track the vehicle using GPS, to overcome this problem personal handy system is provided which works even if the vehicle is in not reachable area. The Personal Handy System (PHS) service was launched first in 1995 to respond to the diversified demand of mobile communication in Japan. Since then, subscribers have been steadily increasing in China and Impressive development centring on Southeast Asia is also seen to be growing. Kyocera has been the major supplier of PHS equipment in Japan as well as in China and Southeast Asian market. The increase in number of vehicles on-road brings not only revenue but also headache to Transport Office, Police Department, and others too. It is tedious to maintain the details of each vehicle, which is running on the road.

With the help of this system, it is possible to easily track vehicle for its geographical locations on a Microcontroller screen. The operator can see the vehicle's current location in real time mode. Whenever a vehicle equipped with it ID Transmitter enters a "cell" / geographical location, that particular "Cell Unit" or "Cell Broadcaster" sends a wireless message to the centralized base unit. In turn the base unit receives the VHF message from the "Cell Broadcaster" and after processing & decoding displays the geographical location of the vehicle on a graphical form on the MC monitor screen. This way the user can find the vehicle in real time mode

& if any necessary the user can lock / immobilize the vehicle under observation; he can do so with the help of control software installed in the Microcontroller. Primarily this system is aimed at the rapidly growing segment of call centre vehicles. This technology forms an integral part of Call Centre Transportation System resulting in a reliable, secure & easy to control system for the call centre vehicle transportation.

PHS operates like cordless phone within house, cell phone outside the house and satellite if out of reach. Also it provides very high speed wireless data transmission. The system setup can be made more interactive by adding a display to show some basic information about the vehicle and add emergency numbers, which can be used in emergency which also makes it more efficient.

The system consists of vehicle tracking and vehicle locking unit. Vehicle Locking facility is provided using DTMF Technic**.** The DTMF decoder used here is CM8870.In addition to this Anti collision and smoke detection applications are also facilitated.

In Vehicle Tracking unit, Where ever the vehicle maybe located we can track the thefted vehicle each second of the clock without any interruption in the connectivity.

2. PROPOSED SYSTEM

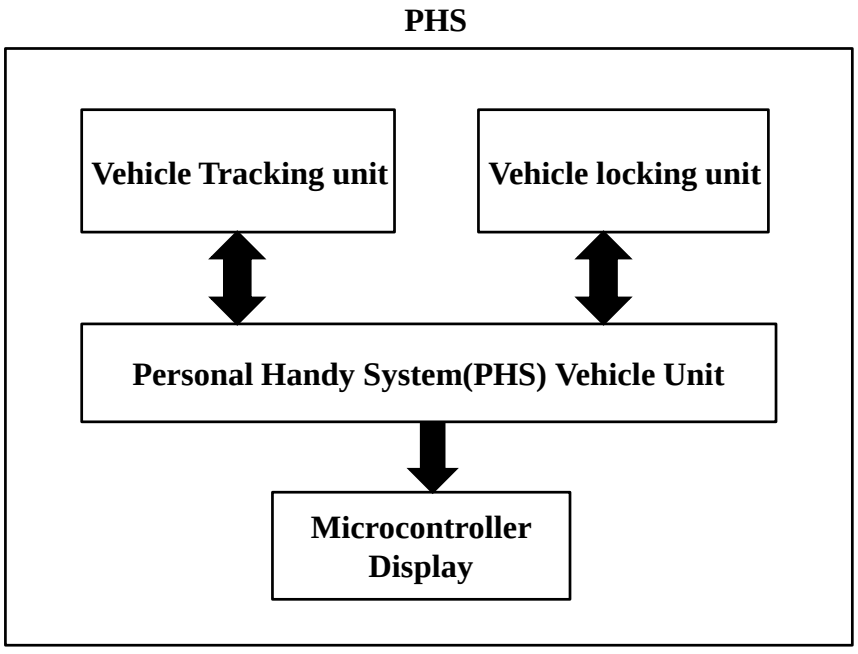

Fig 1.Block diagram of proposed system.

