SMART VEHICLE WITH ADVANCED SECURITY SYSTEM

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Abstract

Design of Smart vehicle with advanced security system is based on automotive localization system using GPS and GSM-SMS services. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) on his request. GPS is the acronym for global positioning system which receives the information from the satellite anywhere in the world and provides the same for controller. The GPS provides us the data like location, time, and speed. The GSM modem provides the communication mechanism between the user and the PIC18F452 microcontroller system by means of SMS messages. It is capable of receiving a set of command instructions in the form of Short message service and performs the necessary actions. We will be using a dedicated modem at the receiver module i.e. and send the commands using SMS service as per the required actions. The system can be interconnected with the car alarm system and alert the owner on his mobile phone. This tracking system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. If the vehicle come across any obstacle that can be detected by ultrasonic sensor and gives information to the microcontroller so that data is displayed on LCD. The Data read by the GPS is stored in the MMC card which can be retrieved by connecting the system to the PC through MAX232.In this design face recognition can be done by interfacing USB camera to the microcontroller through PC with MATLAb. The presented application is a low cost solution for automobile position and status, very useful in case of car theft situations, for monitoring adolescent drivers by their parents as well as in car tracking system applications. The proposed solution can be used in other types of application, where the information needed is requested rarely and at irregular period of time (when requested)

Keywords- PIC18F452, GPS, GSM, MATLAB

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1. INTRODUCTION

In the rapid growth of modernisation the demand of personal vehicles is increasing day by day. It's no wonder if we say that as the proportion of vehicles is increasing the demand for more security and safety measurement of vehicles is also increasing. so observing this things it is required to develop remote monitoring module[1].to avoid unauthorised person to drive the vehicle face recognise system using mat lab [2] can be designed. Understanding the need of person who drives the vehicle we make use of ultrasonic sensors to alert the person when he approaches very close to certain vehicle the system alerts the driver to avoid collisions with other vehicles.

Key feature of this design include:

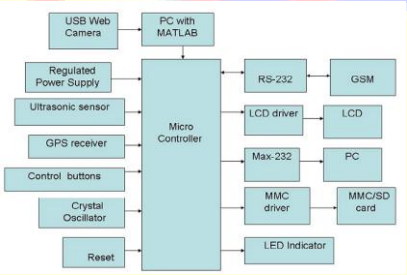
a. Sending SMS to the owner of vehicle on his demand regarding the current position basing on GPS and GSM

b. The location of vehicle is displayed by GUI and this information can be stored in database simultaneously.

c. Face recognisation design developed using matlab to have access to the authorised persons to the vehicle.

d. Real time system is developed by ultrasonic sensors to avoid accidents.

1.1Hardware of smart vehicle with advanced security system



For designing the hardware required is shown in the block diagram. A SIM will be inserted in the slot of GSM module. Whenever the owner sends message to the SIM inserted in the module the GSM receives the message and this is transmitted to the PIC controller.PIC controller processes the data and GPS tracks the location in the form of latitude and longitude then it sends it to the owner. Ultrasonic sensor always emits the sound waves and whenever it detects the obstacle it sends the control signal to the controller which in turn alerts the driver to

keep distance .the MMC/SD card slot is inserted which stores the path travelled by the vehicle. A web cam with MATLAB is used to authorise the person who drives the car.

2. PIC18F452 MICROCONTROLLER:

The pin configuration of the PIC18F452 microcontroller (DIP package).This is a 40-pin microcontroller housed in a DIL package, with a pin configuration similar to the popular PIC16F877. PIC18F2X2 microcontrollers [3] are 28-pin devices, while PIC18F4X2 microcontrollers are 40-pin devices. The architectures of the two groups are almost identical except that the larger devices have more input-output ports and more A/D converter channels. In this section we shall be looking at the architecture of the PIC18F452 microcontroller in detail. The architectures of other standard PIC18F-series microcontrollers are similar, and the knowledge gained in this section should be enough to understand the operation of other PIC18F-series microcontrollers.

3. ULTRA SONIC SENSOR:

Ultrasonic sensors [4] emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their color. Even transparent materials or thin foils represent no problem for an ultrasonic sensor. Micro sonic ultrasonic sensors are suitable for target distances from 30 mm to 10 m and as they measure the time of flight they can ascertain a measurement with pinpoint accuracy. Some of our sensors can even resolve the signal to an accuracy of less than 0.18 mm. Ultrasonic sensors can see through dust-laden air and ink mists. Even thin deposits on the sensor membrane do not impair its function. Sensors with a blind zone of just 30 mm and an extremely narrow beam spread are finding totally new applications these days: measuring levels in yoghurt pots and test tubes as well as scanning small bottles in the packaging sector - no trouble for our sensors. Even thin wires are reliably detected.

