Vidyalankar Polytechnic

Vision

To achieve excellence in imparting technical education so as to meet the professional and societal needs.

Mission

- Developing technical skills by imparting knowledge and providing hands on experience.
- Creating an environment that nurtures ethics, leadership and team building.
- Providing industrial exposure for minimizing the gap between academics & industry.

Program: Electronics & Telecommunication Engineering (NBA Accredited)

Vision

To produce Electronics and Telecommunication engineers capable of effectively using technical knowledge and interpersonal skills to benefit the industry and society.

Mission

- Providing state of the art facilities and conducive environment enabling the students to sustain the challenges in the field of Electronics and Telecommunication.
- Educating the students to face the competitive world, develop leadership skills and to instill discipline and ethics.
- Promoting industry institute interaction.

Program Educational Objectives (PEOs):

- **PEO1: Core Competence:** To develop expertise amongst students to meet the needs of the employer by using mathematical foundation, electronic fundamentals and enable them to understand and solve engineering problems.
- **PEO2.Professionalism:** To inculcate life-long learning, codes of professional ethics and entrepreneurial mindset.
- **PEO3.Conducive Learning Environment:** To provide encouraging academic learning environment needed for a successful professional career so that students can become a noble soul and an asset to the society.

Program Specific Outcomes (PSOs): (What s/he will be able to do in the Electronics and Telecommunication engineering specific industry soon after the diploma programme)

PSO 1. Electronics and Telecommunication Systems: Maintain various types of Electronics and Telecommunication systems.

PSO 2. EDA Tools Usage: Use EDA tools to develop simple Electronics and Telecommunication engineering related circuits**.**

Program Outcomes (PO) given by NBA. (What s/he will be able to do at the entry point of industry soon after diploma programme)

PO1. Basic knowledge: Apply knowledge of basic mathematics, sciences and basic engineering to solve the broad-based Electronics and Telecommunication engineering problems.

PO2. Discipline knowledge: Apply Electronics and Telecommunication engineering knowledge to solve broad-based Electronics and Telecommunications engineering related problems.

PO3. Experiments and practice: Plan to perform experiments and practices to use the results to solve broad-based Electronics and Telecommunication engineering problems.

PO4. Engineering tools: Apply relevant Electronics and Telecommunications technologies and tools with an understanding of the limitations.

PO5. The engineer and society: Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to practice in field of Electronics and Telecommunication engineering.

PO6. Environment and sustainability: Apply Electronics and Telecommunication engineering solutions also for sustainable development practices in societal and environmental contexts.

PO7. Ethics: Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of Electronics and Telecommunication engineering.

PO8. Individual and team work: Function effectively as a leader and team member in diverse/ multidisciplinary teams.

PO9. Communication: Communicate effectively in oral and written form.

PO10. Life-long learning: Engage in independent and life-long learning activities in the context of technological changes also in the Electronics and Telecommunication engineering and allied industry.

A Project Report on

AUTOMATIC ROAD QUALITY DETECTOR

Submitted by

17201C0007: AMAN SHAIKH
17201C0012: CHINMAY MULIK

Under the guidance of

Er. Servesh Gupta

Head of the Department

Er. Anjum Mujawar

Department of Electronics & Telecommunication Engineering
(NBA Accredited)

Vidyalankar Polytechnic
Wadala (E), Mumbai – 400 037

Maharashtra State Board of Technical Education, Mumbai

2019 – 2020

Certificate

This is to certify that the following students

17201C0007: Aman Shaikh
17201C0012: Chinmay Mulik

Have completed the Project on

Automatic Road Quality Detector

A partial fulfillment of the requirement of Third Year Diploma in Electronics and Telecommunication Engineering affiliated to Maharashtra State Board of Technical Education, Mumbai for the Academic Year 2019-2020.

	Er. Servesh Gupta
External Examiner	(Project Guide)
Er. Anjum Mujawar	Prof. Ashish Ukidve
(Head of Department)	(Principal)

ACKNOWLEDGEMENT

It is our pleasure to be indebted to various people, who directly or indirectly contributed in the development of this work and who influenced my thinking, behavior, and acts during the course of study.