Personal Handy System (PHS) mainly consists of 2 units they are:

1- Vehicle tracking unit.
2- Vehicle locking unit.

2.1. VEHICLE TRACKING UNIT

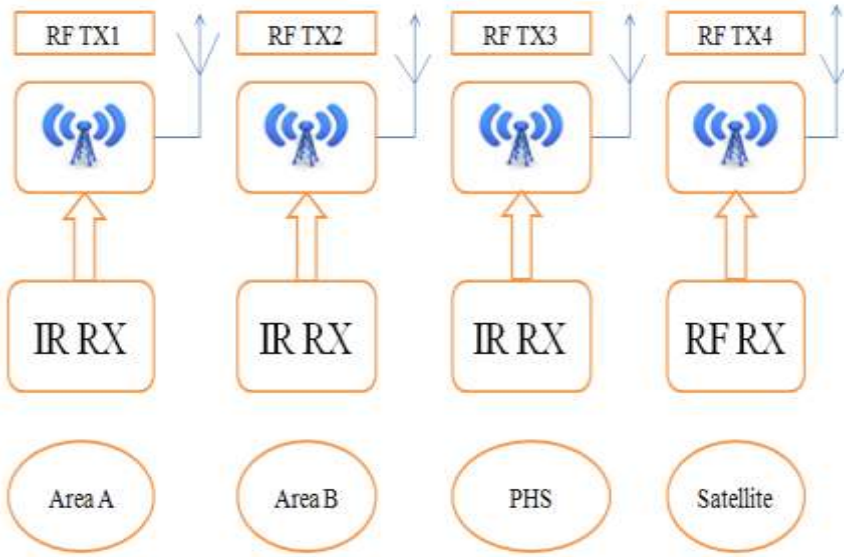

Fig2. Vehicle tracking unit.

Vehicle tracking unit: In Vehicle Tracking unit, Where ever the vehicle maybe located we can track the thefted vehicle each second of the clock without any interruption in the connectivity. Vehicle will be tracked based on the signal received from the RF and IR module. If the vehicle is thefted and found in AREA A(Local area) then the signal will be received via IR and RF TX and RX, then information will be displayed on the LCD display via microcontroller. If the vehicle is in the PHS area then the signal will be received via IR and RF TX and RX, and the received signal will be sent to the receiver with the help of satellite. Then information will be displayed on the LCD display via microcontroller.

The **Atmel AT89 series** is an Intel 8051-compatible family of 8-bit microcontrollers (µCs) manufactured by the Atmel Corporation. Based on the Intel 8051 core, the AT89 series remains very popular as general-purpose microcontrollers, due to their industry standard instruction set, and low unit cost. This allows a great amount of legacy code to be reused without modification in new applications. While considerably less powerful than the newer AT90 series of AVR RISC microcontrollers, new product development has continued with the AT89 series for the advantages.

2.1.1. Power supply unit

This section needs two voltages viz., +12 V & +5 V, as working voltages. Hence specially designed power supply is constructed to get regulated power supplies.

2.1.2. IR Transmitter And Receiver

Infrared (IR) transmitters and receivers are present in many different devices, though they are most commonly found in consumer electronics. The way this technology works is that one component flashes

an infrared light in a particular pattern, which another component can pick up and translate into an instruction. These transmitters and receivers are found in remote controls and all different types of devices, such as televisions and DVD players. Peripheral devices that include this technology can also allow a computer to control various other consumer electronics. Since infrared remotes are limited to line of sight operation.

Fig3. IR transmitter and receiver.

2.1.3. RF transmitter

RF transmitters are electronic devices that create continuously varying electric current, encode sine waves, and broadcast radio waves. RF transmitters use oscillators to create sine waves, the simplest and smoothest form of continuously varying waves, which contain information such as audio and video. Modulators encode these sign wives and antennas broadcast them as radio signals. There are several ways to encode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM). Radio techniques limit localized interference and noise.

