VISVESVARAYA TECHNOLOGICAL UNIVERSITY
"Jnana Sangama", Belagavi 590 018

A project report on

"CAR POST CRASH ANALYSIS AND EMERGENCY RESCUE ALERT SYSTEM USING ANDROID PHONE"

Submitted to Visvesvaraya Technological University, Belagavi
In partial fulfillment of the requirement for the degree of

BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE & ENGINEERING

Submitted by

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This is to Certify that the project work entitled **"CAR POST CRASH ANALYSIS AND EMERGENCY RESCUE ALERT SYSTEM USING ANDROID PHONE"** is a bonafied work carried out by **HARSHITHA K[4BW14CS021], KAVYA M J[4BW14CS025], MONIKA P N[4BW14CS043], PAVITHRA S V[4BW14CS049]** in partial fulfillment for the award of **Bachelor of Engineering** in **Computer Science & Engineering** of Visvesvaraya Technological University, Belagavi during the year 2017-18. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report. The project report has been approved as it satisfies the academic requirements with respect to the project work prescribed by the University.

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ABSTRACT

Currently traditional method of crash analysis is being used in cops need to visit accident site and check for signs of accident. Then they need to check for evidences like skid marks, degree of damage, collision part, eye witness etc. Often there is situation of insufficient evidences. Sometimes it may also possible that some clues got missed by police. This is very time consuming and complex process. By using this evidences Collection system we could perform analysis of accident cases just from police station. Results obtained from analysis may also useful in driven training purpose, safety purpose, insurance issuing process etc. An Event data Recorder is a device which is installed in vehicles to record information related to vehicle crashes or accidents.

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Chapter 1

INTRODUCTION

1.1 Overview

Vehicle accident is one of the major problems in almost all over the world. According to the World Health Organization, more than a million of people in the world die each year because of transportation-related accidents [1]. In recent days, improving safety driving is an important objective that has led many organization and companies like vehicle manufacturers to invest significant amounts of resources, mainly in improving road infrastructure and to reduce the car crashes despite of many awareness campaigns, these problems keeps increasing day by day, due to several reasons such as drunk and drive, over speeding, riding without sufficient sleep and so on [1]. Even though different vehicle manufacturers have taken several measures in improving the safety of the vehicle this problem tends to remain due to the above mentioned reasons. Due to the delay in the medical assistance the mortality rates is at the high level, this causes economic and social burdens to people who are involved. Like flight data recorders in aircraft, "black box" technology now plays a very important role in the motor vehicle crash investigation [2]. Good and the safety measures are very expensive and also it is difficult to implement so it is planned to implement in four wheelers using black box.

Black box is defined as an electronic device which is used to record and store the information especially in the flights. We have used the same concept here in implementing the black box in car for the assistance [2]. Here black box is used to record and to store vehicle accelerometer, temperature, pressure, alcohol sensor, ultrasonic sensor values in real time and also it stores the past driving history of a vehicle.

We can also analyse and monitor the driving state of the vehicle and accident. We used analog to digital converter (ADC) to collect analog values collected by the sensors and convert them into a digital value to feed into the microcontroller.

Black box is a device which is designed in such a way that it can withstand large impacts; due to this the data stored in it cannot be destroyed easily. That is why it is so important to have the black box in the car which records the information before, during and after a crash [3]. Here in our project the black box will give us the complete information about the conditions of the car and it helps to monitor it by updating the values to the database for every 3 sec. suppose in the case of any crash or the physical anomalies the stored data can be accessed from the black box. This data can be used in forensics in the case of accidents or any other related crimes.

Here in the proposed system we have designed the black box by using any conjunctive components such as accelerometer sensor, temperature sensor, pressures sensor, ultrasonic sensor, alcohol sensor, analog to digital converter (ADC), microcontroller unit, LCD display Global Positioning System (GPS) and Global System for Mobile Communications (GSM) module. For the implementation many components & the various types of sensors are used and it is implemented by using the embedded C programming [4]. Embedded C programming not only helps in recording the data but also helps in retrieving the data from Micro Controller memory to an LCD which is used to display the output.

Let us consider a situation where there is an accident and there is no service for assisting the victims under this situation it will be so difficult to treat, keeping this idea we have designed a system where in such type of situation the car itself will switches into its surveillance mode immediately and intimates the family members, nearby emergency medical service and police station by sending a short message along with the exact location of the car, the location of the car is taken with the help of GPS module [4]. So by this system we can provide the assistance to the victims immediately and thereby we can reduce the mortality rates.

In this project demonstration a database is maintained at a server end. This database is interfaced with a GSM. The database contains the contact detail of nearest police station and hospitals to any accident occurred site.

Whenever the accident occurs, the coordinates of the accident site is acquired by the on-board unit (OBU) of the concerned vehicle. Through the help of GSM module the acquired coordinates are sent to the database.

GSM is short form of Global System for Mobile Communications, one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency [5]. OBU has tilt sensing android mobile which senses the tilt when accident. occurs and sends the tilted coordinates which will be deviated from the normal coordinates. The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of site of four or more GPS stations [6]. The system provides critical capabilities to military, civil and commercial users around the world. The server maintaining the database, has a .NET based application with GSM unit to communicate with OBU, police stations, hospital, ambulance etc., The police station and hospitals are also equipped with mobile phone handsets. Ambulance is also equipped with cell phone or mobile phone handsets.

1.2 Problem Statement

Nowadays lots of accidents happen on highway due to increase in traffic and also due to rash and careless driving. In many situations the family members or ambulance and police authority cannot be informed in time. This delay lends to chaotic situation and the injured person's life is in danger.

1.3 Objectives of the project

The main objective of the project is make zero accident level in real time all over the globe and if accidents occur to recover fast very short time, increases the probability of survival of the injured, and reduces the injury severity. And automatically deployed the actions required, thereby reducing the time to assist inured person.

Chapter 2

LITERATURE SURVEY

2.1 Introduction

To complete the project in proper manner, a literature survey is of great help techniques are being constantly proposed through various researchers and are presented in many national and international conferences and published in various journals. This chapter presents the best techniques that are taken from various research publications that are best suited for the proposed design.

2.2 Literature review

Using Bluetooth and sensor networks for intelligent transportation systems

There are many efforts, applications; approaches have been proposed to provide security and safety in case of the accidents. A novel approach to increase the safety of road travel using the concept of wireless sensor networks and Bluetooth protocol has been proposed. Discussed, how vehicles can from mobile ad-hoc networks exchange data sent by the on board sensor

Using smart phone to car accidents and provide situational Awareness to emergency responders

Is it developed integrated system to manage, control and monitor all the accessories inside the vehicles in order to achieve the idea intelligence car with ability to users personal mobile hand phone as a remote interface. Smartphone based accident detection can reduce overall traffic congestion and Awareness of emergency responders.

A GSM & GPS based systems for automatic accident notification and severity estimation

In this paper the accident can be notified automatically using sensors and the location & severity of accident also send as SMS via GSM to the nearest police station and hospital to bring the ambulance to the spot to rescue the passengers. Our system considers most relevant variables (such as sensors) that can characterize the severity of accident.

Road accidents are a human tragedy. They involve high human suffering and monetary costs in terms of untimely death, injuries. Unfortunately, more than half victims are in the economically active age group of 25-65 years. Advanced life saving measures, such as electronic stability control, also show significant promise for reducing injuries. By observing previous accident history chart we are able to conclude that there are more number of people dies in each country. Moreover, each minute that an injured crash victim does not receive emergency medical care can make a large difference in their survival rate, e.g. his paper shows how the sensors and processing capabilities of GPS and GSM can be used to overcome the challenges of detecting traffic accidents without direct interaction with a vehicle's on-board sensors.

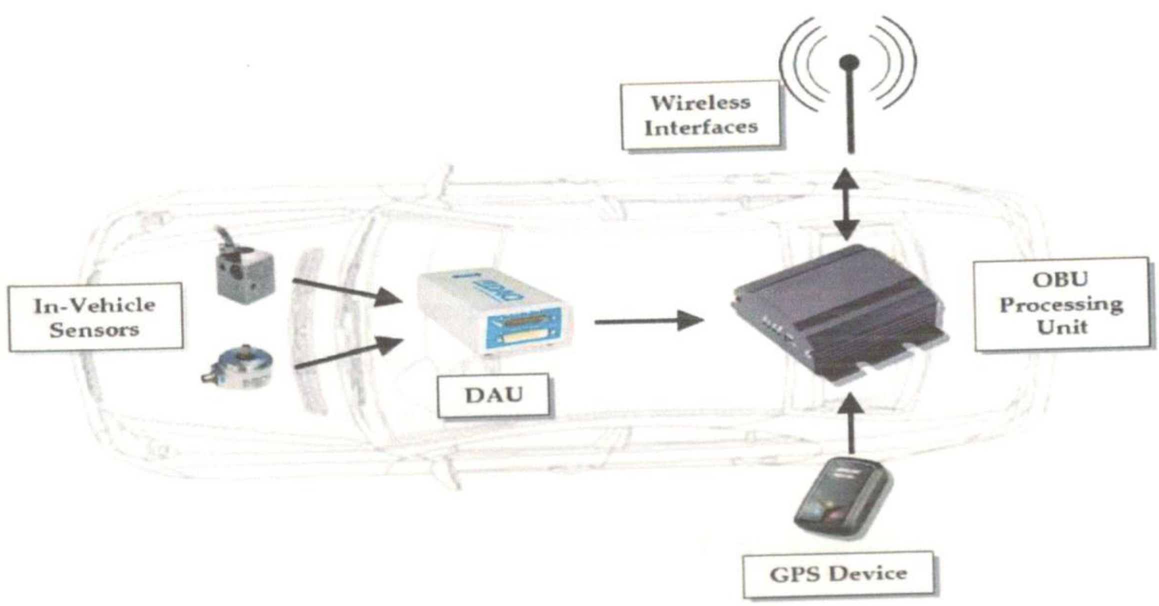


Fig 2.1 Literature survey system Architecture

The main objective of the proposed OBU lies in obtaining the available information from sensors inside the vehicle to determine when a dangerous situation occurs, and reporting that situation to the nearest Control Unit, as well as to other nearby vehicles that may be affected. Fig. 2.1 shows the OBU system, which relies on the interaction between sensors, the data acquisition unit, the processing unit, and wireless interfaces:

1) *In-vehicle sensors*: They are required to detect accidents and provide information about its causes. Accessing the data from in-vehicle sensors is possible nowadays using the On-Board Diagnostics (OBD) standard interface, which serves as the entry point to the vehicle's internal bus. This standard is mandatory in Europe and USA since 2001.

2) *Data Acquisition Unit (DAU):* This device is responsible for periodically collecting data from the sensors available in the vehicle (airbag triggers, speed, fuel levels, etc.), converting them to a common format, and providing the collected data set to the OBU Processing Unit.

3) *OBU Processing Unit:* It is in charge of processing the data coming from sensors, determining whether an accident occurred, and notifying dangerous situations to nearby vehicles, or directly to the Control Unit. The information from the DAU is gathered, interpreted and used to determine the vehicle's current status.

Proof collection from car black box using smart phone for accident detection

According to the WHO, more than a million people in the world die each year because of vehicle accidents. In order to react to this situation, the black box concept is used as first step to solve the problem. In order to overcome from this problem, in this paper we are trying to implement the concept of "black box" in the car. Car black box is a device used to record the information's such as engine temperature, presence of obstacle, alcohol content and exact location of the accident about the vehicle. Along with this we are using smart phone to get the snap shots which are related to accidents and finally send this information along with the snaps to police sever.

Intelligent Safety Information Gathering System Using a Smart Black box

This paper presents an intelligent method to collect the accident or safety information using the widespread black box system. Conventionally, when information is needed after an accident or crime happened, investigators seek for possible clues non-systematically by hand. We propose a systematic method of gathering that information using an intelligent black box system which analyses and gathers information of neighbouring vehicles while driving. For this purpose, in addition to the functionality of storing the video sequence while driving, we add a recognition engine to extract and record the license plate number and colour of neighbouring vehicles. We also add the IOT functionality to receive information request message from the server and upload the matched information to the server.

