VEHICLE ACCIDENT DETECTION WITH GPS AND GSM MODEM

A Project Report

Submitted to

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CERTIFICATE

This is to Certify that this Preliminary Project Report on VEHICLE ACCIDENT DETECTION WITH GPS AND GSM MODEM is a bonafide record of the seminar done by **HOLMES JOSEPH (13153815) ,GOKUL S NAIR(13153813),MUBEEN M A(13153817),SARATH R DEV(13153820)** of Seventh semester B.Tech in Electrical and Electronics Engineering, towards the partial fulfilment of the requirement as a part of the curriculum for the award of degree of Bachelor of Technology by Cochin University of Science and Technology.

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ABSTRACT

Accidents – nowadays become a common word, especially on high ways. In many cases the casualty is very high not because of the accident but because of the delay in treatment. This happens because the appropriate authorities are not informed that promptly. And also the number of vehicles that come into the road has increased drastically. With more of modernization and vehicles cost coming down rapidly, the vehicle population has shown a steady increase and is expected to rise exponentially. As the population increases there is a continuous need for monitoring them and preventing them from misuse or theft by unauthorized persons. A GPS and GSM systems are placed along with the microcontroller. The GPS system gives the exact position of the vehicle by giving out its latitude and longitude. The GSM uses the existing mobile phones towers to transmit and receive information to and from another GSM terminal device. The project aims at providing a wireless information system that helps in transfer of information to a predefined station which can be an emergency service or police party immediately after the accident. The heart of the system is a microcontroller that is connected to both the GPS and GSM system and also different sensors for detecting intrusion .The microcontroller on detecting the accident receives the position of the vehicle from the GPS system and transmits it to the designated centre using GSM network. Hence the project provides Speedy action to the accident persons. This helps in the authorities to get the information on the vehicle that is caught into an accident. And take appropriate action immediately.

LIST OF FIGURES

INTRODUCTION

CHAPTER 1

The high demand of automobiles has increased the traffic hazards and the road accidents. Life of the people is under high risk. This is because of the lack of best emergency facilities available in our country. This design is a system which can detect accidents in significantly less time and sends the basic information to first aid centre within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the rescue team in a short time, which will help in saving the valuable lives. A Switch is also provided in order to terminate the sending of a message in rare case where there is no casualty, this can save the precious time of the medical rescue team. When the accident occurs the alert message is sent automatically to the rescue team and to the police station. The message is sent through the GSM module and the location of the accident is detected with the help of the GPS module. The accident can be detected precisely with the help of both Micro Electro Mechanical System (MEMS) sensor and vibration sensor. The angle of the rolls over of the car can also be known by the message through the MEMS sensor. This application provides the optimum solution to poor emergency facilities provided to the roads accidents in the most feasible way.

1.1 VEHICLE TRACKING FEATURES

It is mainly benefit for the companies which are based on transport system. Since it can show the position of all vehicles in real time, so that they can create the expected data accordingly. These tracking system can store the whole data where the vehicle had gone, where did it stop, how much time it take at every stop and can create whole data analysis. It is also used in buses and trains, to estimate how far are they, how much time it takes for them to come to a particular stop. These systems are used for data capture, data storage, data analysis and finally data transfer.

1.2 ACCIDENT ALERT SYSTEM FEATURES

This system is based on new technology, its main purpose is to detect an accident and alert to the control room, so the victim can find some help. It can detect accidents the intensity of the accident without any visual contact from control room. If this system is inserted in every vehicle then it is easy to understand how many vehicles are involved in a particular accident and how intense is it. So that the help from control room will be according to the control room. The present board designed has both vehicle tracking and accident alert systems, which make it more valuable and useful. This board alerts us from theft and as well as accident detection. It also detects fire accidents by placing fire detector in one of the interrupt pins.

1.3 USAGE OF TRACKING IN INDIA

Tracking in India is mainly used by transport systems, taxi companies, traffic operators. Taxi operators use this to estimate how far the vehicle is from a particular area and send this information to call centres and they can inform general public about the distance of the taxi location and time it takes to come to them. Another use is for traffic police if this system is located in every vehicle they can estimate the traffic by looking on the map and if any accident is detected then they can route the traffic in to another way. This is how tracking is useful because India is one of the busy traffic countries and this system can control many of the traffic problems

CONCEPT AND OVERVIEW

CHAPTER 2

Concept and Overview This vehicle tracking system takes input from GPS and send it through the GSM module to desired mobile/laptop using mobile communication. Vehicle Tracking System is one of the biggest technological advancements to track the activities of the vehicle. The security system uses Global Positioning System GPS, to find the location of the monitored or tracked vehicle and then uses satellite or radio systems to send to send the coordinates and the location data to

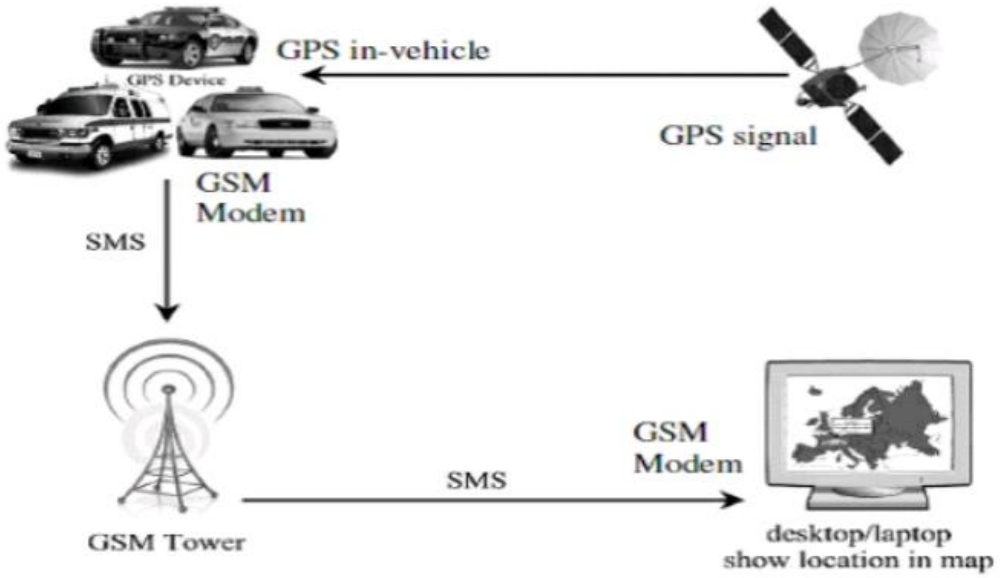


Figure 2.1

the monitoring center. At monitoring center various software's are used to plot the vehicle on a map. In this way the vehicle owners are able to track their vehicle on a real-time basis. Due to real-time tracking facility, vehicle tracking systems are becoming increasingly popular among owners of expensive vehicles