Fig4. RF transmitter.

2.1.4. RF receiver

RF receivers are electronic devices that separate radio signals from one another and convert specific signals into audio, video, or data formats. RF receivers use an antenna to receive transmitted radio signals and a tuner to separate a specific signal from all of the other signals that the antenna receives. Detectors or demodulators then extract information that was encoded before transmission. There are several ways to decode or modulate this information, including amplitude modulation (AM) and frequency modulation (FM). Radio techniques limit localized interference and noise.

Fig5. RF receiver.

2.2.VEHICLE LOCKING UNIT

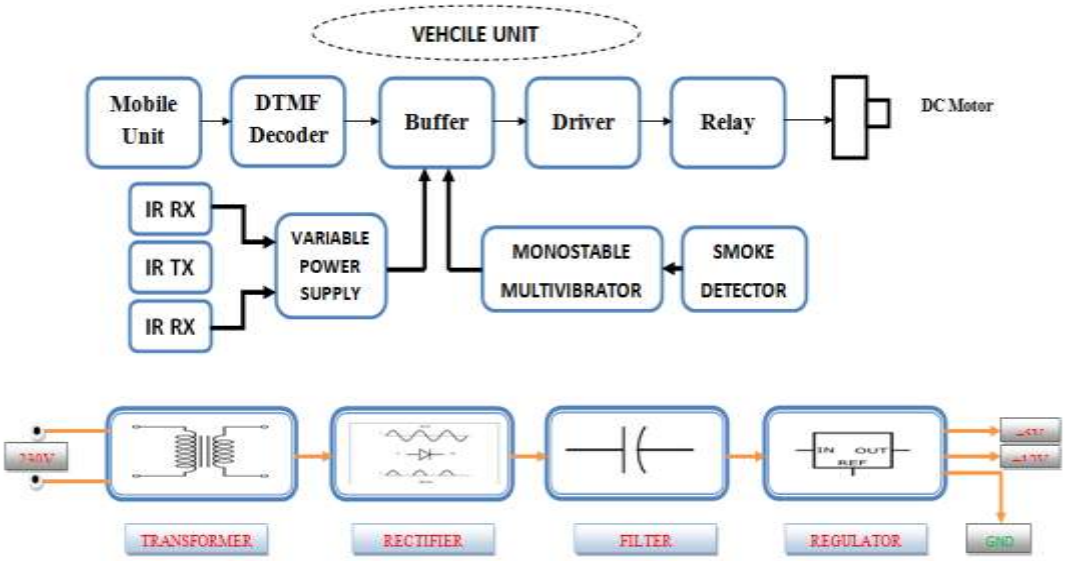

Fig6. Vehicle locking unit.

Vehicle locking unit: After Vehicle tracking process, vehicle locking is one more beneficial application to the user in PHS. Vehicle Locking facility is provided using DTMF Technic.

2.2.1. DTMF Decoder:

The DTMF decoder used is CM8870. It is used to decode the mobile's audio signal, i.e., the keypad tone. When the user presses a button in the keypad of the mobile, it generates two tones at the same time. These tones are taken from a table comprising of a row frequency and a column frequency. Thus the resulting frequency signal is known as "Dual Tone Multi-Frequency" signal. A DTMF signal is an algebraic sum of two different frequencies, one from the row frequency (higher frequency) group and another from the low frequency (column frequency) group. The CM8870 decodes the received DTMF tone and then sends its equivalent binary code to the microcontroller. According to the program loaded into the microcontroller, the corresponding action starts.

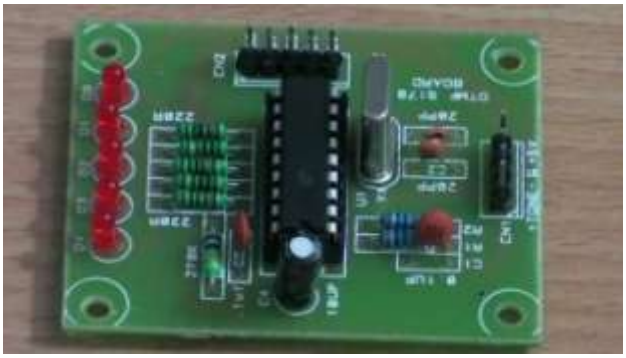

Fig7. DTMF decoder.