Chapter 3

SYSTEM ANALYSIS

3.1 Existing System

- Do not have Evidence collection system in the present system.
- Rescue facility was not present which causes difficulty in many lives.
- Waste of time and fuel due to lack of information about an accidents.
- Existing system will take more time in police verification and accident analysis process.
- Smartphone based accident detection can reduce overall traffic congestion and awareness of emergency responders
- When information is needed after an accident or crime happened, investigators seek for possible clues non-systematically by hand.
- By observing previous accident history chart we are able to conclude that there are more number of people dies in each country.
- We cannot detect where the accident has occurred and hence no information related to it.
- In early we are not used black box technology.

3.1.1 Disadvantages

- Server sometimes may be down.
- Sometime accident locations may be too remote for the units to work properly

3.2 Proposed system

- In Proposed system we are using Evidence collection system. Evidence collection car can collect the statistically applicable crash or accident information to improve the safety of the vehicles.
- This collected information are sent to android mobile phone of car owner.
- The locations are captured can be collected via GSM through android.
- This demonstration shows the whole process to collect information and data's like temperature, obstacle and seat belt worn. This data is then sent through GSM to concerned authorities
- Information delivered to the respectively individuals on time.
- Helps in giving accurate position of the incident thereby saving life.
- An Evidence collection system which will reduce time and complexity in police verification and accident analysis process.
- Often, there is situation of insufficient evidences. Sometimes it may also possible that some clues got missed by police.
- An Event Data Recorder is a device which is installed in vehicles to record information related to vehicle crashes or accidents.
- This collected information are sent to android mobile phone of car owner.

3.2.1 Advantages

- Efficient accident networking information system.
- Can expect immediate rescue operations.
- Automatic Ambulance Rescue.
- Immediate medication will be provided to the accident victims in the rescue areas.

Chapter 4

SOFTWARE REQUIREMENTS SPECIFICATION

4.1 System requirements

For any project system design plays an important role. Hardware requirements involve physical components construction and software requirements involved the working software and the programming language.

- **Hardware used**
  - Renesas 64 pin Microcontroller
  - LCD
  - Dc motor
  - Ultrasonic sensor
  - Temperature sensor
  - Accelometric sensor
  - Seat Belt
  - GPS
  - GSM
- **Software specification**
  - Android
  - Renesas Flash Programmer
  - Renesas Cubesuite plus

4.2 64 Pin Renesas Microcontroller

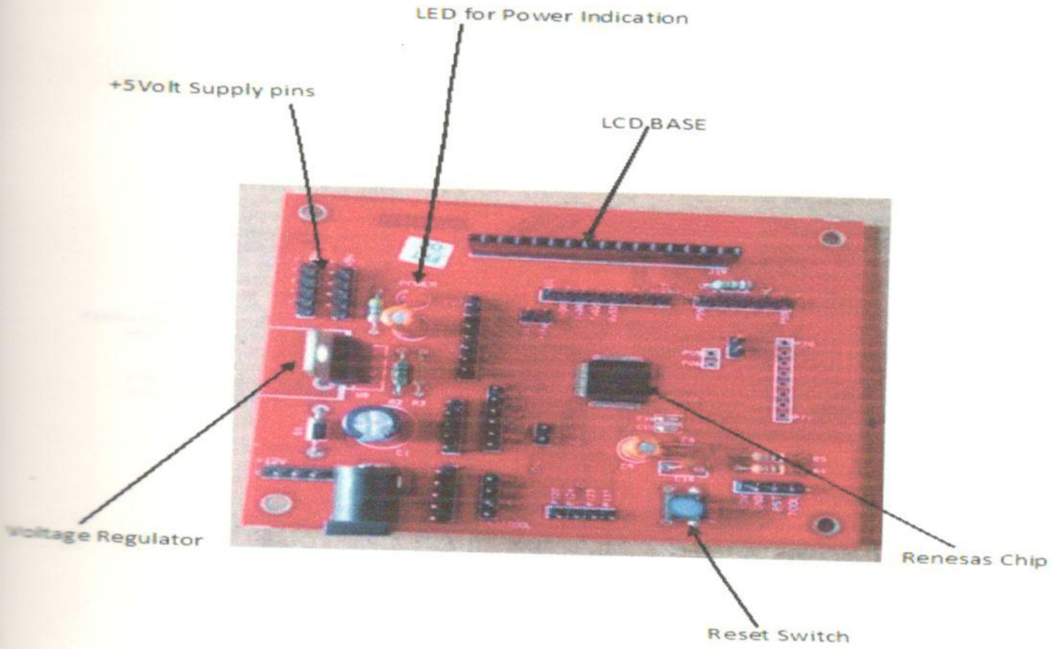


Fig 4.1 Renesas Microcontroller Board

Renesas microcontroller is a 8051 family of microcontrollers, with various in-built features. Renesas is a 16 bit microcontroller with minimum instruction time can be changed from ultra-low speed(30.5us) to high speed(0.03125us). 16 to 512kb of rom and 2 to 32kb of ram are available depending upon the series and number of pins. On-chip high-speed (32 mhz to 1 mhz) as well a low-speed (15 khz) oscillator is present.10 bit resolution A/D converter(6 to 26 channels depending upon the series) totally 3 UART for serial interface with 0-7 channels for timer with built in PWM features. Most of the pins of Renesas have multi-task features. Cost of Renesas microcontroller is comparatively less. Rigid body of microcontroller hence less prone to damages due to electrostatic charge. Operates with 5v power supply.

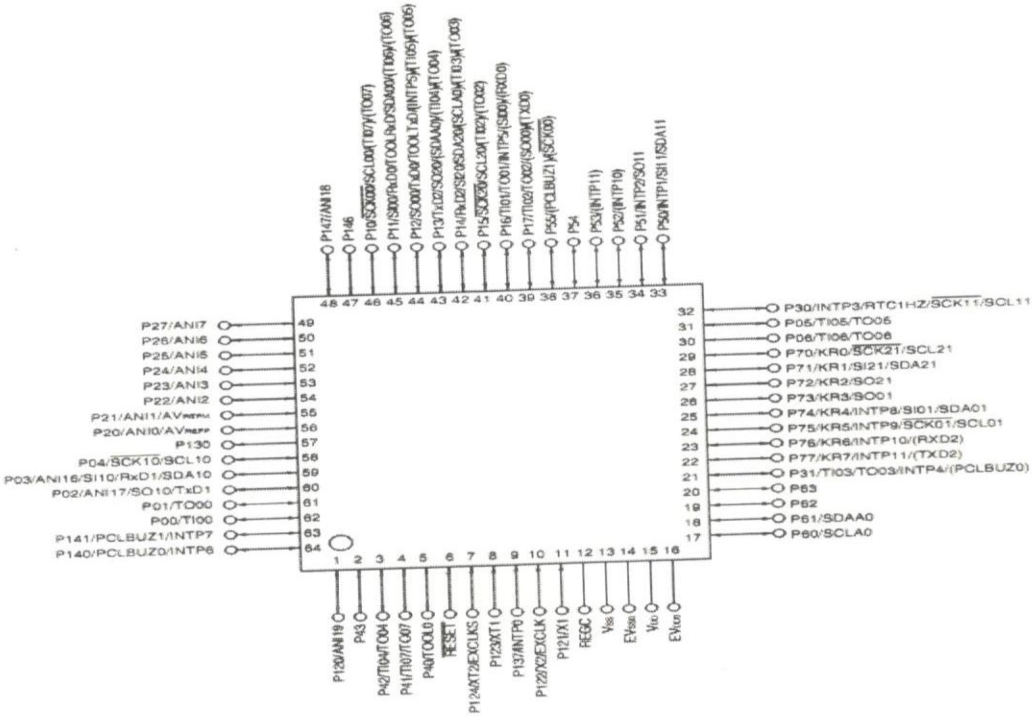


Fig 4.2 Pin Diagram of 64 Bit Renesas Microcontroller

4.2.1 Features

- General-purpose register: 8 bits × 32 registers (8 bits × 8 registers × 4 banks)
- ROM: 512 KB, RAM: 32 KB, Data flash memory: 8 KB
- On-chip high-speed on-chip oscillator
- On-chip single-power-supply flash memory (with prohibition of block erase/writing function)
- On-chip debug function
- Ports → Total 11 ports with 58 Input / Output Pins
    - Port 0 → 0 to 6 → Total 7 pins in port 0
    - Port 1 → 0 to 7 → Total 8 pins in port 1
    - Port 2 → 0 to 7 → Total 8 pins in port 2

  - Port 3 → 0 to 1 → Total 2 pins in port 3
  - Port 4 → 0 to 3 → Total 4 pins in port 4
  - Port 5 → 0 to 5 → Total 6 pins in port 5
  - Port 6 → 0 to 3 → Total 4 pins in port 6
  - Port 7 → 0 to 7 → Total 8 pins in port 7
  - Port 12 → 0 to 4 → Total 5 pins in port 12
  - Port 13 → 0, 7 → Total 2 pins in port 13
  - Port 14 → 0, 1, 6, 7 → Total 4 pins in port 14
- On-chip power-on-reset (POR) circuit and voltage detector (LVD)
- On-chip watchdog timer (operable with the dedicated low-speed on-chip oscillator)
- I/O ports: 16 to 120 (N-channel open drain: 0 to 4)
- Timer → 16-bit timer: 8 to 16 channels, Watchdog timer: 1 channel
- Different potential interface: Can connect to a 1.8/2.5/3 V device
- 8/10-bit resolution A/D converter (VDD = EVDD =1.6 to 5.5 V): 6 to 26 channels
- Power supply voltage: VDD = 1.6 to 5.5 V

Processor Registers

The RL78/G13 products incorporate the following processor registers.

Control Register

The control registers control the program sequence, statuses and stack memory. The control register consist of a programme counter (PC), a program status word (PSW) and a stack pointer.

Program Counter (Pc)

The program counter is a 20-bit register that holds the address information of the next program to be executed. In normal operation, pc is automatically incremented according to the number of bytes of the instruction to be fetched. When a branch instruction is executed, immediate data and register contents are set. *Reset signal generation sets the reset vector table values at addresses 0000h and 0001h to the program counter.*

Program Status Word (PSW)

The program status word is an 8-bit register consisting of various flags set/reset by instruction execution. Program status word contents are stored in the stack area upon vectored interrupt request is acknowledged or push PSW instruction execution and are restored upon execution of the RETB, RETI and pop PSW instructions. Reset signal generation sets the psw register to 06h.

Interrupt enable flag

This flag controls the interrupt request acknowledge operations of the CPU. When 0, the IE flag is set to the interrupt disabled (DI) state, and all mask able interrupt requests are disabled. When 1, the IE flag is set to the interrupt enabled (EI) state and interrupt request acknowledgment is controlled with an in-service priority flag (isp1, isp0), an interrupt mask flag for various interrupt sources, and a priority specification flag. The IE flag is reset (0) upon DI instruction execution or interrupt acknowledgment and is set (1) upon EI instruction execution.

Zero Flag (Z)

When the operation result is zero, this flag is set (1). It is reset (0) in all other cases.

Register Bank Select Flags (Rbs0, Rbs1)

These are 2-bit flags to select one of the four register banks. In these flags, the 2-bit information that indicates the register bank selected by SEL RBN instruction execution is stored.

Auxiliary Carry Flag (AC)

If the operation result has a carry from bit 3 or a borrow at bit 3, this flag is set (1). It is reset (0) in all other cases.

In-Service Priority Flags (Isp1, Isp0)

This flag manages the priority of acknowledgeable mask able vectored interrupts. Vectored interrupt requests specified lower than the value of isp0 and isp1 flags by the priority specification flag registers (prn0l, prn0h, prn1l, prn1h, prn2l, prn2h) (see 16.3 (3)) cannot be acknowledged. Actual request acknowledgment is controlled by the interrupt enable flag (IE). Remark n = 0, 1

Carry Flag (CY)

This flag stores overflow and underflow upon add/subtract instruction execution. It stores the shift-out value upon rotate instruction execution and functions as a bit accumulator during bit operation instruction execution.