BLOCK DIAGRAM

CHAPTER 3

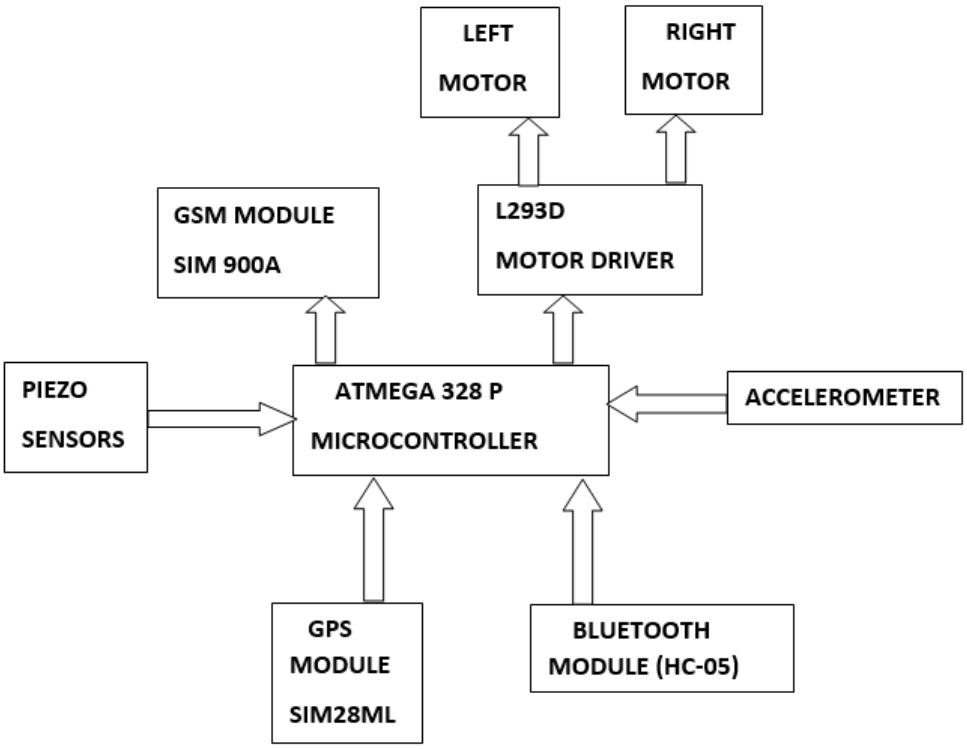


Figure 3.1

CIRCUIT DIAGRAM

CHAPTER 4

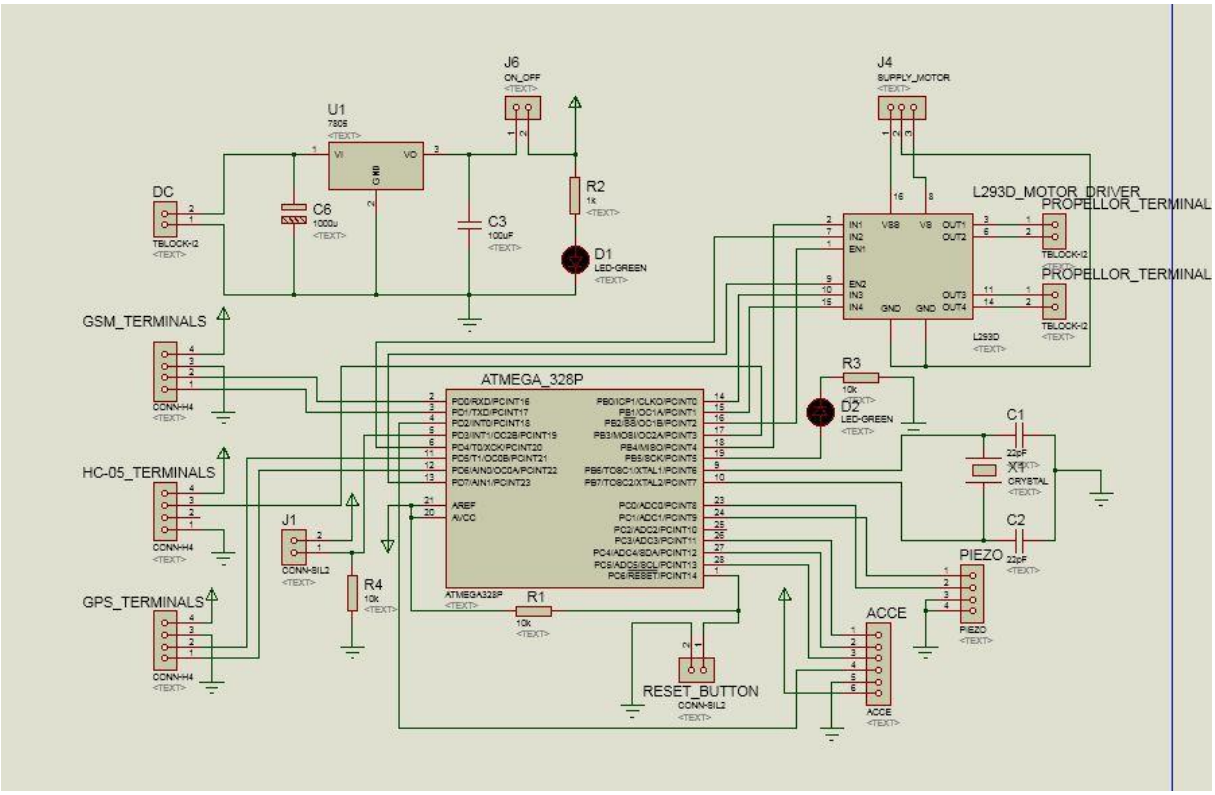


Figure 4.1

WORKING

CHAPTER 5

5.1 VEHICLE TRACKING SYSTEM WORKING

This system takes input from GPS and which goes into rs232. This Rs232 sends data into the Rx pin of microcontroller and this microcontroller stores this data in USART buffer and the data stored is sent again through Tx pin sends the data into GSM via Rs232 .This is how vehicle tracking works using GSM and GPS.

5.2 ACCIDENT ALERT SYSTEM WORKING

Accident in the sense it could be collision of two vehicles or fire accident inside the vehicle .These piezo sensors are attached to the car on all sides of the vehicle and they all are connected to the OR gate . OR gate is used because to detect at least one sensor is high. The output from the or gate is connected to the interrupt pin of microcontroller and whenever this pin is high the microcontroller sends the message about the accident.

ALGORITHM

CHAPTER 6

1. **START**
2. **READ DATA FROM PIEZO SENSORS AND ACCELEROMETER**
3. **STORE THE DATA**
4. **CALCULATE THE PITCH VALUE**
5. **IF PIEZO VALUE> THRESHOLD OR PITCH VALUE> SET VALUE GOTO 6 ELSE GOTO 9**
6. **READ THE GPS DATA**
7. **SEND GPS DATA THROUGH GSM**
8. **CHECK FOR OVERRIDE IF OVERRIDE GIVEN GOTO 9**
9. **READ BLUETOOTH DATA**
10. **CONTROL MOTORS**
11. **GOTO 2**