2.2.2. Buffers

Buffers do not affect the logical state of a digital signal (i.e. a logic 1 input results in a logic 1 output whereas logic 0 input results in a logic 0 output). Buffers are normally used to provide extra current drive at the output but can also be used to regularize the logic present at an interface.

2.2.3. Drivers

This section is used to drive the relay where the output is complement of input which is applied to the drive but current will be amplified.

2.2.4. Relays

It is an electromagnetic device which is used to drive the load connected across the relay and the o/p of relay can be connected to controller or load for further processing.

2.2.5. DC motor

A DC motor relies on the facts that like magnet poles repels and unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the centre of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

Fig8. DC motor.

2.2.6. PHS Technology

PHS (personal handy system) this system acts like an cordless phone in home, and mobile phone outside the home and satellite phone once it goes out of reach where GSM cannot track at that time.This system is recently launched in Japan, china, and Taiwan. PHS comes under 3.9 G. It has very vast application.

PHS is, essentially, a cordless telephone like DECT, with the capability to handover from one cell to another. PHS cells are small, with transmission power of base station a maximum of 500 mW and range typically measures in tens or at most hundreds of meters (some can range up to about 2 kilometers in line-of-sight), as opposed to the multi-kilometre ranges of GSM. This makes PHS suitable for dense urban areas, but impractical for rural areas, and the small cell size also makes it difficult if not impossible to make calls from rapidly moving vehicles.

PHS uses TDMA/TDD for its radio channel access method, and 32Kbit/s ADPCM for its voice codec. Modern PHS phone can also support many value-added services such as high speed wireless data / Internet connection (64 Kbit/s and higher), www access, e-mailing, text messaging and even colour image transfer.

3. METHODOLOGY

As we know that in this project there are different stages of working or we can say two are different applications used to monitor the Vehicle.

Vehicle Tracking: Here the vehicle will be tracked based on the signal received from the RF and IR modules. If the vehicle is thefted and that vehicle is there in the AREA A then the signal will be received via IR and RF TX and RX, then information will be displayed on the LCD display via Microcontroller. If

the vehicle is there in the AREA B then the signal will be received via IR and RF TX and RX, then information will be displayed on the LCD display via Microcontroller.

If the vehicle is there in the PHS AREA then the signal will be received via IR and RF TX and RX, and the received signal will send to the receiver with the help of a Satellite. Then information will be displayed on the LCD display via Microcontroller.

3.1. Thefting Detection

In this stage we are monitoring the thefting done to the Vehicle. As for the above discussion we were tracking the vehicle. Where ever the vehicle maybe we can track the vehicle each and every second of the clock with out any interruption in the connectivity.

In our project one more application is there that is the vehicle Locking facility by using DTMF Technic. The vehicle has Mobile, DTMF Decoder, Buffer, Driver, Relay and Motor. If some is trying to theft the vehicle will stoped automatically by deactivating the Motor.