Fig.1.Ultrasonic sensor module

3.1Specification:

The ultrasonic range sensor detects objects in it's path and can be used to calculate the range to the object. It is sensitive enough to detect a 3cm diameter broom handle at a distance of over 2m.

Voltage - 5v

Current - 30mA Typ. 50mA Max.

Max Range - 3 m

Min Range - 3 cm

Sensitivity - Detect 3cm diameter broom handle at > 2 m

Input Trigger - 10uS Min. TTL level pulse

Echo Pulse - Positive TTL level signal, width proportional to range.

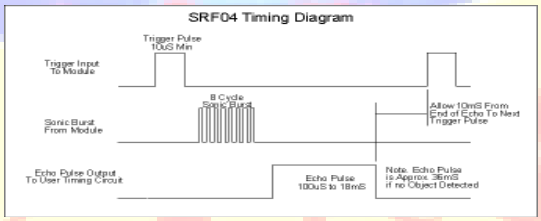


Fig.2 Ultrasonic sensor timing diagram

3.2Electrical connection:

The SRF004 ultrasonic range finder has 5 connections pins. The power supply is connected to the 5V and 0V ground connections on the SRF004. (Note that BOTH the 'Mode' (hole 4) and '0V Ground' (hole 5) connections **MUST** be connected to 0V for correct operation with the PICAXE system).

Take care not to overheat, and therefore damage, the solder connection pads whilst making connections.

The SRF004 **Trigger Input** is connected to a PICAXE **output** pin.

The SRF004 **Echo Output** is connected to a PICAXE **input** pin.

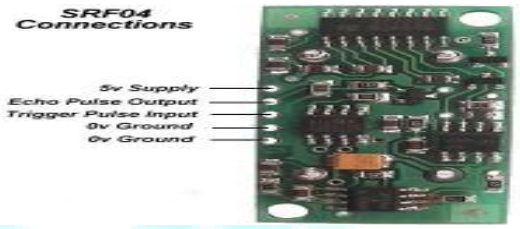


Fig.3.Pin configuration of ultrasonic sensor module

4. GLOBAL POSITIONING SYSTEM:

The Global Positioning System (GPS) is a burgeoning technology, which provides unequalled accuracy and flexibility of positioning for navigation, surveying and GIS data capture. The GPS NAVSTAR (Navigation Satellite timing and Ranging Global Positioning System) is a satellite-based navigation, timing and positioning system. The GPS provides continuous three-dimensional positioning 24 hrs a day throughout the world. The technology seems to be beneficiary to the GPS user community in terms of obtaining accurate data up to about100 meters for navigation, meter-level for mapping, and down to millimetre level for geodetic positioning. The GPS technology [5] has tremendous amount of applications in GIS data collection, surveying, and mapping. The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day.

There are no subscription fees or setup charges to use GPS.The GPS are made up of three parts: satellites orbiting the Earth; control and monitoring stations on Earth; and the GPS receivers owned by users. Farmers, surveyors, geologists and countless others perform their work more efficiently, safely, economically, and accurately using the free and open GPS signals. The SCYTEK Sky track 3000 GPS Vehicle Tracking System is the ultimate GPS tracking system. It features unlimited real-time GPS tracking with user-friendly Internet software, notification alerts to cellular phone or e-mail address and an optional plug-in camera that takes pictures to display on a computer.

4.1 National Marine Electronics Association (NMEA):

NMEA 2000 is a protocol used to create a network of electronic devices—chiefly marine instruments—on a boat. Various instruments that meet the NMEA 2000 standard are connected to one central cable, known as a backbone. The backbone powers each instrument and relays data among all of the instruments on the network. This allows one display unit to show many different types of information. It also allows the instruments to work together, since they share data. NMEA 2000 is meant to be "plug and play" to allow devices made by different manufacturers to talk and listen to each other. The interconnectivity among instruments in the network allows, for example, the GPS receiver to correct the course that the autopilot is steering. The NMEA 2000 standard was defined by, and is controlled by, the US-based National Marine Electronics Association (NMEA)[6]. Although the NMEA divulges some information regarding the standard, it claims copyright over the standard and the contents thereof are thus not publicly available. For example, the NMEA publicizes which messages exist and which fields they contain but they do not disclose how to interpret the values contained in those fields. However, enthusiasts are slowly making progress in discovering these PGN definitions.