FLOWCHART

CHAPTER 7

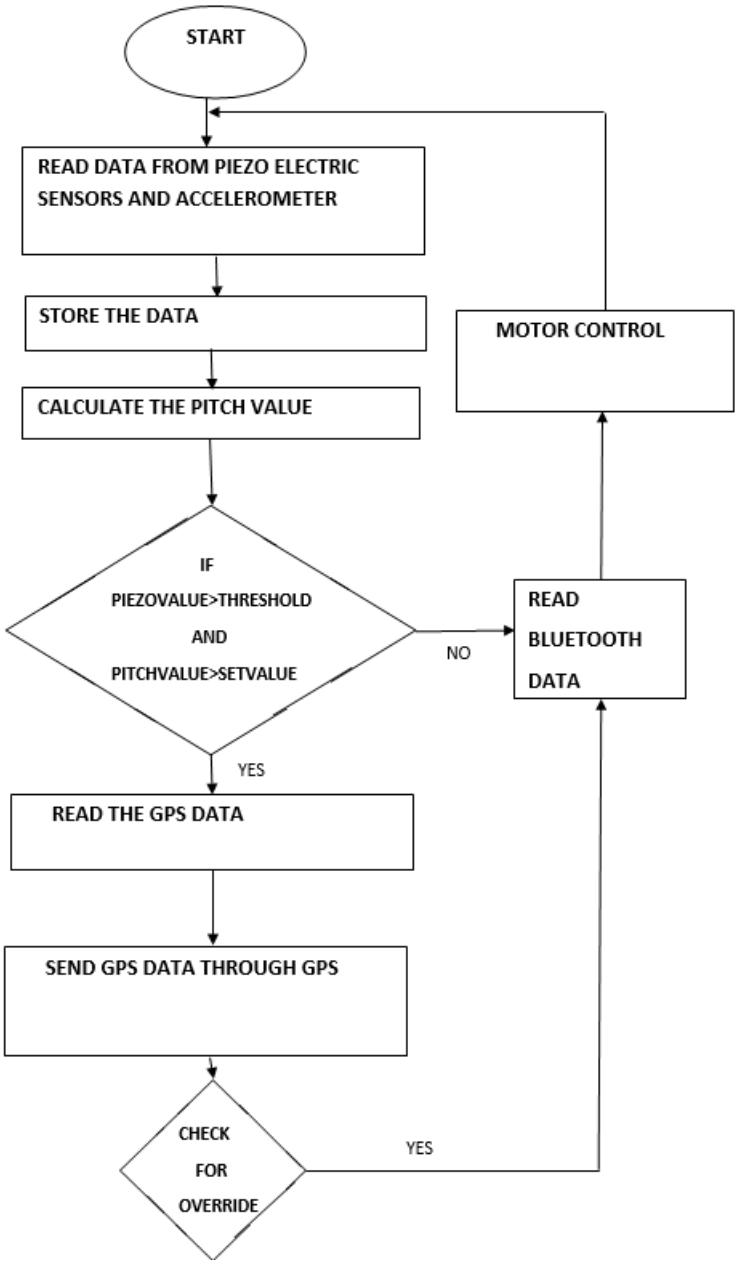


Figure 7.1

8 COMPONENTS

CHAPTER 8

8.1 GSM — GLOBAL SYSTEM FOR MOBILE COMMUNICATION

GSM is used as a media which is used to control and monitor the vehicle or person from anywhere by sending a message. It has its own deterministic character. Thereby, here GSM is used to monitor and control the vehicle or person by sending a message through GSM modem. Hence it is considered as highly efficient communication through the mobile which will be useful in industrial controls, automobiles, and appliances which would be controlled from anywhere else. It is also highly economic and less expensive; hence GSM is preferred most for this mode of controlling. 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. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages

GSM Module

Figure 8.1

GSM/GPRS MODEM is a class of wireless MODEM devices that are designed for communication of a computer with the GSM and GPRS network. It requires a SIM (Subscriber Identity Module) card just like mobile phones to activate communication with the network. Also they have IMEI (International Mobile Equipment Identity) number similar to mobile phones for their identification. A GSM/GPRS MODEM can perform the following operations:

1. Receive, send or delete SMS messages in a SIM.

2. Read, add, search phonebook entries of the SIM.

3. Make, Receive, or reject a voice call.

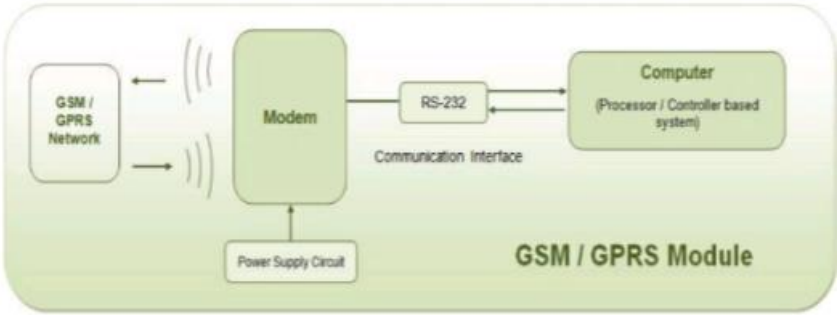


Figure 8.2

8.2 MICROCONTROLLER

8.2.1ATMEGA328

The Atmega328 is a low power CMOS 8-bit Microcontroller based on the AVR enhanced RISC architecture. By executing power full instruction in a single clock cycle, the Atmega328 achieves throughputs close to 1MIPS per MHz.

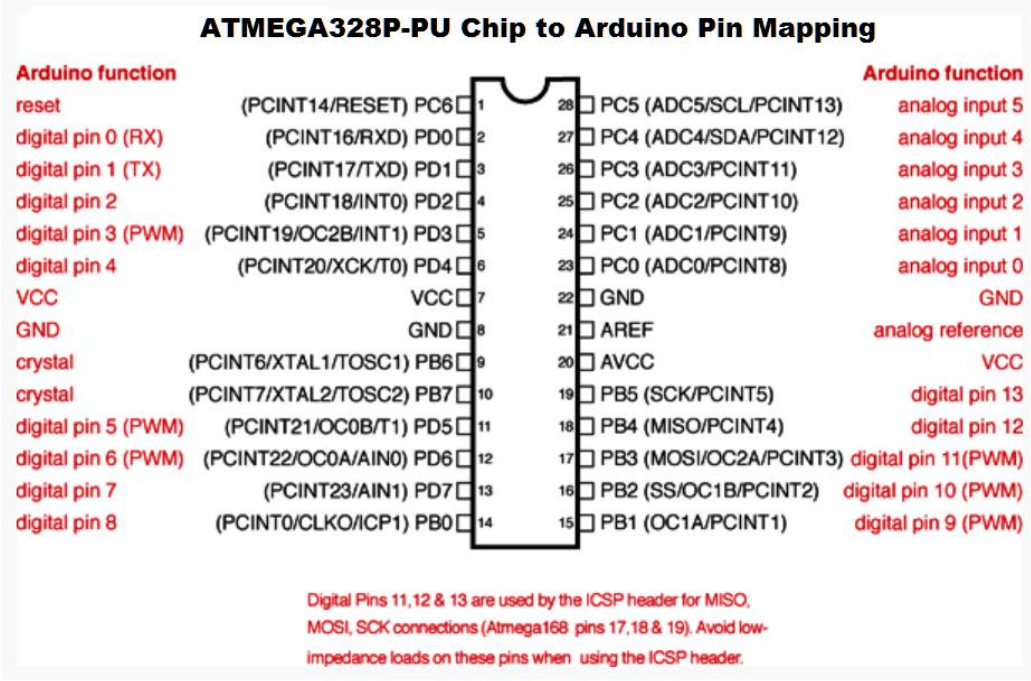


Figure 8.3

8.2.2 FEATURES

• High-performance, Low-power Atmel AVR 8-bit Microcontroller

• Advanced RISC Architecture

– 131 Powerful Instructions - Most Single-clock Cycle Execution

– 32 × 8 General Purpose Working Registers

– Fully Static Operation – Up to 16MIPS Throughput at 16MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-volatile Memory segments