4.3 LCD

LCD abbreviation of Liquid Crystal Display screen is an electronic display module which is found in a wide range of applications.

A 16 digit display is the very basic module and is very commonly used in most of the devices and circuits. There are three types of LCD:

- NUMERIC LCD: displays only numbers. E.g.: old calculators.
- ALPHANUMERIC LCD: displays numbers and alphabets. E.g.: Scientific calculators.
- GRAPHICAL LCD: displays pictures. E.g.: mobile displays.

4.3.1 Alpha-Numeric LCD Display

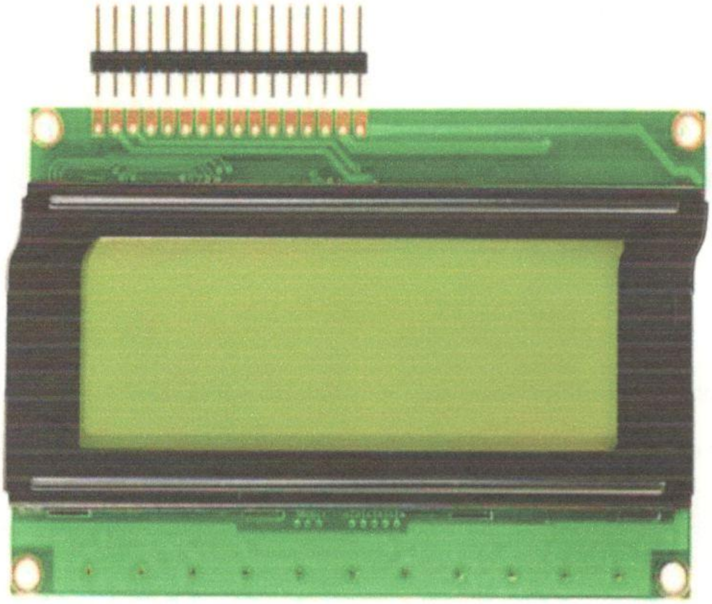


Fig 4.3 LCD

A liquid -crystal display (LCD) is a flat panel display, electronic visual display or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in general purpose computer display or fixed images which can be displayed or hidden, such as preset words, digits and 7-segment displays as in a digital clock.

This is a high quality 16 character by 2 line intelligent display module, with back lighting, works with almost any controller. The serial LCD is a simple and cost effective solution for interfacing 2 liquid crystal displays based on PSOC controller. The module takes incoming 9600 BPS TTL level signals and displays those characters on the LCD screen. Only 3 wires + 5 V, GND and signal are needed to Interface to the LCD.

A liquid crystal display consists of an array of tiny segments (called pixels) that can be manipulated to present information. Liquid crystals do not emit light directly instead they use light modulating techniques. LCDs are used in a wide range of applications, including computer monitors, television, instrument panels, aircraft cockpit displays, signage, etc. They are common in consumer devices such as video players, gaming devices, clocks, watches, calculators, and telephones.

The LCD requires 3 control lines from the microcontroller:

- **Enable (E)**
  - This line allows access to the display through R/W and RS lines. When this line is low, the LCD is disabled and ignores signals from R/W and RS. When (E) line is high, the LCD checks the state of the two control lines and responds accordingly.

- **Read/Write (R/W)**
  - This line determines the direction of data between the LCD and microcontroller. When it is low, data is written to the LCD. When it is high, data is read from the LCD.

- **Register Select (RS)**
  - With the help of this line, the LCD interprets the type of data on data lines. When it is low, an instruction is being written to the LCD. When it is high, a character is being written to the LCD.

Pin NO.	Symbol	Level	Description
1	VSS	0V	Ground
2	VDD	5.0V	Supply voltage for logic
3	VO	---	Input voltage for LCD
4	RS	H/L	H : Data signal, L : Instruction signal
5	R/W	H/L	H : Read mode, L : Write mode
6	E	H, H → L	Chip enable signal
7	DB0	H/L	Data bit 0
8	DB1	H/L	Data bit 1
9	DB2	H/L	Data bit 2
10	DB3	H/L	Data bit 3
11	DB4	H/L	Data bit 4
12	DB5	H/L	Data bit 5
13	DB6	H/L	Data bit 6
14	DB7	H/L	Data bit 7
15	LED A(+)	4.2V	Back light anode
16	LED K (-)	0V	Back light cathode

Table 4.1 pin description of LCD interface

LCDs are preferred to cathode ray tube (CRT) displays in most applications because of

1. The size of LCDs comes in wider varieties.
2. They do not use Phosphor; hence images are not burnt-in.

3. Safer disposal
4. Energy Efficient
5. Low Power Consumption

LCD Command Codes

Code (Hex)	Command to LCD Instruction Register
1	Clear display screen
2	Return home
4	Decrement cursor (shift cursor to left)
6	Increment cursor (shift cursor to right)
5	Shift display right
7	Shift display left
8	Display off, cursor off
A	Display off, cursor on
C	Display on, cursor off
E	Display on, cursor blinking
F	Display on, cursor blinking
10	Shift cursor position to left
14	Shift cursor position to right
18	Shift the entire display to the left
1C	Shift the entire display to the right
80	Force cursor to beginning to 1st line
C0	Force cursor to beginning to 2nd line
38	2 lines and 5x7 matrix

Table 4.2 LCD Command code

4.4 Motor

4.4.1 DC Motor

A DC motor is a device that converts direct current (electrical energy) into mechanical energy. Two dc motors are used for driving the wheels connected to the robot. L293d is a dc motor driver used for driving dc motors. 200rpm centre shaft economy series DC motor is high quality low cost dc geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside. Although motor gives 200 rpm at 12v but motor runs smoothly from 4 v to 12v and gives wide range of rpm, and torque.

Fig 4.4 12v 100 rpm DC Geared Motor

NR-DC-ECO is high quality low cost DC geared motor. It contains Brass gears and steel pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. These spindles rotate between bronze plates which ensures silent running. The output shaft rotates in a sintered bushing.

4.4.2 L293D Motor Driver IC

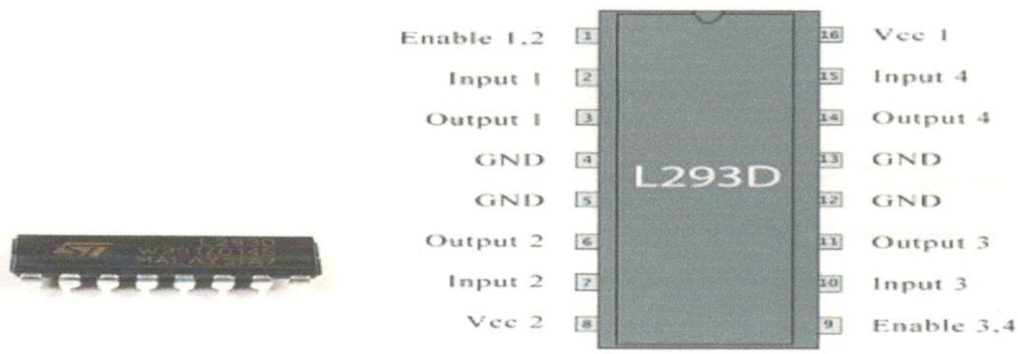


Fig 4.5 Motor Driver IC

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H Bridge Motor Driver integrated circuit (IC). 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. 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 and 7 and 10 and 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.

Here the driver circuits are used to control the operations of firing unit, laser unit & audio reception unit present on the robotic module. Here three types of driver circuits are used they are ground driver, laser driver and motor driver circuit.

- 100RPM 12V DC motors with Gearbox
- 6mm shaft diameter with internal hole
- 125gm weight
- *Stall Torque = 1.5kgcm torque*
- No-load current = 60 mA(Max), Load current = 300 mA(Max)

The Device is a monolithic integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads (such as relays solenoids, DC and stepping motors) and switching power transistors. We have used this driver circuit too drive the motors of the robot. Each L293D is used to drive two motors. Two L293D's are used to drive four motors. When both the inputs are low the motor will be in the halt state, when the first input is high and the second input is low the motor will move in the forward direction, when first input is low and second input is high the motor will move in the reverse direction and when both the inputs are low the motor will be in the halt state.

4.5 Ultrasonic module HC-SR04

The HR-SR04 ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures the distance by sending out a sound waves it measures the distance by sending sound waves at a specific frequency and listing that sound waves to bounce back. It is possible to calculate the distance between the sonar sensor and the object. since it is known as sound travels through air at about 344m/s you can take the time for the sound waves to return and multiply by 344 meters to find the total round trip distance of the sound waves travelled 2 times the distance to the object before it was detected by the sensor it includes the trip from sonar sensor to the object AND the trip from the object to the ultrasonic sensor to find the distance from the object simply divide the round trip distance in half. It uses sonar emission technique to determine distance with an object just like bats or dolphins do. A model of the HC-SR04 Ultrasonic Module is given in the fig 4. It offers excellent range detection without contact but with high accuracy of stable readings to use the package in an easy manner. Its operation is not affected by sunlight or black material like Sharp range finders but acoustically soft materials like cloth can be difficult to detect. It comes with a complete ultrasonic transmitter and receiver module.

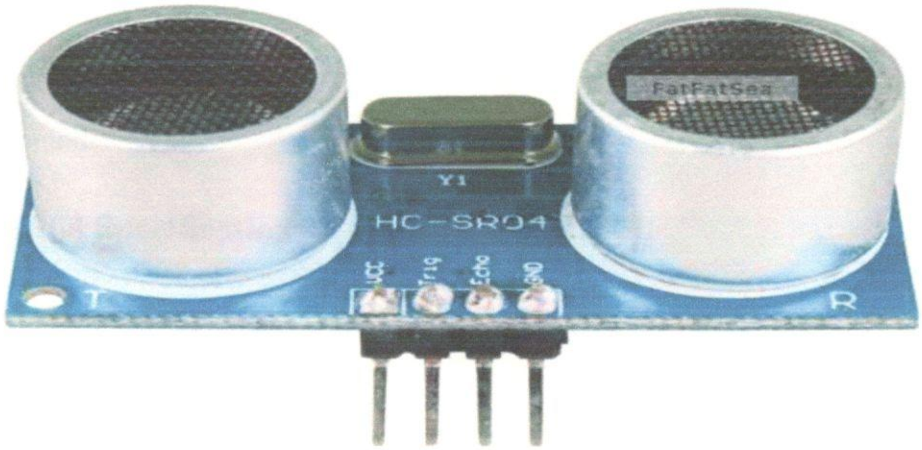


Fig 4.6 Ultrasonic Sensor

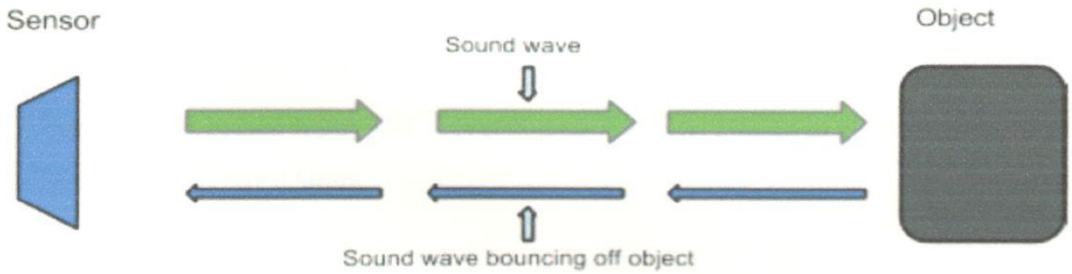


Fig 4.7 Working of an Ultrasonic Sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work:

- Using IO trigger for at least 10us high level signal
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

- IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time × velocity of sound (340M/S) / 2,

Wire connecting direct as following:

- 5V Supply
- Trigger Pulse Input
- Echo Pulse Output
- 0V Ground

4.5.1 HC-SR04 Specifications

- Working Voltage: DC 5V
- Working Current: 15MA
- Working Frequency: 40HZ
- MAX Range:4m
- MIN Range:2cm
- Measuring Angle: 15 Degree
- Trigger Input Signal: 10us TTL Pulse
- Echo Output Signal Input TTL Lever Signal And The Range In Proportion
- Dimension 45*20*15mm

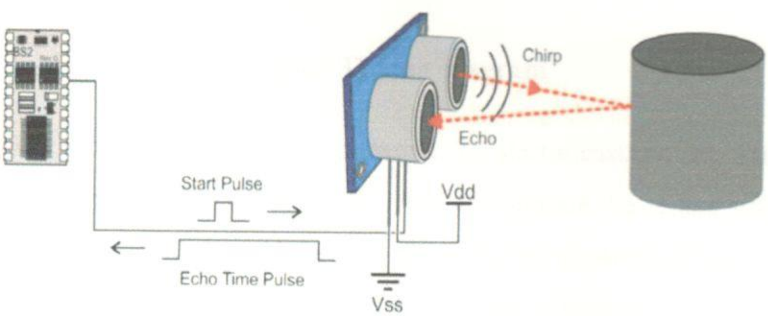


Fig 4.8 Ultrasonic Sensor

$$d = v \times t \quad (1)$$

Distance= Time *Speed Of Time / 2.