Recommended minimum specific GPS/Transit data

eg1. $GPRMC,081836,A,3751.65,S,14507.36,E,000.0,360.0,130998,011.3,E*62

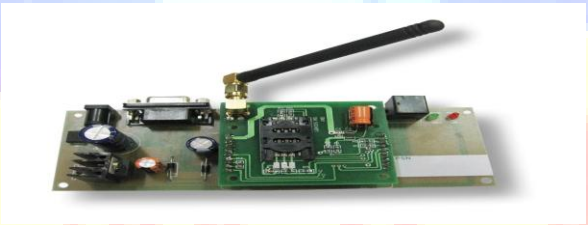
eg2. $GPRMC,225446,A,4916.45,N,12311.12,W,000.5,054.7,191194,020.3,E*68

225446	Time of fix 22:54:46 UTC
A	Navigation receiver warning A = OK, V = warning

4916.45,N	Latitude 49 deg. 16.45 min North
12311.12,W	Longitude 123 deg. 11.12 min West
000.5	Speed over ground, Knots
054.7	Course Made Good, True
191194	Date of fix 19 November 1994
020.3,E	Magnetic variation 20.3 deg East
*68	mandatory checksum

5. Global System for Mobile Communication (GSM)

GSM, which stands for Global System for Mobile communications, reigns (important) as the world's most widely used cell phone technology. Cell phones use a cell phone service carrier's GSM network by searching for cell phone towers in the nearby area. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication.GSM [7] is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz It is estimated that many countries outside of Europe will join the GSM partnership.



5.1 MODEM SPECIFICATIONS:

The SIM300 is a complete Tri-band GSM solution in a compact plug-in module. Featuring an industry-standard interface, the SIM300 delivers GSM/GPRS900/1800/1900Mhz performance for voice, SMS, data and Fax in a small form factor and with low power consumption. The leading features of SIM300 make it deal fir virtually unlimited application, such as WLL applications (Fixed Cellular Terminal), M2M application, handheld devices and much more.

Tri-band GSM/GPRS module with a size of 40x33x2.85

Customized MMI and keypad/LCD support

An embedded powerful TCP/IP protocol stack

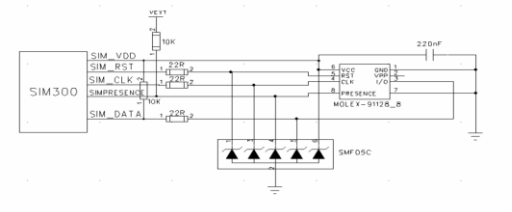


Fig.4. SIM interface reference circuit with 8 pins SIM card

5.2 LCD interface:

SIM300 provides a serial LCD display interface that supports serial communication with LCD device. These are composite pins that can be used as GPIO ports or LCD display interface according to your application. When use as LCD interface, the following table is the pin define. LCD interface timing should be united with the LCD device.

SD/MMC Mini Board:Our new SD/MMC Mini Board is a great way to interface to a standard SD or MMC memory card. This board features a standard SD/MMC connector for easy connection of your memory card. Data can be easily downloaded or read from the card using standard SD or SPI communication.

6. WEBCAM:

A webcam is a video camera that feeds its image in real time to a computer or computer network. Unlike an IP camera (which uses a direct connection using ethernet or Wi-Fi), a webcam is generally connected by a USB cable, FireWire cable, or similar cable.

What You Need

In order to create a simple Webcam, you need three things:

1. A **camera** of some sort connected to your computer
2. A piece of **software** that can grab a frame from the camera periodically
3. A way to **broadcast your images on the Web**

7. SOFTWARE REQUIREMENTS

PIC compiler [8] is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. PIC compiler also supports C language code.