– 32Kbytes of In-System Self-programmable Flash program memory

– 1024Bytes EEPROM

– 2Kbytes Internal SRAM

– Write/Erase cycles: 10,000 Flash/100,000 EEPROM

– Data retention: 20 years at 85°C/100 years at 25°C

– Optional Boot Code Section with Independent Lock Bits

• In-System Programming by On-chip Boot Program

• True Read-While-Write Operation

• Peripheral Features

– Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes

– One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode

– Real Time Counter with Separate Oscillator

– Four PWM Channels – 8-channel, 10-bit ADC

• 8 Single-ended Channels

• 7 Differential Channels in TQFP Package Only

• 2 Differential Channels with Programmable Gain at 1x, 10x, or 200x

– Byte-oriented Two-wire Serial Interface

– Programmable Serial USART

– Master/Slave SPI Serial Interface

– Programmable Watchdog Timer with On-chip Oscillator

– On-chip Analog Comparator

• Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection

– Internal Calibrated RC Oscillator

– External and Internal Interrupt Sources

– Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby

• I/O and Packages

– 32 Programmable I/O Lines

– 40-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF

• Operating Voltages

– 2.7 - 5.5V

• Speed Grades

– 0 - 16MHz

• Power Consumption at 1MHz, 3V, 25°C

– Active: 0.6mA

– Idle Mode: 0.2mA

– Power-down Mode: < 1µA

8.3 L293d

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state

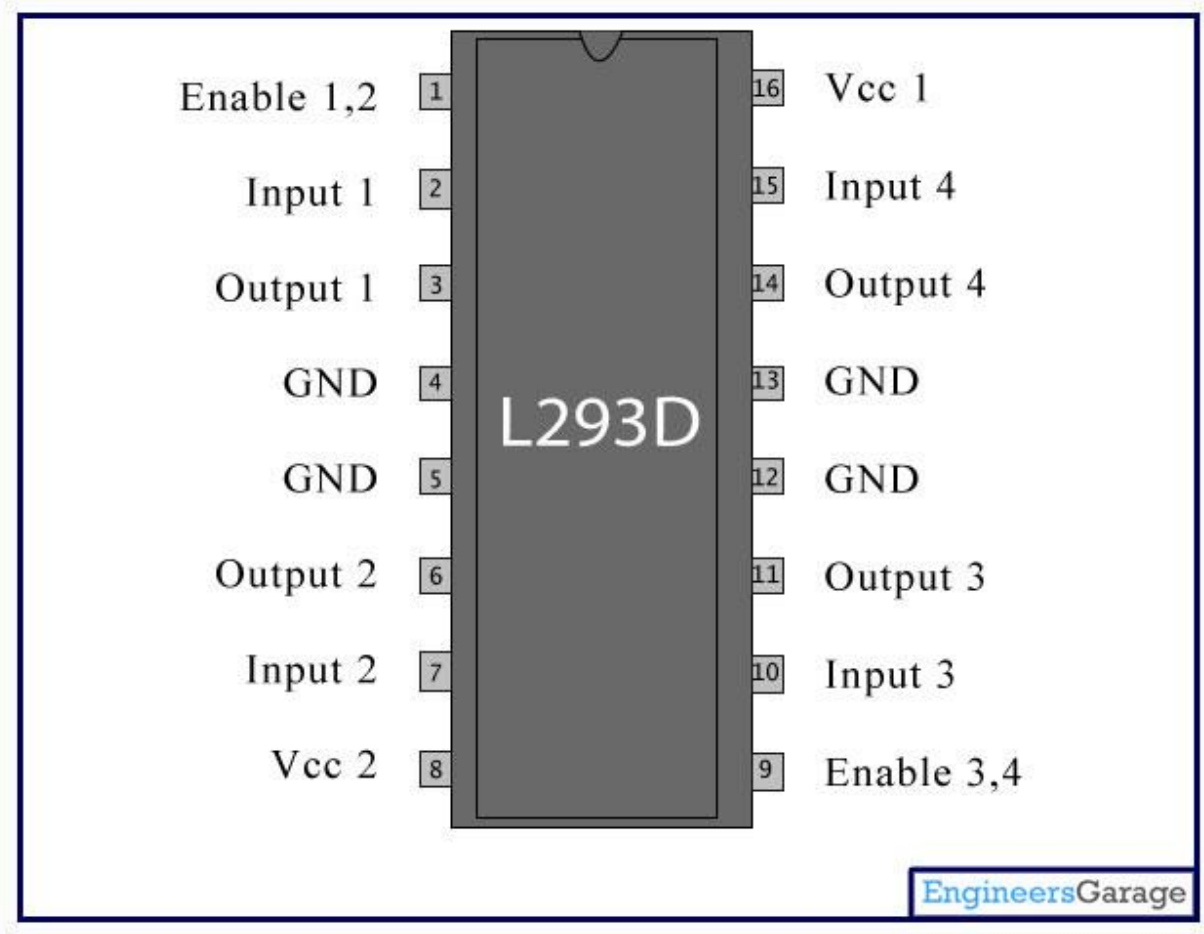


Figure 8.4

8.4 CRYSTAL OSCILLATOR

A piezoelectric crystal is an electronic circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time (as in quartz wristwatches), to provide a stable clock signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits designed around them were called "crystal oscillators".

Figure 8.5

The crystal oscillator circuit sustains oscillation by taking a voltage signal from the quartz resonator, amplifying it, and feeding it back to the resonator. The rate of expansion and contraction of the quartz is the resonant frequency, and is determined by the cut and size of the crystal. When the energy of the generated output frequencies matches the losses in the circuit, an oscillation can be sustained.

8.5 7805 REGULATOR IC

It is a 5V regulator that restricts the voltage output 5V and draws 5V regulator power supply. It comes with provision to add heat sink. The maximum value for input to this regulator is 35V. It can provide a constant steady voltage flow of 5V for higher voltage input till the threshold limit of 35V.If the voltage if near to 7.5V then it does not produce any heat and hence no need for heat sink. If the voltage input is more, then excess electricity is liberated as heat from 7805. It regulate a steady output of 5V if the input voltage is range of 7.2V to 35V. Hence to avoid power loss try to maintain the input to 7.2V. In some circuitry voltage fluctuation is fatal, for such situation to ensure constant voltage IC 7805 voltage regulator is used.

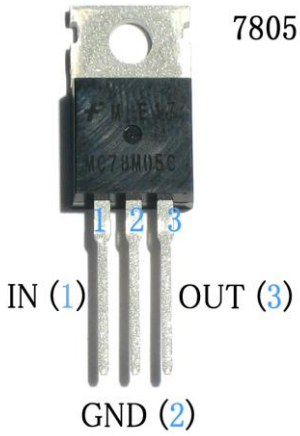


Figure 6.6

PIN.NO:	PIN	DESCRIPTION
1	INPUT	In this pin of the IC positive unregulated voltage is given in regulation
2	GROUND	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

Table 8.1

8.5.1 AT

COMMANDS

T commands are instructions used to control a modem. AT is the abbreviation of Attention. Every command line starts with “AT” or “at”. That’s why modem commands are called AT commands. Many of the commands that are used to control wired dial-up modems, such as ATD (Dial), ATA (Answer). Besides this common AT command set, GSM/GPRS Modems and mobile phones support an AT command set that is specific to the GSM technology, which includes SMSrelated commands like AT+CMGS (Send SMS message), AT+CMSS (Send SMS message from storage), AT+CMGL (List SMS messages) and AT+CMGR (Read SMS messages). Note that the starting “AT” is the prefix that informs the modem about the start of a command line. It is not part of the AT command name.

8.6 GPS MODULE

Fig.8.7 GPS Module

A GPS navigation device is a device that accurately calculates geographical location by receiving information from GPS satellites. The satellite data is free and works anywhere in the world. We use a third generation POT (Patch Antenna on Top) GPS module. This POT GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions. The GPS module has to be powered with 3.3V. It is 3v3 powered, level converter(3v3-5v) may be required for interfacing with 5V microcontroller. The GPS solution enables small form factor devices. They deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility. They are designed to simplify the embedded system integration process. To determine the location of the GPS satellites two types of data are required by the GPS receiver: the almanac and the ephemeris. This data is continuously transmitted by the GPS satellites and your GPS receiver collects and stores this data.

Features:

- TTL asynchronous serial interface
- Data output Baud rate: 9600 bps(Default)
- Single 3.3 VDC supply @ 55 mA (typical)
- Standard NMEA0183 output format
- Standard 8-pin header interface (.100" spacing).
- Based on MediaTek Single Chip Architecture.
- Dimension: 26mm x 26mm x 11.7mm
- Patch Antenna Size: 25mm x 25mm x 4mm
- Low Power Consumption: 55mA @ acquisition, 40mA @ tracking
- L1 Frequency, C/A code, 51-channel
- High Sensitivity: Up to -158 dBm tracking, superior urban performances1

8.6.1GPS SERVICES

GPS provides two levels of services: standard positioning service (SPS) and precise positioning service (PPS). The standard positioning service is a positioning and timing service that is available to all GPS users (military, private and commercial) on a continuous, worldwide basis with no direct charge. Precise Positioning Service (PPS) is a highly accurate military positioning, velocity and timing service on a continuous word wide basis to authorized users only. Only authorized users with cryptographic equipment and keys and specially equipped receivers can use the precise positioning service. In our project we are using Standard Positioning and timing

8.7 LED (LIGHT EMITTING DIODE)

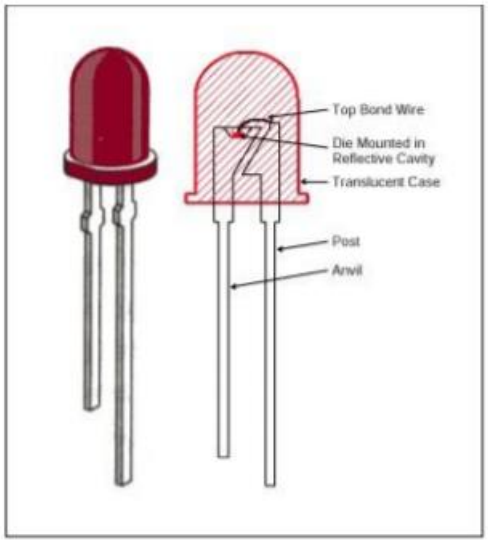


Figure 6.8

As its name implies, it is released during recombination and is given out in the form of light. LED emits no light when the junction is as its name implies, it is a diode, which emits light when forward biased. Charge carrier recombination takes place when electrons from the N-side, cross the junction and recombine with the holes on the P side. Electrons are in the higher conduction band on the N side, whereas holes are in the lower valence band on the P side. During recombination, some of the energy is given up in the form of heat and light. In the case of semiconductor materials like Gallium arsenide (GaAs), Gallium phosphide (Gap) and Gallium arsenide phosphide (GaAsP) a greater percentage of energy reverse biased.