Where,

d=distance in cm ,v=velocity in m/sec, t=time in sec.

4.5.2 Timing diagram

The Timing diagram is shown below. You only need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: uS / 58 = centimeters or uS / 148 =inch; or: the range = high level time * velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.

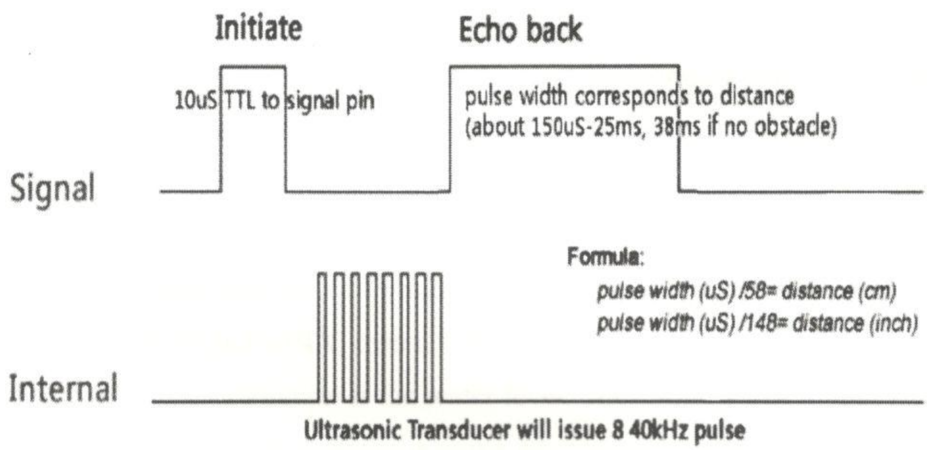


Fig 4.9 Timing diagram

The timing diagram of HC-SR04 is shown. To start measurement, Trig of SR04 must receive a pulse of high (5V) for at least 10us, this will initiate the sensor will transmit out 8 cycle of ultrasonic burst at 40khz and wait for the reflected ultrasonic burst. When the sensor detected ultrasonic from receiver, it will set the Echo pin to high (5V) and delay for a period (width) which proportion to distance. To obtain the distance, measure the width (Ton) of Echo pin.

Attention:

- The module is not suggested to connect directly to electric, if connected electric, the GND terminal should be connected the module first, otherwise, it will affect the normal work of the module.
- When tested objects, the range of area is not less than 0.5 square meters and the plane requests as smooth as possible, otherwise ,it will affect the results of measuring.

4.6 LM35 Temperature Sensor

Engine temperature is the important parameter in control unit, if this value goes to abnormal, some unwanted gases exhaust from vehicles due to improper combustion. In this paper, to obtain the vehicle engine temperature, we used LM35 as temperature sensor. It continuously senses the engine temperature and fed to the microcontroller. It converts temperature value into electrical signals. It is rated to operate over a -55 to +150°C temperature range.

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 μA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range.

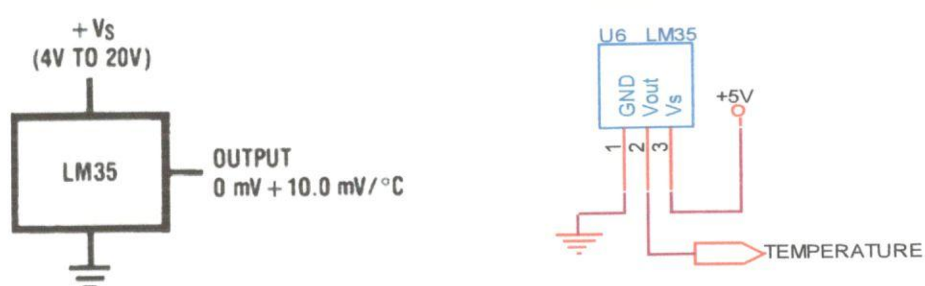


Fig 4.10 Temperature sensor

The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature.

This presumes that the ambient air temperature is almost the same as the surface temperature; if the air temperature were much higher or lower than the surface temperature, the actual temperature of the LM35 die would be at an intermediate temperature between the surface temperature and the air temperature. This is especially true for the TO-92 plastic package, where the copper leads are the principal thermal path to carry heat into the device, so its temperature might be closer to the air temperature than to the surface temperature.

4.7 Accelometer

Accelerometer is a device that measures proper acceleration (“g-force”). Proper acceleration is not the same as co-ordinate acceleration (rate of change of velocity). For example, an accelerator at rest on the surface of the earth will measure an acceleration g=9.81 m/s2 straight up words. By contrast, accelerometers in free fall off orbiting and acceleration due to the gravity of earth will measure zero. Accelerometers have multiple applications in industry and Science. Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. Accelerometers are used in drones for flight stabilization. These devices are called Gravity gradiometer, as they measure gradients in the gravitational field. Such pairs of accelerometers in theory may also be able to detect gravitational waves. An accelerometer measures proper acceleration, which is the acceleration it experiences relative to free fall and is the acceleration felt by people and objects.

4.8 GSM

4.8.1 Introduction to GSM

A GSM modem is a specialised type of 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 model 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. A GSM modem vacated modem device with a serial, USB or Bluetooth connection, such as the Falcon Samba 75. Other manufacturers of dedicated GSM modem devices include wave multi tech and Tango. The term GSM modem is used as a generic term to refer to any model that supports one or more of the protocols in GSM evolutionary family, including the 2.53 Technologies GPRS and EDGE, as well as 3G technologies WCDMA, UMTS, HSDPA, and HSUPA.

GSM modem exposes and interface that allows applications such as now SMS to send and receive messages over the modem interface. To perform these tasks, 8 GSM modem must support and "extended ET command set" sending or receiving SMS messages, as defined in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications.

4.8.2 Circuit diagram of GSM

- Circuit diagram of GSM board is shown in the figure.
- GSM modem needs 5 volts DC supply
- Transmitter and receiver pins are connected to microcontroller

A GSM modem is a wireless modem that works with a GSM wireless network. Global system for mobile communication is a globally accepted standard for Digital cellular communication. GSM is the name of 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. GSM uses a process called circuit switching. This method of communication allows a path to be established between two devices. Once the two devices are connected, a constant stream of digital data is relayed. GSM networks consist of three major systems. They are switching System, the base station system and the mobile station.

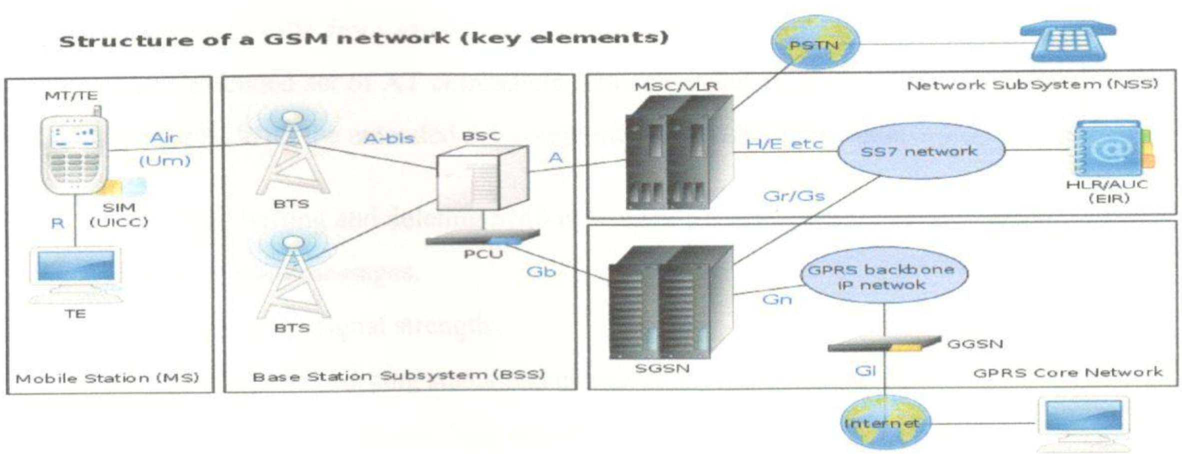


Fig 4.11 GSM network Topology

The Switching system:

The Switching System is very operative system in which many crucial operations are conducted. Switching systems hold 5 databases with in 8 which perform different functions. If we talked about major tasks of Switching System it performs call processing and subscriber related functions. Authentication Centre is small unit with handles the security end of the system and equipment identity register is an another important database which holds crucial information regarding mobile equipment's.

The Base Station System (BSS):

Base station system have very important role in mobile communication. BSS are basically 2 units which consist of iron rods and are usually of high length. BSS are responsible for connecting subscribers (MS) to mobile networks. All the communication is made in radio transmission. The base station system is further divided in two systems. These two systems, they are BTS and BSC. BTS (base transceiver station) handles communication station using radio transmission with mobile station and BSC (base station controller) creates physical link between subscriber and BTS, then manage and controls functions of it.

Mobile Station (Subscriber):

MS consists of a mobile unit and a smart card which is also referred as a subscriber identity module (SIM) card. This card fitted with the GSM modem and gives the user more personal mobility. The equipment itself is identified by a unique number known as the international mobile Equipment Identity (IMEI). It is build to perform switching functionality of the entire system. It's most important task is to control the calls to and from other telephones, which means it controls calls from same networks and calls from other networks. GSM modems support and extended set of AT commands. This extended AT commands are defined in the GSM standards. With the extended AT comments we can do things like:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

4.8.3 GSM Hardware of SIM900A

The core of data communication about this system life in wireless communication control terminals that uses GSM module to transfer long distance that are extensively and reliably.. It supports instruction of AT comments. SIM900 can be integrated with a wide range of applications. The SIM900 is a complete Quad-band GSM/GPRS solution is a SMT module which can be embedded in the customer applications. Featuring an industry standard interface, the Sim900 delivers GSM/GPRS 850/900/1800/1900Mhz performance for voice, SMS data fax in a small form factor and with low power consumption. With a tiny configuration of 24mm × 3mm, SIM900 fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

Product description of AA01-SIM900A:

- High quality product (not hobby grade)
- Quad-band GSM/GPRS 850/900/1800/1900 MHz
- Built in RS232 Level Converter (MAX3232)
- Configurable baud rate
- SMA connector with GSM L Type Antenna
- Built in SIM card holder
- Built in network status LED
- Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
- Audio interface Connecters. Most Status & Controlling Pins are available at Connecter
- Normal operation temperature: -20°C to +55°C
- Input voltage: 5V -12V DC