It's important that you know C language for microcontroller which is commonly known as Embedded C. As we are going to use PIC Compiler, hence we also call it PIC C. The PCB, PCM, and PCH are separate compilers. PCB is for 12-bit opcodes, PCM is for 14-bitopcodes, and PCH is for 16-bit opcode PIC microcontrollers. Due to many similarities, all three compilers are covered in this reference manual. Features and limitations that apply to only specific microcontrollers are indicated within. These compilers are specifically designed to meet the unique needs of the PIC microcontroller. This allows developers to quickly design applications software in a more readable, high-level language. When compared to a more traditional C compiler, PCB, PCM, and PCH have some limitations. As an example of the limitations, function recursion is not allowed.

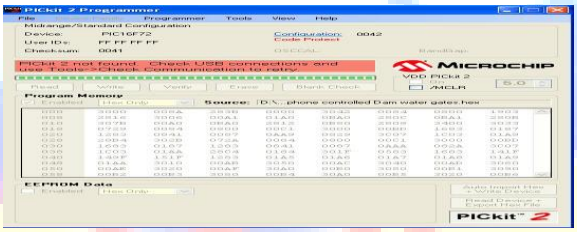


Fig 5: Picture of checking communications before dumping program into microcontroller

7.1 MAT file format:

Binary data container format used by MATLAB[9]; may include arrays, variables, functions, and other types of data; can be saved in different formats by choosing a version within the MATLAB Preferences (select General → MAT-Files).Level 4 MAT-Files support two-dimensional matrices and character strings, while Level 5 MAT-Files include additional support for multidimensional numeric arrays, character arrays, cell arrays, sparse arrays, objects, and structures. MAT-files may also be used to represent audio in 64-bit floating point, 16-bit signed integer, and 8-bit unsigned integer formats.

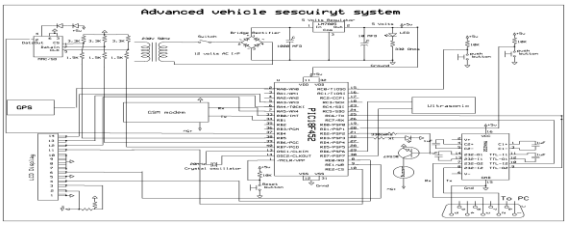


Fig 6: schematic diagram of Advanced vehicle security system

The above schematic diagram of **Advanced vehicle security system** explains the interfacing section of each component with micro controller, RFID and DC motor. Crystal oscillator connected to 13th and 14th pins of micro controller and regulated power supply is also connected to micro controller and LED's also connected to micro controller through resistors.

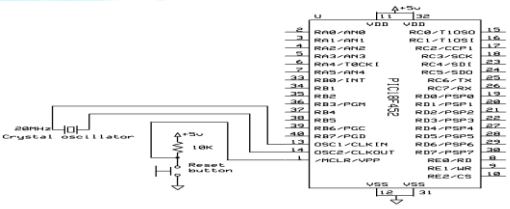


Fig 7: Diagram of crystal oscillator and reset input interfacing with micro controller

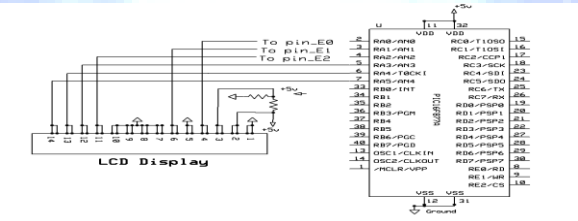


Fig 8: Diagram of LCD interfacing with micro controller

8. ADVANTAGES:

1. Remote communication using GSM modem.
2. Sends location in the form of latitude and longitude.
3. Reliable for remote tracking
4. Obstacle detection and displaying on LCD.
5. Storing latitude and longitude data in MMC card.

9. APPLICATIONS:

1. VIP vehicle tracking.
2. Child and animal tracking.
3. Ambulance tracking.

10 RESULTS:

The design "**Smart vehicle with advanced security system"** was used to design automotive localization system using GPS and GSM-SMS services. The system permits localization of the automobile and transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. Face recognization with MATLAB permits only authorised person can drive the vehile.Path travelled by the vehicle is stored in MMC

11. CONCLUSION:

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the design has been successfully implemented. Thus the design has been successfully designed and tested.

12. REFERENCES:

[1] https://www.beckwithelectric.com/docs/specs/M-3904B-SP.pdf
[2] http://www.mathworks.in/discovery/face-recognition.html?nocookie=true
[3] http://www.microchip.com/wwwproducts/Devices.aspx?product=PIC18F452
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[7] http://cellphones.about.com/od/phoneglossary/g/gsm.htm
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