8.8 PIEZOELECTRIC SENSORS

8.8.1 INTRODUCTION

The word piezo comes from the Greek word piezo, meaning to press or squeeze. Piezoelectricity refers to the generation of electricity or to electric polarity in dielectric crystals when subjected to mechanical stress and conversely, the generation of stress in such crystals in response to an applied voltage . In 1880, the Curie brothers found that quartz changed its dimensions when subjected to an electrical field and generated electrical charge when pressure was applied. Since that time, researchers have found piezoelectric properties in hundreds of ceramic and plastic materials. Many piezoelectric materials also show electrical effects due to temperature changes and radiation.

8.8.2 THEORY AND MODELLING

The basic theory behind piezoelectricity is based on the electric dipole. At the molecular level, the structure of a piezoelectric material is typically an ionic bonded crystal. At rest, the dipoles formed by the positive and negative ions cancel each other due to the symmetry of the crystal structure, and an electric field is not observed. When stressed, the crystal deforms, symmetry is lost, and a net dipole moment is created. This dipole moment forms an electric field across the crystal. In this manner, the materials generate an electrical charge that is proportional to the pressure applied. If a reciprocating force is applied, an ac

voltage is seen across the terminals of the device. Piezoelectric sensors are not suited for static or dc applications because the electrical charge produced decays with time due to the internal impedance of the sensor and the input impedance of the signal conditioning circuits. However, they are well suited for dynamic or ac applications.

8.8.3 SIGNAL CONDITIONING

Normal output voltages from piezoelectric sensors can vary from micro-volts to hundreds of volts, and signal conditioning circuitry requirements vary substantially. Key items to consider when designing the amplifier are:

- Frequency of operation
- Signal amplitude
- Input impedance
- Mode of operation

The following discussion assumes that the sensor output needs a moderate amount of amplification, and that the desired signal levels are in the 3V to 5V range for full scale. Typically, the high impedance of the sensor requires an amplifier with high-input impedance. JFET or CMOS input op-amps, like the TLV2771, are natural choices. Two circuits are used for signal conditioning. Figure 8.7 shows charging mode amplification of the piezoelectric sensor. Voltage mode amplification is used when the amplifier is very close to the sensor.

Charge mode amplification is used when the amplifier is remote to the sensor.

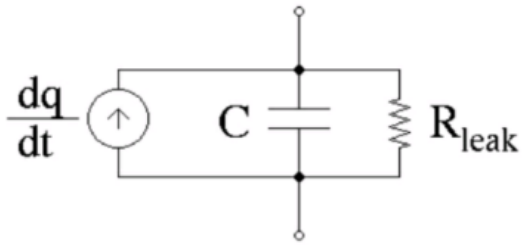


Figure 6.9

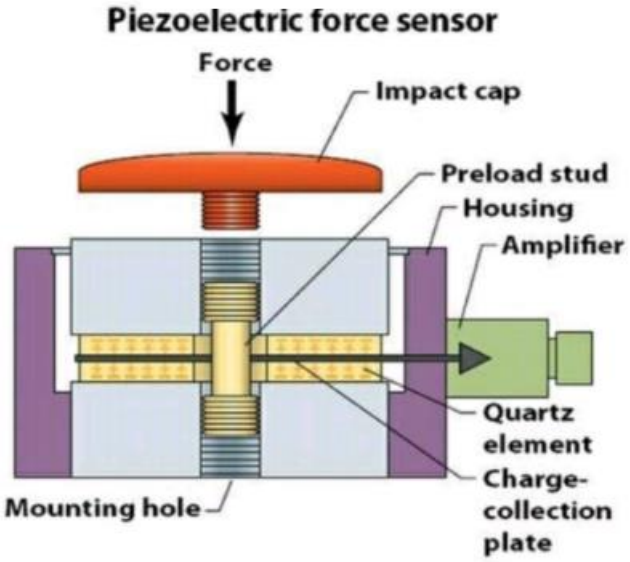


Figure 8.10

8.9 RESISTORS

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportion to the current, that is, in accordance with Ohm's law:

V = IR

Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well As resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).

Figure 8.11

The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design. Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

8.10 CAPACITORS

A capacitor or condenser is a passive electronic component consisting of a pair of conductors separated by a dielectric. When a voltage potential difference exists between the conductors, an electric field is present in the dielectric. This field stores energy and produces a mechanical force between the plates. The effect is greatest between wide, flat, parallel, narrowly separated conductors.

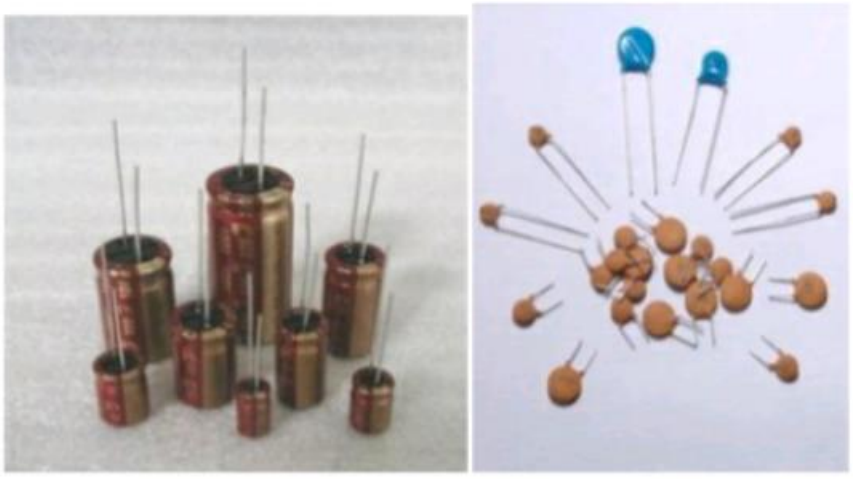


Figure 8.12

An ideal capacitor is characterized by a single constant value, capacitance, which is measured in farads. This is the ratio of the electric charge on each conductor to the potential difference between them. In practice, the dielectric between the plates passes a small amount of leakage current. The conductors and leads introduce an equivalent series resistance and the dielectric has an electric field strength limit resulting in a breakdown voltage. The properties of capacitors in a circuit may determine the resonant frequency and quality factor of a resonant circuit, power dissipation and operating

frequency in a digital logic circuit, energy capacity in a high-power system, and many other important aspects.

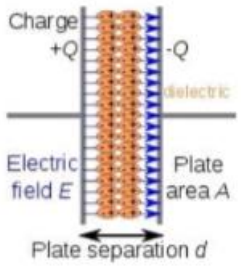


Figure 8.13

8.11 MEMS ACCELEROMETER

An accelerometer is an electromechanical device that is used to measure acceleration and the force producing it. Many types of accelerometers are available in the market today. They can be divided according to the force (static or dynamic) that is to be measured. Even today, one of the most commonly used one is the piezoelectric accelerometer. But, since they are bulky and cannot be used for all operations, a smaller and highly functional device like the MEMS accelerometer was developed. Though the first of its kind was developed 25 years ago, it was not accepted until lately, when there was need for large volume industrial applications. Due to its small size and robust sensing feature, they are further developed to obtain multi-axis sensing.