Chapter 5

SYSTEM DESIGN

5.1 System Architecture

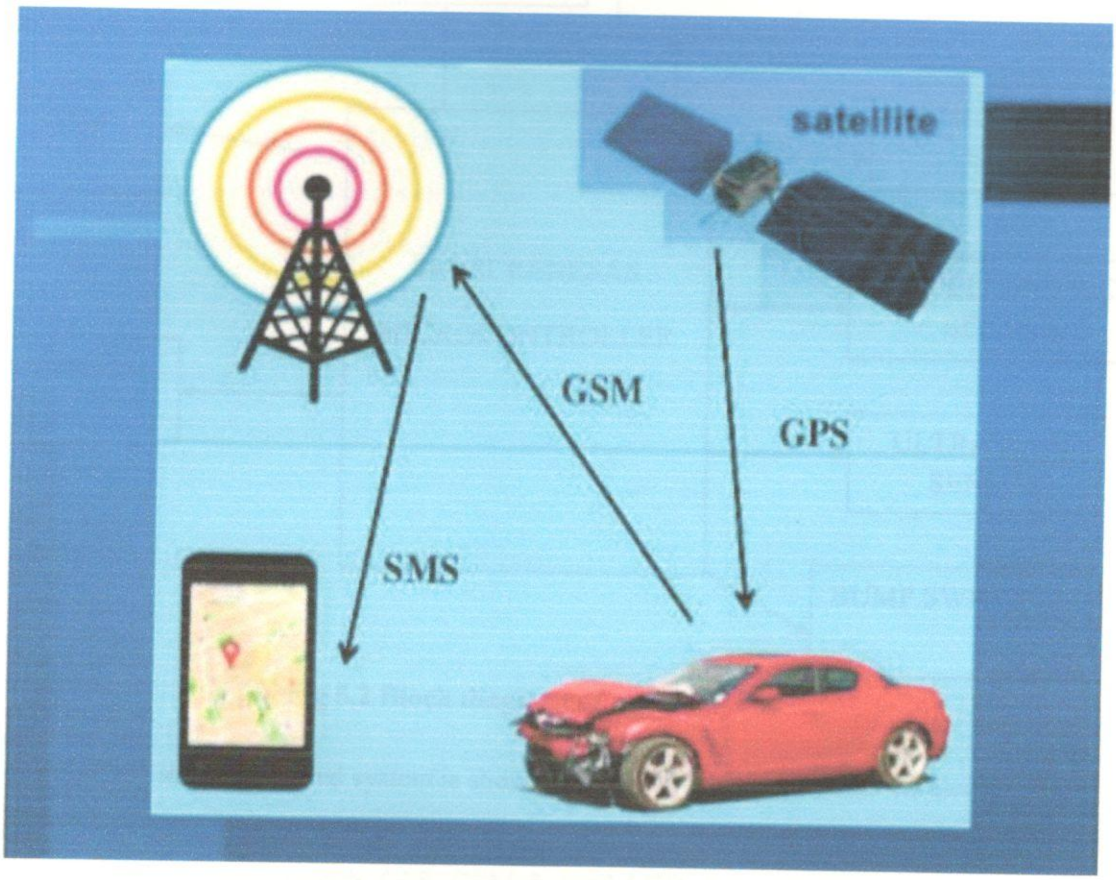


Fig 5.1 System Architecture

- Whenever accident occurs sensor detect and sends electrical signal to the ADC channel of the PIC microcontroller.
- By using GPS, we get particular location where accident occurs, then GSM modem sends message to authorized mobile number through SMTP protocol.
- The GPS positioning is done in the form of latitude and longitude along with the exact location of the place by making Google maps.

5.2 Block diagram

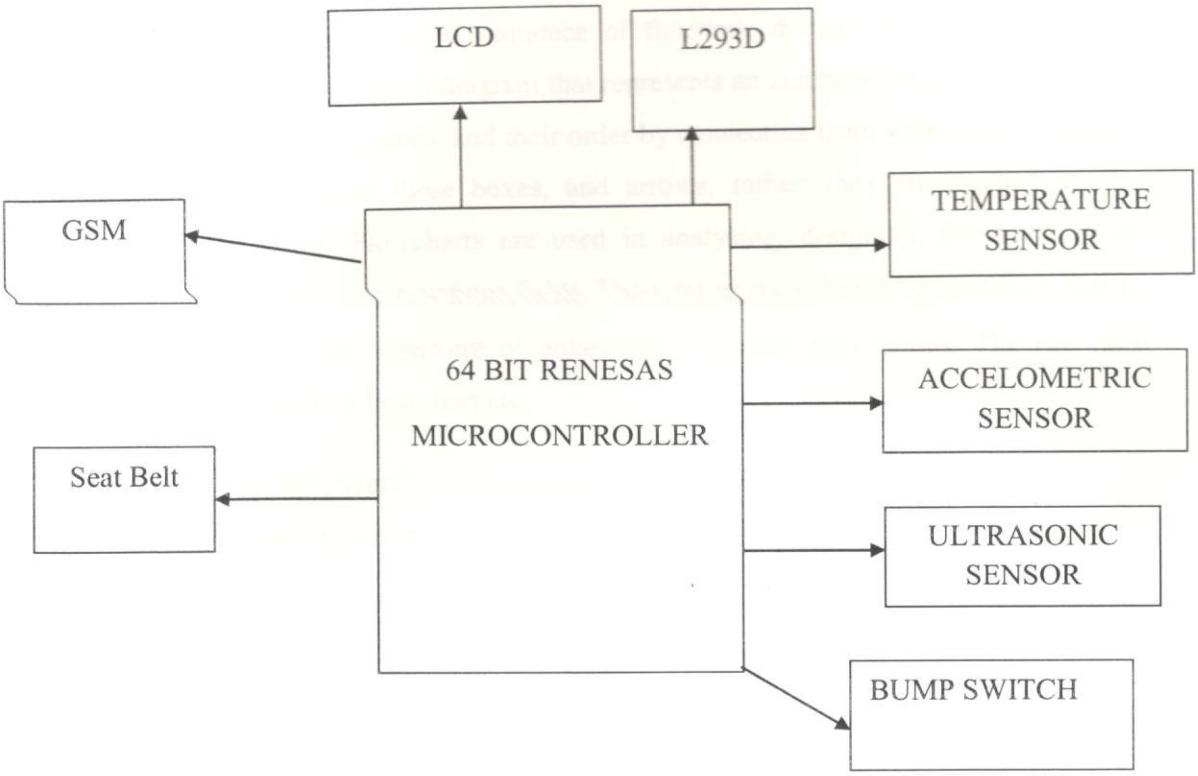


Fig 5.2 Block diagram of car black box

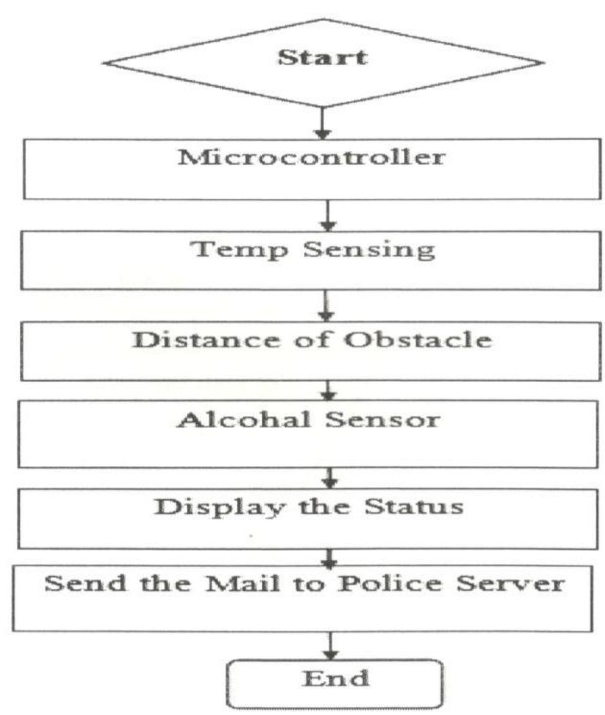
Block diagram in our proposed system is shown in Fig1. Black box contains the alcohol sensor, temperature sensor, ultrasonic sensor, accelometric sensor, LED indicator, slot sensor, toggle switch, DC motor, dump switch, GPS, GSM & 16x2 LCD. It detects the engine temperature, location (GPS), obstacle presences, acceleration & alcoholic content. The outputs of these parameters are displayed on the LCD. This collected information's along are send to the police server, ambulance through the internet. GPS tracking system developed in this paper helps to track the vehicle in case of accident and enables authorities to extend immediate emergency medical service.

When accident occurs the microcontroller gets activated and starts collecting the information such as temperature, presence of obstacle, alcohol content respectively from the sensors. This collected information is displayed and is sent to the police server through mail. By using this information police can easily know the accident spot and they get the correct proofs for the accident to provide justice.

5.3 Dataflow diagram

A flowchart is a diagram that describes a process or operation. It includes multiple steps, which the process "flows" through from start to finish. A graphical representation of a computer program in relation to its sequence of functions distinct (as from the data it processes). A flowchart is a type of diagram that represents an algorithm or process, showing the steps has boxes of various kinds, and their order by connecting them with arrows. Process operations are represented in these boxes, and arrows; rather, they are implied by the Sequencing of operations. Flowcharts are used in analysing, designing, documenting or managing a process or program in various fields. There are many different types of flow charts, and each type has its own repertoire of boxes and rotational conventions. The two most common types of boxes in a flowchart are:

- A processing step, usually called activity, and denoted as a rectangular box
- A decision usually denoted as a diamond.