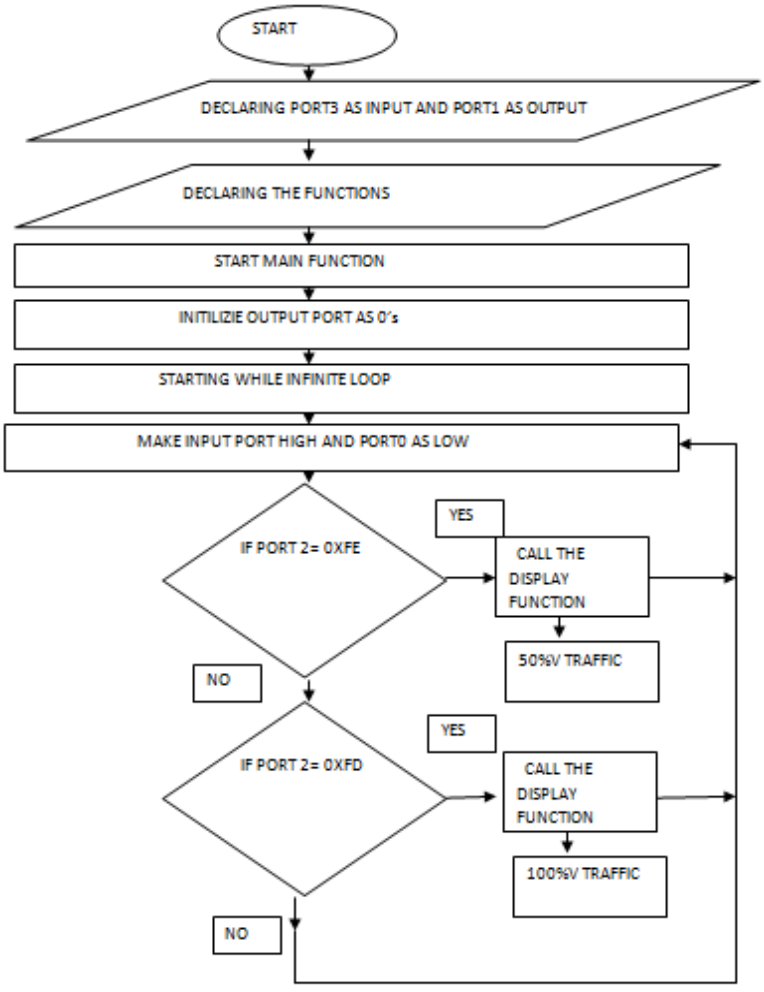

Fig9. Flowchart of PHS system.

3.2. Anti-collision and Smoke Detection

Anti-collision unit will be having single IR transmitter and double IR receivers. IR TX continuously transmits the signal. Whenever the obstacle or another vehicle comes near to our vehicle then the rays transmitted from IR TX hits an object, received by first IR RX. Then it will reduce the vehicle speed. If the distance again reduces then that will be detected by both IR receivers and it will stop the vehicle. Smoke detection will be monitored by MQ3 sensor. Sensor detected signal stops the motor by via monostable multivibrator, driver and relay unit. Driver is used drive the relay and relay is used for switching purpose.

4. ADVANTAGE, DISADVANTAGES AND APPLICATIONS.

4.1. ADVANTAGES

1. High-speed wireless data transmissions.
2. Effective in implementation and Easy to use.
3. Low power consumption, and compact size.
4. High reliability, due to the usage of power semiconductor devices.
5. Vehicles monitored from a remote area.
6. As in our project we are using PHS technology using this technology it is possible to detect the vehicle in not reachable area also.
7. Vehicle engine ON/OFF control.

4.2. DISADVANTAGES

1. Large Battery Backup is required.
2. Less automation.

4.3. APPLICATIONS

1. Tracking vehicle position
2. Surveillance
3. Fuel Monitoring
4. Stolen vehicle recovery.
5. Protection of exam paper during transportation.
6. Protection of important documents while transporting.
7. Avoiding robbery using DTMF decoder.

5. CONCLUSION

The PHS used in the present scenario thus helps us to overcome the limitation of GPS, that is when GPS signals are not accurate due to some obstacles such as buildings, trees and by extreme atmospheric conditions.PHS also provides vehicle tracking and locking facility from a remote end of users. It includes additional application of anti-collision and smoke detection. Thus with the help of PHS technology it becomes more acceptable to avoid and control vehicle theft and to detect anti-collision. This system can be further setup to be more interactive by adding a display to show some basic information about the vehicle and add emergency numbers, which can be used in case of emergency, which also makes it more efficient.

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