Figure 6.14

One of the most commonly used MEMS accelerometer is the capacitive type. The capacitive MEMS accelerometer is famous for its high sensitivity and its accuracy at high temperatures. The device does not change values depending on the base materials used and depends only on the capacitive value that occurs due to the change in distance between the plates

8.12 BLUETOOTH MODULE

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module,designed for transparent wireless serial connection setup.The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication.This serial port bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Rluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature).

The Bluetooth module HC-05 is a MASTER/SLAVE module.By default the factory setting is SLAVE.The Role of the module (Master or Slave) can be configured only by AT COMMANDS.The slave modules cannot initiate a connection to another Bluetooth device, but can accept connections.Master module can initiate a connection to other devices.The user can use it simply for a serial port replacement to establish connection between MCU and GPS

8.12.1 HARDWARE FEATURES

- Typical -80dBm sensitivity.
- Up to +4dBm RF transmit power.
- 3.3 to 5 V I/O.
- PIO(Programmable Input/Output) control.
- UART interface with programmable baud rate.
- With integrated antenna.
- With edge connector

Figure 8.1

HADWARE FABRICATION

CHAPTER 9

9.1 INTRODUCTION

Procedures done for making the hardware is as follows:

9.1.1 Wire Mapping done for the PCB

The circuit diagram is modified and components are replaced with other connectors for the ease of designing the PCB. That is the switches, communication module, sensors, output devices must be replaced with connectors for PCB.

9.1.2 Net list imported and started PCB routing

The vector file is imported to a PCB designing suit. So that there will be no error or confusion on PCB design procedures. Procedures done in the PCB design suit are: • A board is deployed with a higher dimension

. • Components are placed accordingly. Position of the components are considered according to their role in the circuit some of the rules are

• Crystal oscillator should be near to the microcontroller.

• Screw header connectors must be placed at the edge and the connecting holes should face outwards.

• Rectifier and regulator components should be placed nearby this is better for circuit debugging and also it avoid the chance of higher voltage tracks to be at the low voltage area thus reduce risk of damage.

• High power tracks and low power tracks should be placed at two different areas. Track bend angles must be made acute angles as possible

9.1.3 Printing

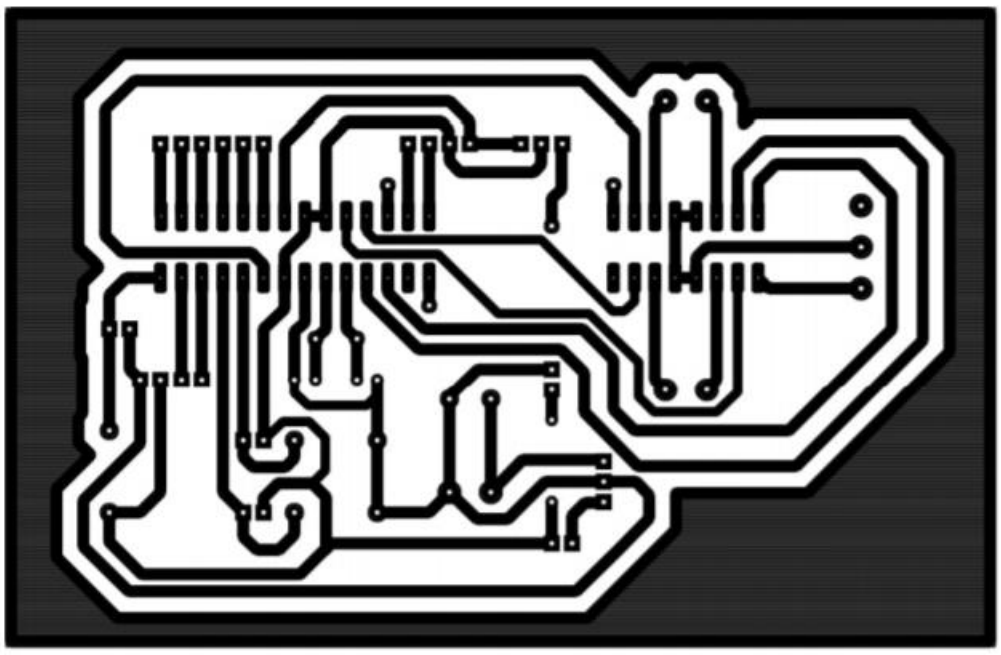


Figure 9.1

The pcb layout is then printed to a special toner transfer paper or at the glossy side of photo paper. It is recommended to use laser printing. Make sure that while printing double check if size of the paper is set correctly and the image is not scaled. If it is done then the alignment of the PCB design will be lost.

9.1.4 Preparing the copper clad

The copper clad come factory out as a one square feet in dimension we will have to draw a template with the approximate length and breadth. Then cut the clad according to the template. Use a rotating cutting machine with suitable wheel

(recommended).So that gaps will not be developed between the copper sheet and the glass epoxy material.

Figure 9.2

After the cutting is done, the cut out piece is cleaned with sandpaper (soft) and also with thinner to remove all kinds of impurities.

9.1.5 Transferring the pattern to the clad

The pattern on the printed paper should be transferred to a clad for etching procedure. To do that the clad is taken and placed on the print then folded tightly. Then it is ironed using high temp dress iron box

Figure 9.3

After ironing for 10 minutes the clad is then put in water, after a while the paper will be socked wet and the print will be over the copper portion of the clad and the paper is removed easilyAfter that the clad is checked thoroughly for errors or for missing in transferring of the designs. Slight missing can be done using a UV resistant marker pen or we can use water proof patch tapes

9.1.6 Etching

A plastic beaker is taken then poured with water and some amount of ferric chloride is added. Then the copper clad with the design is put into that beaker.

Figure 9.4

After a while the copper that is exposed will be converted into copper chloride. The operative reactions in a ferric chloride-based etchant are as follows: First, the ferric will oxidize the copper metal to cupric, while being reduced to ferrous:

2 Fe(3+) + Cu(0) –> 2 Fe(2+) + Cu(2+)

Next, the cupric will also participate in the oxidation of copper metal, with both going to cuprous (by a reaction called “proportionating”):

Cu(2+) + Cu(0) –> 2 Cu(+)

Both reactions are just exchanges of electrons between ions. The problem with ferric chloride is that the ferric ion Fe(3+) is not easily regenerated from the ferrous ion Fe(2+). Reaction between ferrous and the oxygen in air is slow

: 4 Fe(2+) + O2 + 4 H(+) –> 4 Fe(3+) + 2 H2O

However, reaction between cuprous ion Cu(+) and oxygen is virtually instantaneous:

4 Cu(+) + O2 + 4 H(+) –> 4 Cu(2+) + 2 H2O

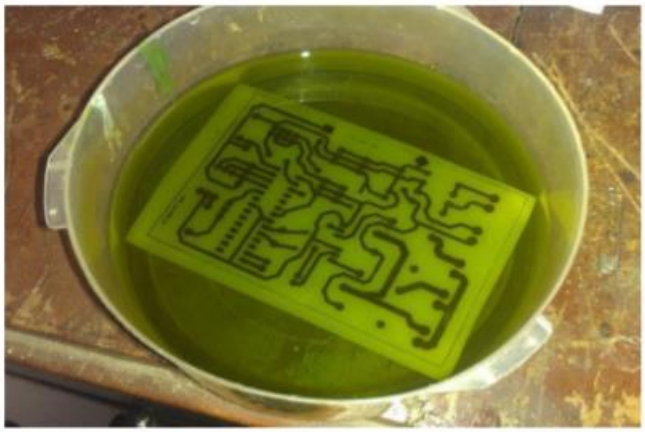


Figure 9.5

9.1.7 Drilling

To place the components on the circuit holes should be drilled on the PCB. Before drilling punches are made on the holes so that drilling precession can be enhanced.

Figure 9.6

9.1.8 Placing the components

The components and the Jumpers are placed on the top of the PCB careful

9.1.9 Soldering

The leads of the components are soldered so that electrical as well as mechanical contact is achieved at the copper tracks of the clad.