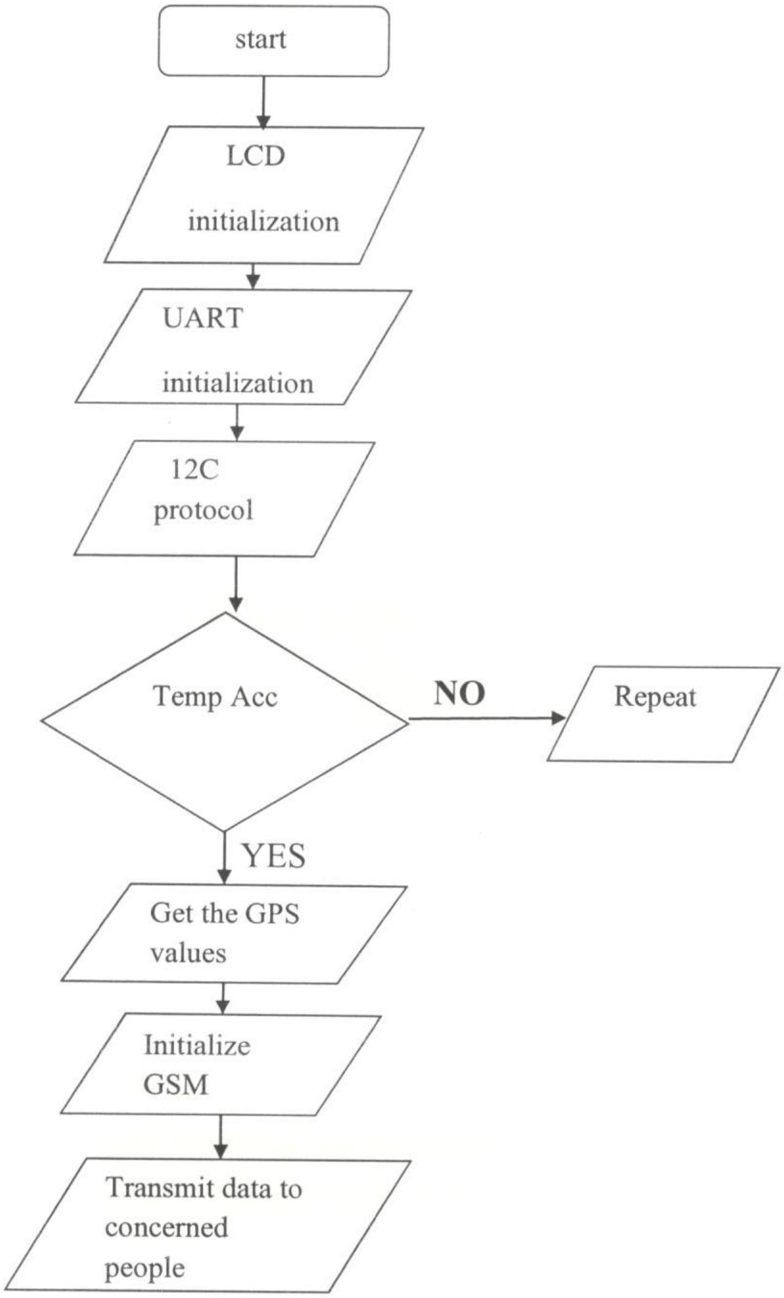


Fig 5.3 Flowchart

5.4 Interfacing of LCD display with Renesas 64 pin Microcontroller

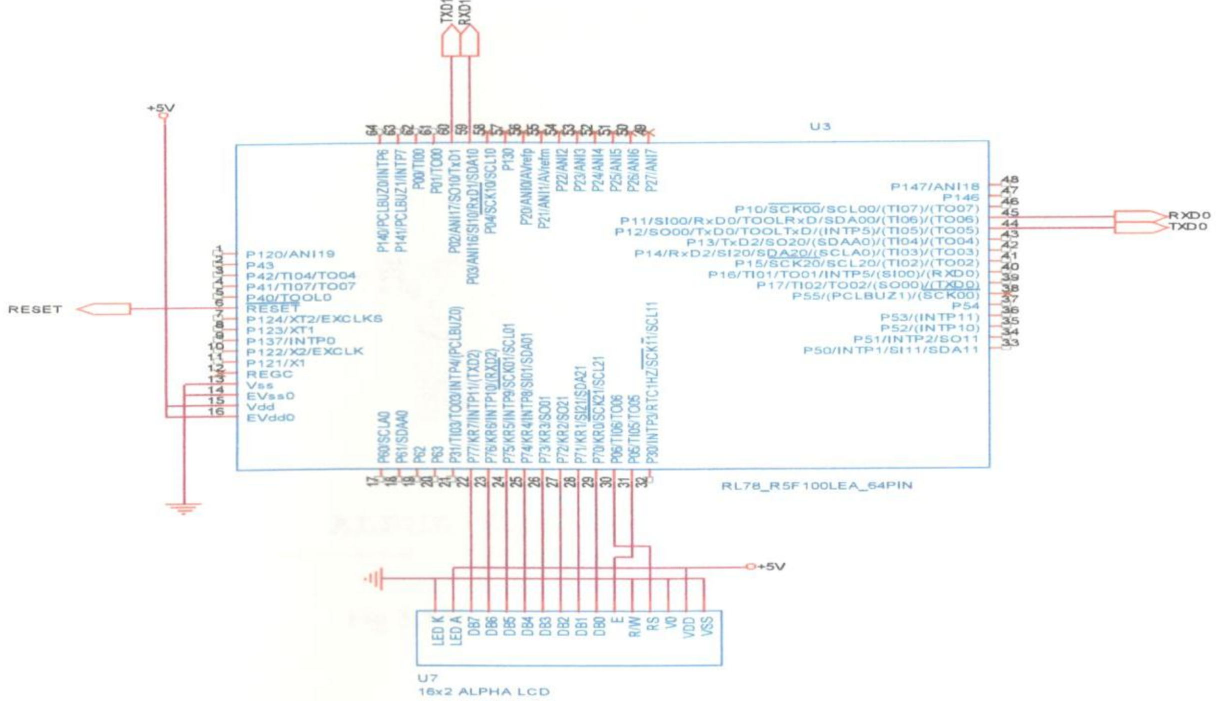


Fig 5.4 Circuit Diagram of LCD with 64 Pin Renesas

Alpha Numeric displays form an integral part of the Embedded Systems. The Data displayed here is controlled by the Microcontroller. The Control pins like Read Strobe, Read/Write and Enable are controlled through the Microcontroller Ports as per the waveforms. The 8 data is also provided through a Microcontroller Port. Make sure that 5V and GND lines are properly connected otherwise you may end up in damaging parallel port.

If you want backlight than connect pin 15 of LCD to 5V and pin 16 of LCD to GND. By adjusting 10k resistor make pin 3 of LCD at 0V. If connections are proper you will see this after power on. The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used, the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus.) The control lines are referred to as EN, RS, and RW. The EN line is called "Enable". This control line is used to tell the LCD that you are sending it data. To send data to the LCD,.When the other lines are completely ready, bring EN low (0) again.

The RS line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

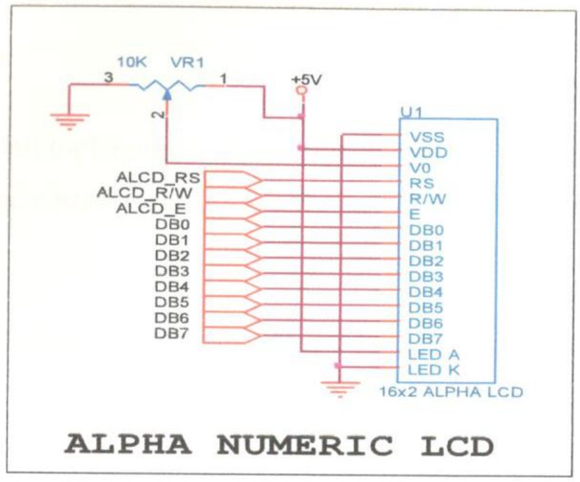


Fig 5.5 General Circuit of LCD

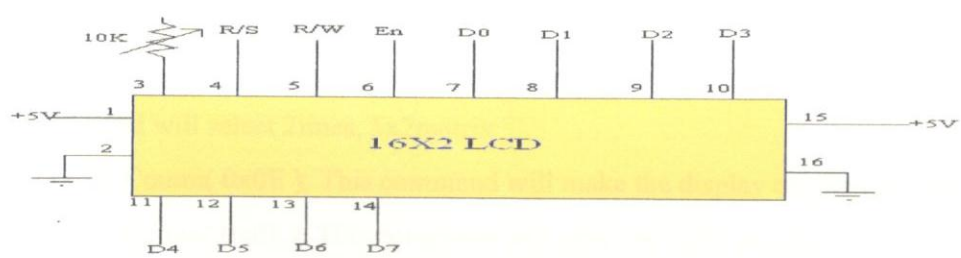


Fig 5.6 Pin Diagram of LCD

The user may select whether the LCD is to operate with a 4-bit data bus or an 8-bit data bus. If a 4-bit data bus is used, the LCD will require a total of 7 data lines (3 control lines plus the 4 lines for the data bus). If an 8-bit data bus is used, the LCD will require a total of 11 data lines (3 control lines plus the 8 lines for the data bus.)

The control lines are referred to as EN, RS, and RW. The EN line is called "Enable". This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should first set this line high (1) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring EN low (0) again.

The RS line is the "Register Select" line. When RS is low(0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

LCD initialization

This is the pit fall for beginners. Proper working of LCD depend on the how the LCD is initialized. Command must be sent to initialize the LCD. Simple steps to initialize the LCD are

1. Specify function set**:** Send 38H for 8-bit, double line and 5x7 dot character format.

2. Display On-Off control: Send 0FH for display and blink cursor on.

3. Entry mode set: Send 06H for cursor in increment position and shift is invisible.

4. Clear display: Send 01H to clear display and return cursor to home position.

Steps for LCD Initialization

- ALCD_Comm(0x38); Command transmitted serially to LCD through data lines, This command will select 2lines, 5x7matrix.
- ALCD_Comm(0x0E); This command will make the display on, cursor blinking.
- ALCD_Comm(0x01); This command will clear the LCD display.
- ALCD_Comm(0x06); This command will shift the cursor to right

Algorithm To Send Data To LCD

Step 1: Make R/W low.

Step 2: Make RS=0; if data byte is command.

Step 3: RS=1; if data byte is data (ASCII value).

Step 5: Place data byte on data register.

Step 6: Pulse E (HIGH to LOW).

Step 7: Repeat the steps to send another data byte.

5.5 Interfacing of L293D motor Driver IC and DC motor with Renesas 64 pin microcontroller

The motor operations of two motors can be controlled by input logic at pins 2 and 7 and 10 and 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.

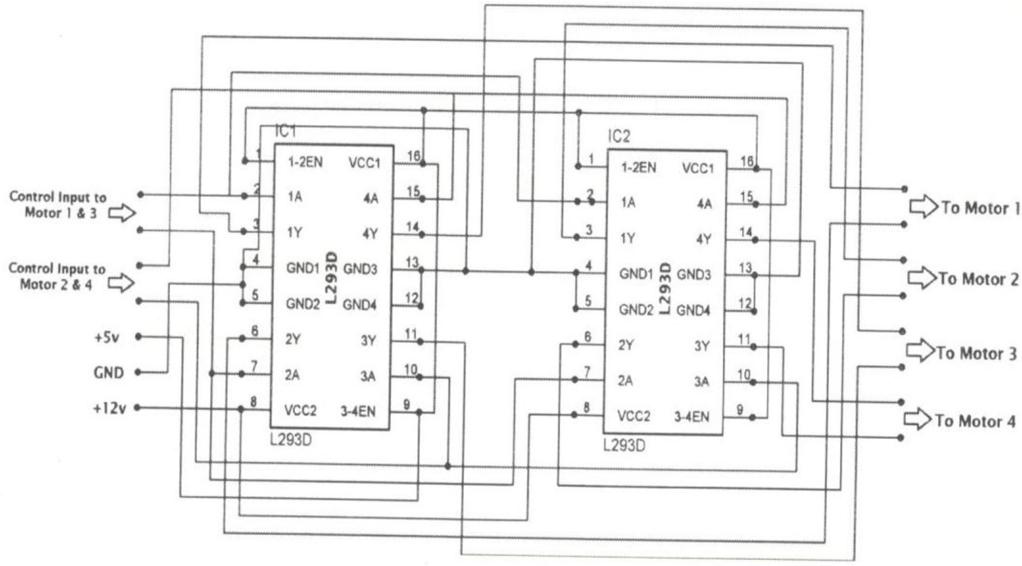


Fig 5.7 Circuit Diagram of L23D Motor Driver IC

Each L293D is used to drive two motors. Two L293D's are used to drive four motors. When both the inputs are low the motor will be in the halt state, when the first input is high and the second input is low the motor will move in the forward direction, when first input is low and second input is high the motor will move in the reverse direction and when both the inputs are low the motor will be in the halt state

Chapter 6

SYSTEM IMPLEMENTATION

6.1 Pseudo code

```
unsigned char Mistake_Count;

unsigned char High_Speed_Count;

unsigned char Conti_Spd_Change_Count, Conti_Spd_Change_Count_Flag;

unsigned char GSM_Tx_Data[19] = "V25T00A0F0S0M00A0@";

unsigned int Volt_Temp1, Volt_Temp2, Temp_Value ;

//unsigned char Disp_Line[17] = "T00S0F0B0I0D0A0@";

unsigned char Disp_Line[17] = "T00 A0 F0 S0 M00";

//unsigned char Disp_Line[17] = "T00S0U0 AC0BR0A0";

void Device_Init(void);

/* End user code. Do not edit comment generated here */

/***********************************************************************
*********************************************

* Function Name: main

* Description  : This function implements main function.

* Arguments    : None

* Return Value : None

***********************************************************************
*******************************************/

void main(void)

{
```

```
/* Start user code. Do not edit comment generated here */
    Device_Init( );
    MSDelay(500);
while(1)
{
    ALCD_Message( 0x80, " PWM START" );//pulse  width modulation start
    TDR01 = 0xFFFF;
    ALCD_Message( 0xC0, " 1 " );
    MSDelay(8000); //
    TDR01 = 0x2200;
    ALCD_Message( 0xC0, " 2 " );
    MSDelay(8000);
    TDR01 = 0x1100;
    ALCD_Message( 0xC0, " 3 " );
    MSDelay(8000);
}
    ALCD_Message( 0xC0, "GSM INITIALIZED " );
    GSM_Send_SMS( Mb_Num1, GSM_SMS1 );
    MSDelay(5000);
    ALCD_Message( 0xC0, " TEST SMS SENT  " );
    MSDelay(2000);
    ALCD_Comm(0x01);
    MSDelay(200);
```

```
Conti_Spd_Change_Count = 0;

Conti_Spd_Change_Count_Flag = 0;

High_Speed_Count = 0;

Mistake_Count = 0;

Rx_count1 = 0;

Rx_ST_Flag1 = 0;

while(1)

{

        ADC64_Start(0x00);

        Temp_Value = Volt_Temp;

        Disp_Line[1] = Volt_Value[1];

        Disp_Line[2] = Volt_Value[2];

        ALCD_Message( 0x80, Disp_Line );

        GSM_Tx_Data[4] = Disp_Line[1];

        GSM_Tx_Data[5] = Disp_Line[2];

        if( Temp_Value > 40 )

        {

                Mistake_Count++;

                ALCD_Message( 0xC0, "HIGH TEMPRATURE" );

                Disp_Line[14] = (Mistake_Count / 10) + 48;

                  Disp_Line[15] = (Mistake_Count % 10) + 48;

                ALCD_Message( 0x80, Disp_Line );

                MSDelay(3000);
```

```
        ALCD_Message( 0xC0, "  " );
}
 ADC64_Start(0x01);
ALCD_Message( 0xC0, Volt_Value );
if( Volt_Temp <= 140 )
{
        if( Conti_Spd_Change_Count_Flag == 0 )
        {
                Conti_Spd_Change_Count_Flag = 1;
                Conti_Spd_Change_Count++;
        }
        High_Speed_Count = 0;
        Disp_Line[5] = 'L';
        GSM_Tx_Data[7] = 'L';
}
else if( (Volt_Temp >= 141) && (Volt_Temp <= 150) )
{
        Conti_Spd_Change_Count = 0;
        High_Speed_Count = 0;
        Disp_Line[5] = 'M';
        GSM_Tx_Data[7] = 'M';
}
else if( Volt_Temp >= 151 )
```

```
    {
        High_Speed_Count++;
        Disp_Line[5] = 'H';
        GSM_Tx_Data[7] = 'H';
        if( High_Speed_Count >= 3 )
        {
            High_Speed_Count = 0;
            Mistake_Count++;
            ALCD_Message( 0xC0, "HIGH SPD CONTI " );
            Disp_Line[14] = (Mistake_Count / 10) + 48;
            Disp_Line[15] = (Mistake_Count % 10) + 48;
            ALCD_Message( 0x80, Disp_Line );
            MSDelay(3000);
            ALCD_Message( 0xC0, "                " );
        }
            if( Conti_Spd_Change_Count_Flag == 1 )
        {
            Conti_Spd_Change_Count_Flag = 0;
            Conti_Spd_Change_Count++;
        }
    }
    if( Conti_Spd_Change_Count >= 5 )
    {
```

```
            Conti_Spd_Change_Count = 0;

            Mistake_Count++;

            ALCD_Message( 0xC0, "CONTI SPD CHANG" );

            Disp_Line[14] = (Mistake_Count / 10) + 48;

            Disp_Line[15] = (Mistake_Count % 10) + 48;

            ALCD_Message( 0x80, Disp_Line );

            MSDelay(3000);

            ALCD_Message( 0xC0, "                " );

    }

    /* ADC64_Start(0x02);

       ALCD_Message( 0xC5, Volt_Value );

       if( Volt_Temp <= 140 )

    {

            Disp_Line[13] = 'L';

    }

    else if( (Volt_Temp >= 141) && (Volt_Temp <= 150) )

    {

            Disp_Line[13] = 'M';

    }

    else if( Volt_Temp >= 151 )

    {

            Disp_Line[13] = 'H';

    } */
```

```
    if(Ultra_Obst_Front == 1)
    {
        Disp_Line[8] = '1';
        GSM_Tx_Data[9] = Disp_Line[8];
        MSDelay(1000);
        if( High_Speed_Count >= 1 )
        {
            Mistake_Count++;
            ALCD_Message( 0xC0, " SPD, LESS DIST" );
            Disp_Line[14] = (Mistake_Count / 10) + 48;
            Disp_Line[15] = (Mistake_Count % 10) + 48;
            ALCD_Message( 0x80, Disp_Line );
            MSDelay(3000);
            ALCD_Message( 0xC0, "                " );
        }
    }
    else if(Ultra_Obst_Front == 0)
    {
        Disp_Line[8] = '0';
        GSM_Tx_Data[9] = Disp_Line[8];
        MSDelay(1000);
    }
    ALCD_Message( 0x80, Disp_Line );
```

```
        if(Seat_Belt == 1)
    {
        Disp_Line[11] = '1';
        GSM_Tx_Data[11] = Disp_Line[11];
        MSDelay(1000);
    }
    else if(Seat_Belt == 0)
    {
        Disp_Line[11] = '0';
        GSM_Tx_Data[11] = Disp_Line[11];
        Mistake_Count++;
        Disp_Line[14] = (Mistake_Count / 10) + 48;
        Disp_Line[15] = (Mistake_Count % 10) + 48;
        ALCD_Message( 0x80, Disp_Line );
        MSDelay(2000);
    }
    ALCD_Message( 0x80, Disp_Line );
    if( Bump_SW_Accid == 1 )
    {
        GSM_Tx_Data[16] = '1';
        TDR01 = 0x0000;
        ALCD_Message( 0xC0, "ACCIDENT DETECT " );
        ALCD_Message( 0x80, Disp_Line );
```

```
            GSM_Tx_Data[13] = Disp_Line[14];

            GSM_Tx_Data[14] = Disp_Line[15];

            GSM_Tx_Data[18] = '\0';

            GSM_Send_SMS( Mb_Num1, GSM_Tx_Data );

            MSDelay(5000);

            GSM_Send_SMS( Mb_Num2, "ACCIDENT DETECTED, PLEASE
        CHECK       YOUR MAIL    FOR LOCATION INFO!!!" );


            MSDelay(5000);

            MSDelay(5000);

            TDR01 = 0x0000;

              ALCD_Message( 0xC0, "                " );

            Rx_count1 = 0;

            Rx_ST_Flag1 = 0;

            while(1)

            {

            }}

        MSDelay(2000);

    }

while (1U){

}

/* End user code. Do not edit comment generated here */}

/* Start user code for adding. Do not edit comment generated here */
```

```
void Device_Init(void)
{
    TDR01 = 0x0000;
    MSDelay(300);
    MSDelay(200);
    ALCD_Init( );
    MSDelay(200);
    ALCD_Message(0xC0, "EVIDENCE COLLECT" );
    MSDelay(2000);
    R_ADC_Create( );
    R_ADC_Set_OperationOn( );
    MSDelay(500);
    R_SAU0_Create( );
    R_UART1_Start( );
//  R_UART1_Send("UART1 TESTED",12);
    MSDelay(500);
    GSM_Init( );
    ALCD_Message( 0xC0, "   GSM ACTIVE   " );
    MSDelay(1000);
    R_TAU0_Create( );
    R_TAU0_Channel0_Start( );
    MSDelay(200);
    ALCD_Message( 0xC0, "                " );}
```

Chapter 7

TESTING AND RESULTS

7.1 Introduction

Testing accomplishes a variety of things, but most importantly it measures the quality of the software we are developing. This view checks whether there are defects in the software under consideration and this view is rarely disproved or even disputed.

Several factors contribute to the importance of making testing a high priority of any software development effort. These include reducing the cost of developing the program. Ensuring that the application behaves exactly as explained to the user for the vast majority of programs, unpredictability is the least desirable consequences of using an application. By providing software that looks and behaves as shown in the documentation, the customers require fewer hours of training and less support from product experts. Develop customer loyalty and word-of-mouth market share.

7.2 Importance of Testing

The importance of software testing and its impact on software cannot be underestimated. Testing is the measurement of software quality. Hence, it is one of the most important stages in the software development process. It involves executing and implementation of the software and its operational behaviour to check that is performing as required. One of the main goals is to have a minimum number of test cases that will find a majority of the implementing errors.

7.3 Test Information Flow

Information flow for testing follows the pattern. Two types of input are given to the test process:

(i) A Software Configuration.

(ii) A Test Configuration.

Tests are performed and all the outcomes are documented. Later, this documented test results will be compared with the expected results. An error that indicates a discrepancy of 0.01

percent between the expected and the actual results can take hours, days or months to identify and correct. It is the uncertainty in debugging that causes testing to be difficult to schedule reliability.

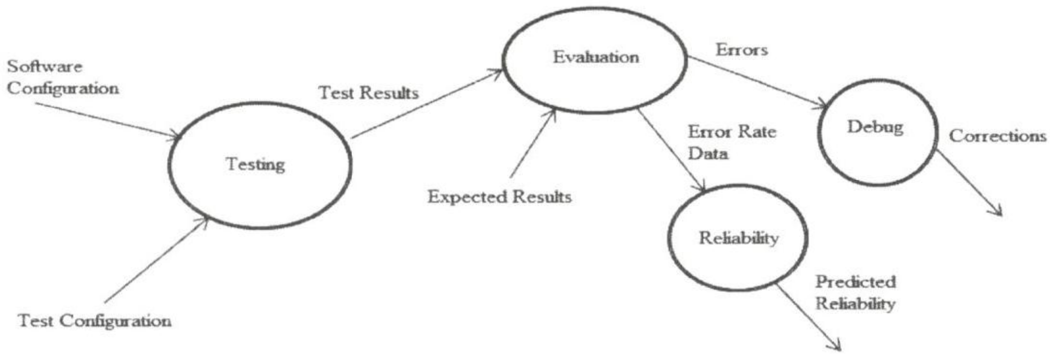


Fig 7.1 Test Information Flow.

Test Cases

RENESAS COMPONENTS TESTING

Components	Description	Action	Working
Renesas Development Board	No arguments	Check for power led and code dump	Yes
GSM Module SIM 300	No arguments	Check for messages sent and received via AT Commands	Yes
Accelometer	No arguments	Check for the Speed	Yes
Temperature Sensor	No arguments	Check for the heat detection around sensor	Yes
GPS module	No arguments	Check for Latitude and longitude of the location	Yes

Table 7.1 Renesas Component Testing

Various tests performed on the model

Test Case ID	Test case Name	Test Case Description	Test Steps	Test Status P/F
TC-01	Black Box Testing	Application should run without errors or warnings	Application is executing without warnings or errors	Pass
TC-03 & TC-04	White Box Testing	UART Ports are used as a medium communication between Renesas and Sensors	Successfully runs all components on receiving inputs from respective sensors	Pass
TC-05	Integration Testing	Connection between GSM AND with RENESAS	The com Port number identified, configured and successful connection takes place	Pass

Table 7.2 Test Cases

TC-06	Integration Testing	Integration is checked with Embedded C programming	Input → GSM Output → Receive SMS Input → GPS Output → Receive Location latitude and longitude Input →temperature Sensor Output→SMS and Display alert Input → Accelometer sensor Output → Display and SMS alert	Pass
TC-07	Unit Testing	Executing main program which involves all the modules such as GSM, Ultrasonic, Accelometer and Temperature.	Successful execution of program	Pass