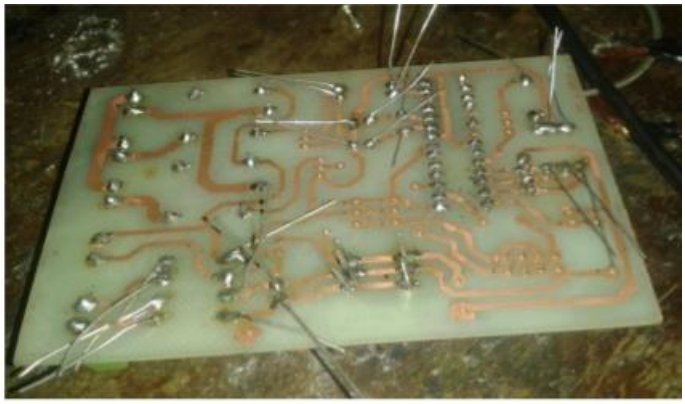


Figure 7.7

The excess contact leads are cut out once the soldering is completed. Wire stripper or nail cutter are the ideal tools for this process.

9.1.10 Hardware Testing

The circuit is connected with all the components i.e. the sensors, switches, power supply. Then a simple test program is loaded and thus confirmed the working of the microcontroller and the power supply, then checked the serial communication. After completing the basic systematic tests the main program is loaded to the microcontroller and checked for errors.

9.2 SOFTWARE

9.2.1 EMBEDDED C

Embedded C is a set of language extensions for the C Programming language by the C Standards committee to address commonality issues that exist between C extensions for different embedded systems. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, As assembly language programs are specific to a processor, assembly language didn't offer portability across systems. To overcome this disadvantage, several high level languages, including C were developed Advantages:

- It is small and reasonably simpler to learn, understand, program and debug.
- Compared to assembly language, C code written is more reliable and scalable, more portable between different platforms.

• C compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers

Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/microcontroller or any system. This makes it convenient for a user to develop programs that can run on most of the systems

. • As C combines functionality of assembly language and features of high level languages, C is treated as a 'middle-level computer language' or 'high level assembly language'.

• It is fairly efficient.

• It supports access to I/O and provides ease of management of large embedded projects

Figure 9.8

AVR Studio was created by Atmel in order to help developers to create applications for AVR microcontrollers using C/C++ programming languages. It provides the users with access to the tools for writing, building and debugging their codes.

The menu of this application is easy-to-use and offers access to powerful tools for both beginners and experienced developers to find their way through C/C++ programming. Some of the key features are: “cycle correct” simulator with advanced debugging functionality, rich SDK that enables tight integration of customer plug-ins and compatibility with many Microsoft Visual Studio plug-in. Also the tool provides a "split window" button that allows the users to work on more than one project at a time. All in all AVR Studio is a complete tool for programmers which develop, test and debug C/C++ applications; should give this tool a try as it comes in handy for programming AVR microcontrollers.

9.2.2 PROTEUS

The Proteus Design Suite is wholly unique in offering the ability to co-simulate both high and low-level micro-controller code in the context of a mixed-mode SPICE circuit simulation. With this Virtual System Modeling facility, can transform product design cycle, reaping huge rewards in terms of reduced time to market and lower costs of development.

PROTEUS VSM

Proteus Virtual System Modeling (VSM) combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-

simulation of complete microcontroller based designs. For the first time ever, it is possible to develop and test such designs before a physical prototype is constructed. This is possible because can interact with the design using on screen indicators such as LED and LCD displays and actuators such as switches and buttons. The simulation takes place in real time (or near enough to it): a 1GMHz Pentium III can simulate a basic 8051 system clocking at over 12MHz. Proteus VSM also provides extensive debugging facilities including breakpoints, single stepping and variable display for both assembly code and high level language source.

SCHEMATIC ENTRY

Proteus VSM uses our proven Schematic Capture software to provide the environment for design entry and development. ISIS is a long established product and combines ease of use with powerful editing tools. It is capable of supporting schematic capture for both simulation and PCB design. Designs entered in to Proteus VSM for testing can be net listed for PCB lat either with our own PCB Design products or with third party PCB lat tools. ISIS also provides a very high degree of control over the drawing appearance, in terms of line widths, fill styles, fonts, etc. These capabilities are used to the full in providing the graphics necessary for circuit animation.

CIRCUIT SIMULATION

At the heart of Proteus VSM is Pro SPICE. This is an established product that combines uses a SPICE3f5 analogue simulator kernel with a fast event-driven digital simulator to provide seamless mixed-mode simulation. Proteus VSM includes a number of virtual instruments including an Oscilloscope, Logic Analyzer, Function Generator, Pattern Generator, Counter Timer and Virtual Terminal as well as simple voltmeters and ammeters. In addition, we provide dedicated Master/Slave/Monitor mode protocol analyzers for SPI and I2C -

simply wire them onto the serial lines and monitor or interact with the data live during simulation.

Should wish to take detailed measurements on graphs, or perform other analysis types such as frequency, distortion, noise or sweep analyses of analogue circuits, can purchase the Advanced Simulation Option. This option also includes Conformance Analysis - a unique and powerful tool for Software Quality Assurance. The most exciting and important feature of Proteus VSM is its ability to simulate the interaction between software running on a microcontroller and any analog or digital electronics connected to it. The micro-controller model sits on the schematic along with the other elements of r product design. It simulates the execution of r object code (machine code), just like a real chip.

The VSM CPU models fully simulate I/O ports, interrupts, timers, USARTs and all other peripherals present on each supported processor. It is anything but a simple software simulator since the interaction of all these peripherals with the external circuit is fully modelled down to waveform level and the entire system is therefore simulated.

SOURCE LEVEL DEBUGGING

Whilst Proteus VSM is already unique in its capability to run near real time simulations of complete micro-controller systems, its real power comes from its ability to perform these simulations in single step mode. This works just like r favorite software debugger, except that as single step the code, can observe the effect on the entire design - including all the electronics external to the microcontroller. VSM achieves this in a number of ways, dependent on the processor family and the compiler/tool chain that prefer to use. For detailed information on the third party compilers supported by Proteus VSM please see the Third Party Compilers page. In addition to traditional debugging where set one or breakpoints in r source and then step the code when they are triggered,

Proteus allows to set breakpoints on the schematic so that a hardware condition can trigger a breakpoint. Whenever it is the case that a problem is identifiable on the hardware using hardware breakpoints is ideal to track down the issue.

PROGRAM CODE

CHAPTER 10

```
#include <Wire.h>

#include <MPU6050.h>

#include <SoftwareSerial.h>

#include <TinyGPS.h>


TinyGPS gps;

MPU6050 accelerometer;

SoftwareSerial sgps(11, A2); // RX, TX for GPS module

SoftwareSerial BT(5, 6); // RX, TX for Bluetooth module


#define m11 12    // rear motor

#define m12 4

#define m21 9    // front motor

#define m22 8


const int piezo_Pin1=A0;

const int piezo_Pin2=A1;


const int ledPin= 13;

const int threshold= 600;


const int ma_EN=10;
```

```
const int mb_EN=7;


int temp=0;
float slat,slon;
char str[2],i;


void setup()
{
 Serial.begin(9600);
 sgps.begin(9600);
 BT.begin(9600);
 while(!accelerometer.begin(MPU6050_SCALE_2000DPS,
MPU6050_RANGE_2G))
 {
 delay(500);
 }
 pinMode(m11, OUTPUT);
 pinMode(m12, OUTPUT);
 pinMode(m21, OUTPUT);
 pinMode(m22, OUTPUT);
 pinMode(ma_EN, OUTPUT);
 pinMode(mb_EN, OUTPUT);
 pinMode(ledPin, OUTPUT);
```

```
 digitalWrite(ma_EN, HIGH);
 digitalWrite(mb_EN, HIGH);
}

void loop()
{
Vector sensor_data = accelerometer.readNormalizeAccel();
int pitch_value = -(atan2(sensor_data.XAxis,
sqrt(sensor_data.YAxis*sensor_data.YAxis +
sensor_data.ZAxis*sensor_data.ZAxis))*180.0)/M_PI;
int roll_value = (atan2(sensor_data.YAxis, sensor_data.ZAxis)*180.0)/M_PI;
int val1= analogRead(piezo_Pin1);
int val2= analogRead(piezo_Pin2);
if (val1 >= threshold || val2 >= threshold || roll_value>=60 || roll_value>=60)
 {
temp=1;
 }
while(temp)
{
 digitalWrite(ledPin, HIGH);
 gpsinfo();
 SendMessage();
}
BT.listen();
```

```
while(BT.available())
 {
  char ch=BT.read();
  str[i++]=ch;

  if(str[i-1]=='1')
  {
   forward();
   i=0;
  }

  else if(str[i-1]=='2')
  {
   right();
   i=0;
  }

  else if(str[i-1]=='3')
  {
    left();
    i=0;
  }
```

```
   else if(str[i-1]=='4')
   {
    backward();
    i=0;
   }

   else if(str[i-1]=='5')
   {
    Stop();
    i=0;
   }
   delay(100);
 }
delay(10);
}

void gpsinfo()
{
 sgps.listen();
 while (sgps.available())
 {
  int c = sgps.read();
  if (gps.encode(c))
```