7.4 Results and Snapshots

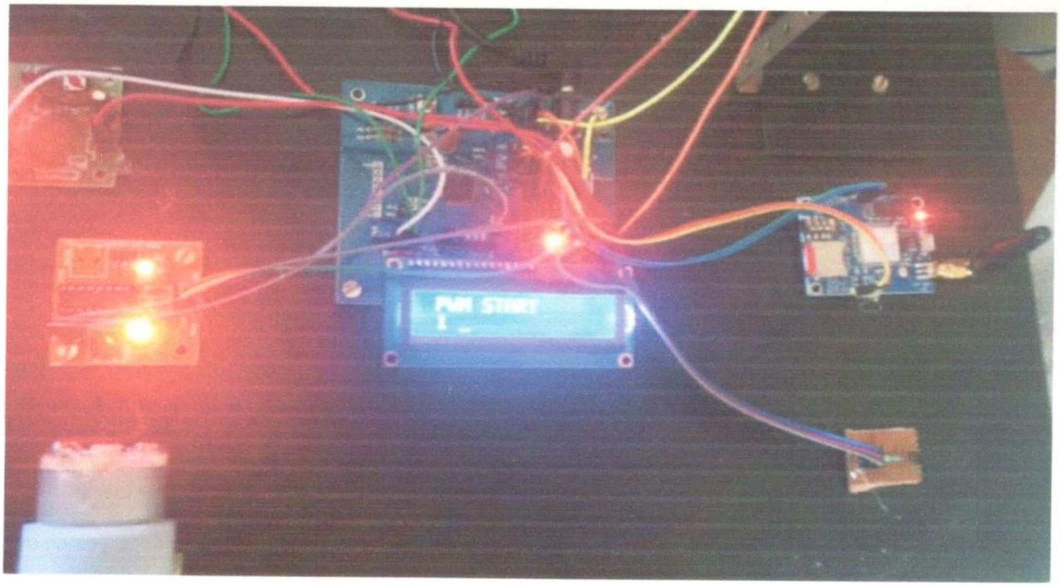


Fig 7.2 PWM start

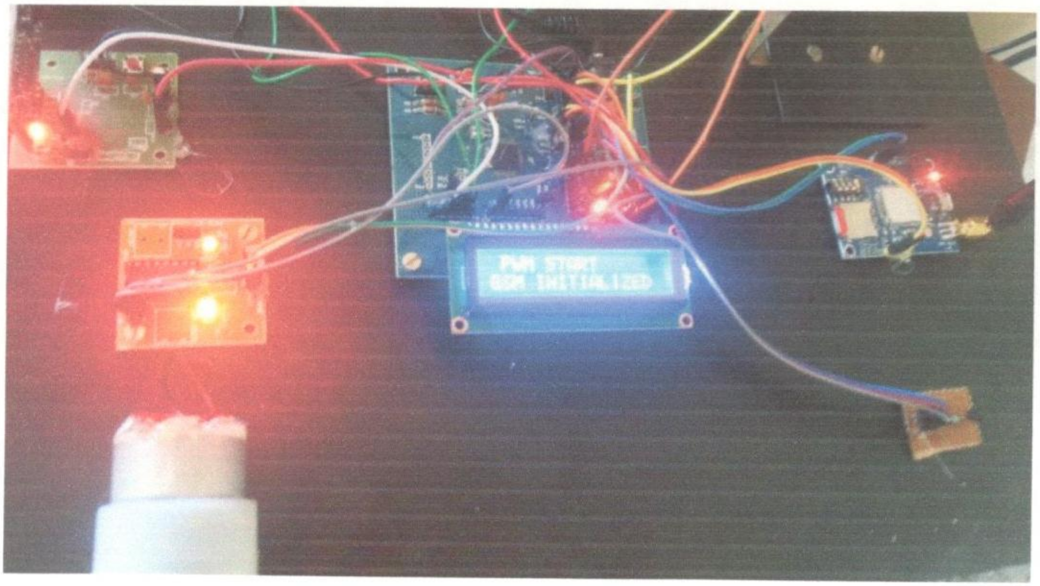


Fig 7.3 GSM initialized

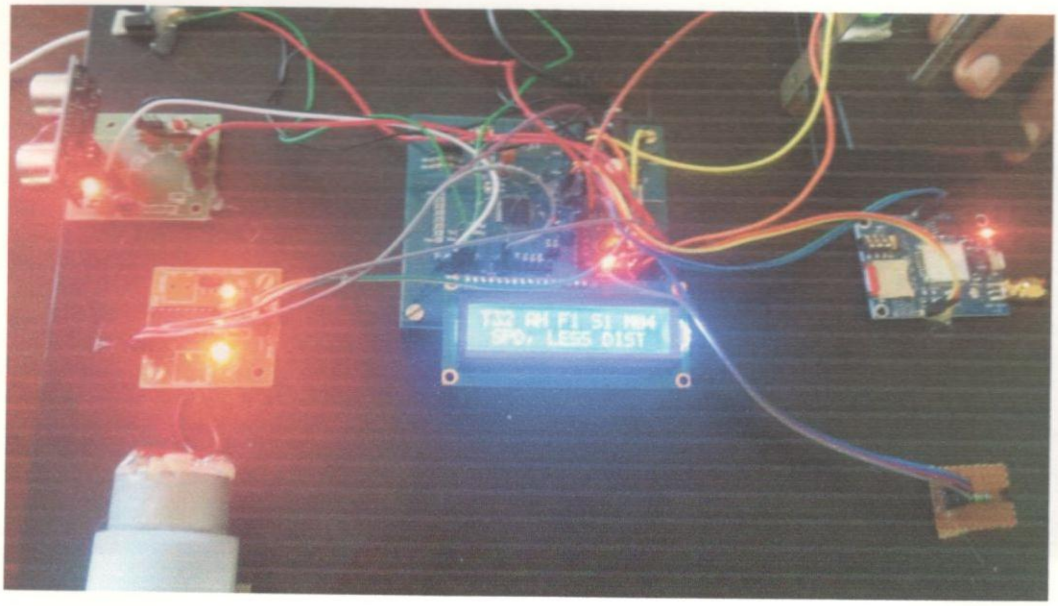


Fig 7.6 Less distance

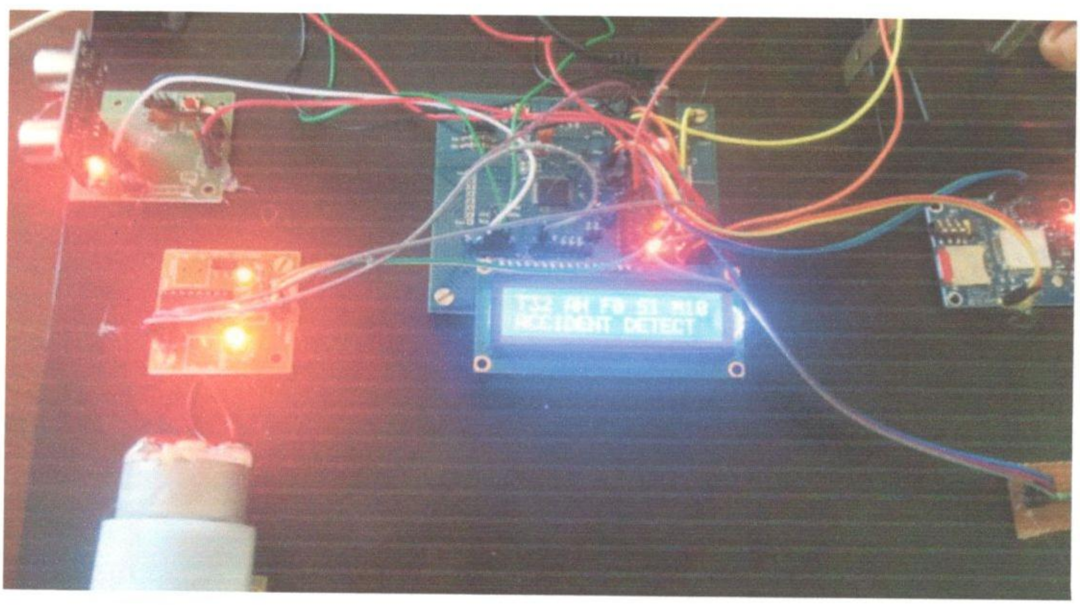


Fig 7.7 Accident detected

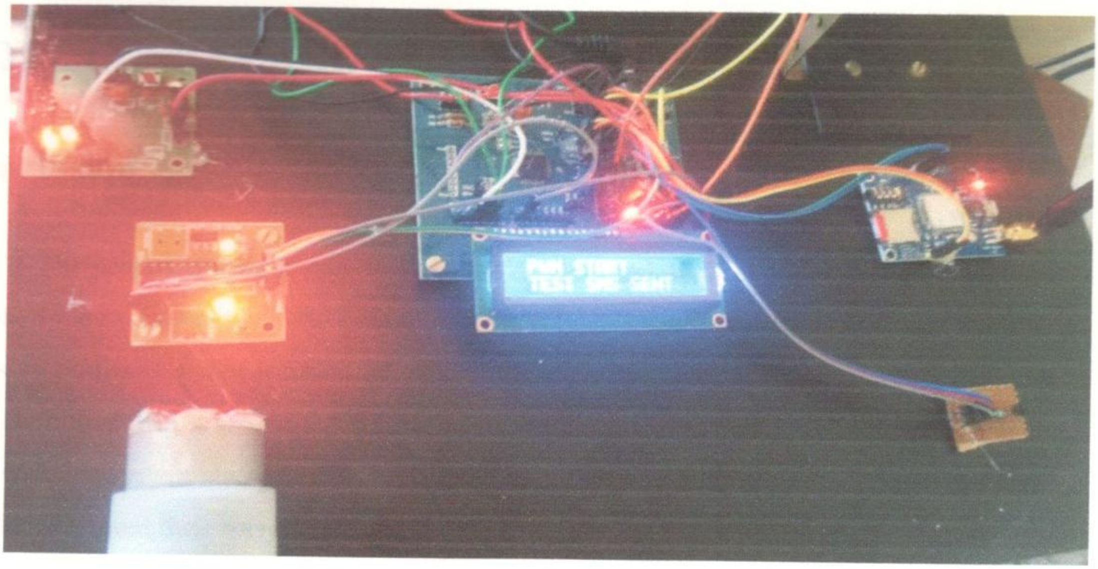


Fig 7.4 Message sent

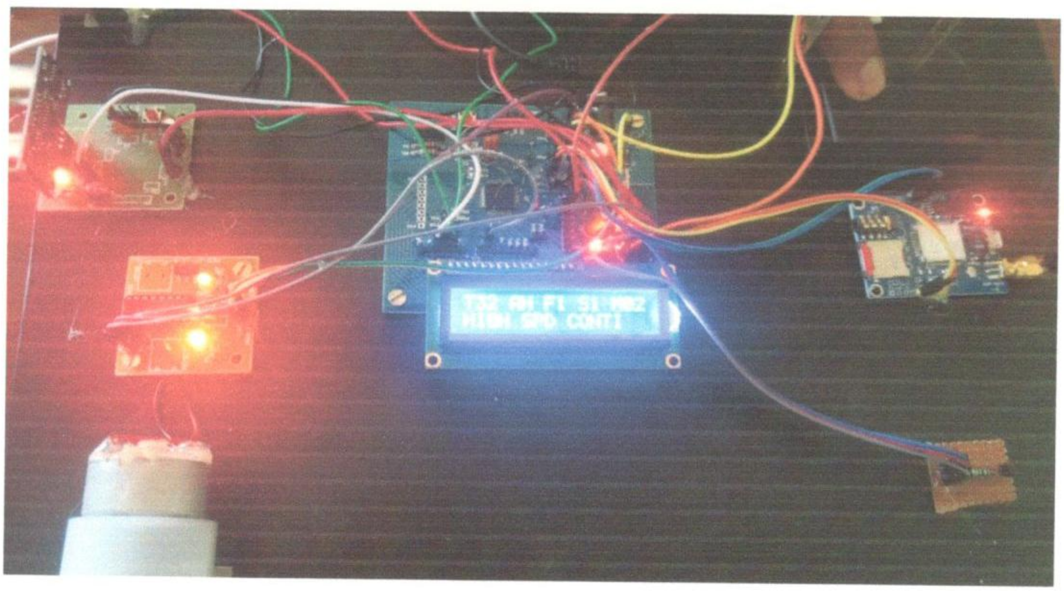


Fig 7.5 High speed continue

CONCLUSION AND FUTURE ENHANCEMENT

Conclusion

The proposed system makes good use of GPS and android applications by providing safe and secure travelling to the travellers. This is done using wrong path alert mechanism. It helps to find the current location of vehicle. Traveller's safety mechanism is also provided using temperature, ultrasonic, smoke and accelometer sensor. As per traveller's safety concern, the proposed system also gives alert massage to authorized mobile so that authorized person also knows about their traveller's safety.

Future enhancement

Going for the cameras can be implemented in order to record drivers side line there by providing accurate information to forensic expert in regards to the occurrence of the accidents. Sing technology of regular network can be used to communicate between the vehicles and thereby reducing the traffic congestion.

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