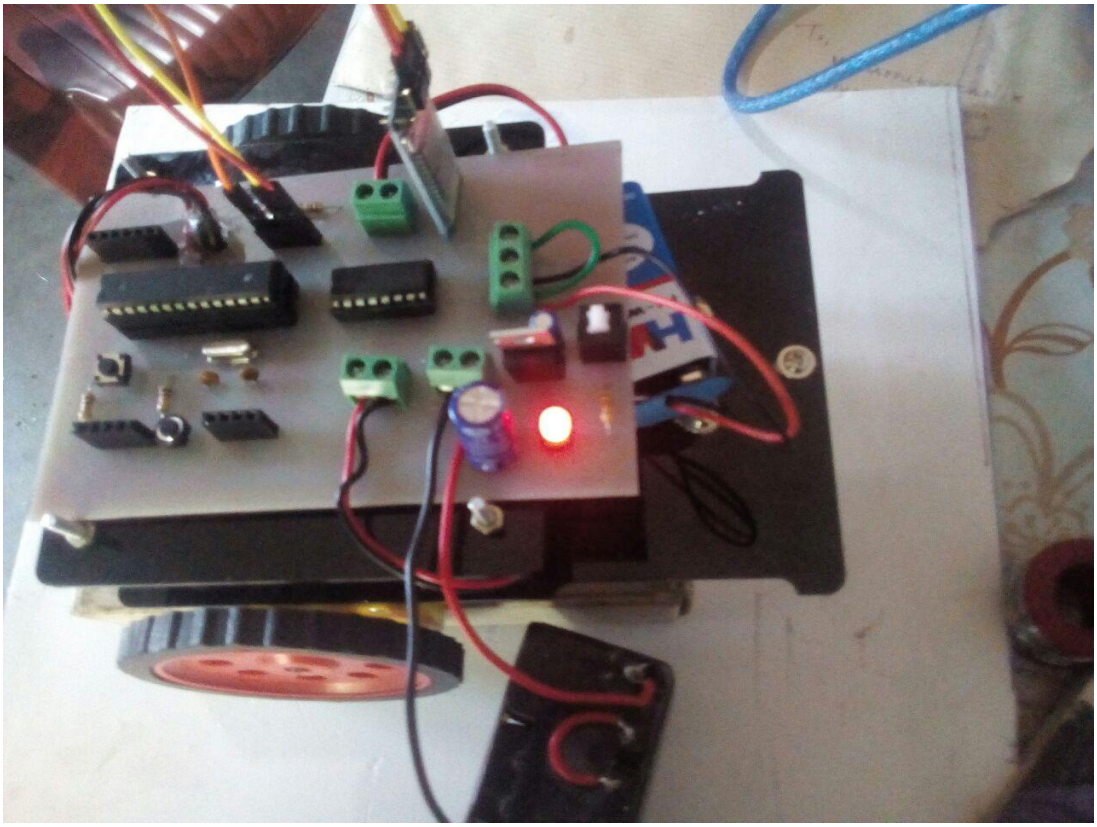
```
   {
    gps.f_get_position(&slat, &slon);
   }
 }
}
 void SendMessage()
{
 Stop();
 if(slat>0 && slon>0)
 {
 Serial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
 delay(1000);  // Delay of 1000 milli seconds or 1 second
 Serial.println("AT+CMGS=\"+919526937208\"\r"); // Replace x with mobile
number
 delay(1000);
 Serial.print("Vehicle Accident Alert:-");
 Serial.print("Latitude :");// The SMS text you want to send: Latitude and
Longitude
 Serial.print(slat, 6);
 Serial.print("   ");
 Serial.print("Longitude:");
 Serial.println(slon, 6);
 delay(100);
 Serial.println((char)26);// ASCII code of CTRL+Z
```

```
 delay(1000);
 temp=0;
 }
digitalWrite(ledPin, LOW);
}
void forward()
{
  digitalWrite(m11, HIGH);
  digitalWrite(m12, LOW);
  digitalWrite(m21, HIGH);
  digitalWrite(m22, LOW);
}

void backward()
{
  digitalWrite(m11, LOW);
  digitalWrite(m12, HIGH);
  digitalWrite(m21, LOW);
  digitalWrite(m22, HIGH);
}

void left()
{
```

```
  digitalWrite(m11, HIGH);
  digitalWrite(m12, LOW);
  delay(100);
  digitalWrite(m21, LOW);
  digitalWrite(m22, LOW);
}
void right()
{
  digitalWrite(m11, LOW);
  digitalWrite(m12, LOW);
  delay(100);
  digitalWrite(m21, HIGH);
  digitalWrite(m22, LOW);
}
void Stop()
{
  digitalWrite(m11, LOW);
  digitalWrite(m12, LOW);
  digitalWrite(m21, LOW);
  digitalWrite(m22, LOW);
}
```

THE PRODUCT

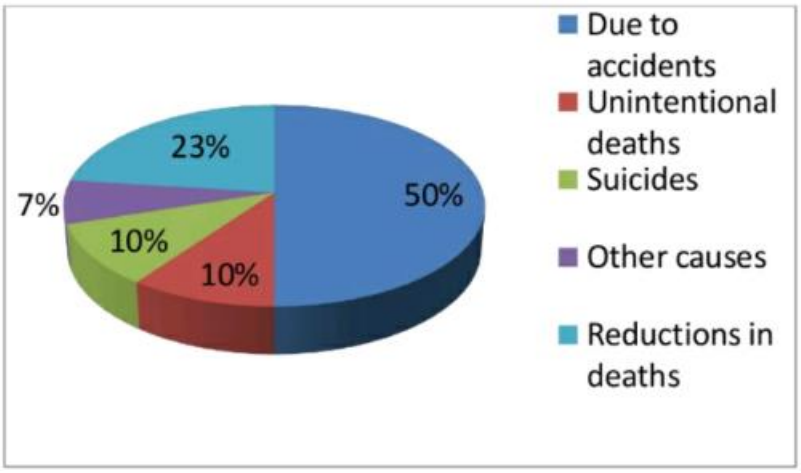
CHAPTER 11



FUTURE SCOPE

CHAPTER 12

- We can monitor some parameters of vehicles like overheat or LPG gas leakage
- We can dial an emergency call if the vehicle goes out of certain /predefined track
- This system can be interfaced with vehicle airbag system that prevents vehicle occupants from striking interior objects such as the steering wheel or window .



Death pi chart

Figure 10.1

CONCLUSION

CHAPTER 13

Vehicle tracking system makes better fleet management and which in turn brings large profits. Better scheduling or route planning can enable you handle larger loads within a particular time. Vehicle tracking both in case of personal as well as business purpose improves safety and security, communication medium, performance monitoring and increases productivity. So in the coming year, it is going to play a major role in our day-to-day living. Main motto of the accident alert system project is to decrease the chances of losing life in such accident which we can't stop from occurring. Whenever accident is alerted the paramedics are reached to the particular location to increase the chances of life. This device invention is much more useful for the accidents occurred in deserted places and midnights. This vehicle tracking and accident alert feature plays much more important role in day to day life in future.

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