We give all glory and honor to Almighty God whose blessings made this Endeavour a success.

We are extremely grateful to Principal, **Prof. Ashish Ukidve** for having provided us with the facilities required for making of this project.

It is our great pleasure to express our gratitude to **Er. Anjum Mujawar**, Head of Electronics and Telecommunication Department for his kind support and valuable advice for this project work.

With immense pleasure and hearties, we express our sincere thanks to our project guide **Er. Servesh Gupta** his valuable suggestions and guidance.

We honestly express our ineptness to the teaching and non-teaching staff for their valuable guidance, help co-operation and continued encouragement in each and every step of this project till now.

Last but not the least; we are ineptness to our parents and siblings for their constant encouragement and support. And also all our classmates who were always there whenever help was required

Abstract

Many on-going projects in the field of vehicular networks are working in the direction of providing driver with relevant information about roads and traffic movements. One of the major problems in developing countries is maintenance of roads. Well maintained roads contribute a major portion to the country's economy and also many people are killed by unwanted potholes and humps and tilt on road. So, identification of pavement distress such as potholes and tilt not only help drivers to avoid accidents or vehicle damages but also helps authorities to maintain roads. The implementation of this service will provide users with valuable information about the conditions of roadways that will limit potential damage to the user's vehicle or Maintenance Authority. This project proposes a cost effective solution to identify potholes and humps and tilt on roads and provide timely alerts to drivers to avoid accidents or vehicle damages, and also send a message to authorities. Ultrasonic sensor is used to identify potholes and humps and also to measure their depth and height and Tilt Sensor is used to sense tilt on road respectively. The sensed-data includes pothole depth, height of hump, and tilt on road and send to the government authorities and vehicle drivers by GSM.

INDEX

CHAPTER	PAGE NO.
CHAPTER ONE	1
1.0 Introduction	2
CHAPTER TWO	3
2.0 Literature Survey	4
CHAPTER THREE	5
3.0 Block Diagram	6
3.1 Block Diagram Description	7-11
3.2 Hardware Design	12
CHAPTER FOUR	13
4.0 Circuit Diagram	14
4.1 Component Description	15
4.2 Circuit Working	16
CHAPTER FIVE	17
5.0 Software Design	18
5.1 Flow Chart	19
5.2 Algorithm	20
5.3 Program	21-22
CHAPTER SIX	23
6.0 Component List with Cost	24
CHAPTER SEVEN	25
7.1 Advantages	26
7.2 Limitations	26
CHAPTER EIGHT	27
8.0 Applications	28
8.1 Future Scope	28
CHAPTER NINE	29
9.0 Result	30
9.1 Conclusion	30
CHAPTER TEN	31
10.0 Reference and Bibliography	32

PROJECT PHOTO WITH STUDENTS AND GUIDE

CHAPTER ONE

1.0 Introduction

India is considered one of the fastest developing countries as of today. India's road network is gigantic, giving it a thought about the condition of the roads. Roads indirectly contribute to the economic growth of the country and it is extremely essential that the roads are well built and strong. India is home to several bad roads be it the metropolitans, the cities or the villages. Since India is a developing nation there is a constant demand for good quality infrastructure, transportation and services. But since India is a huge country with quite a sizable population this problem still has not been addressed in totality. Over the past few years, there has been a large increase in vehicle population. This increase in vehicle population has led to increasing road accidents and also traffic congestion. According to Global Road Safety Report, 2015 released by the World Health Organization (WHO), India accounts for more than 200,000 deaths because of road accidents. These accidents can be due to over speeding, drunk and driving, jumping traffic signals and also due to humps, speed-breakers, tilt and potholes.

Hence it is important to collect information regarding these poor road conditions and distribute the same to other vehicles that in turn help reduce accidents caused due to potholes and humps and tilt. Likewise, potholes are formed due to oil spills, heavy rains and also due to movement of heavy vehicles and tilt are formed due to heavy vehicles. These bad road conditions cause accidents, affect the quality of driving and also consumes more fuel.

Hence, in this project we have proposed a system that would notify the drivers regarding any hurdles such as potholes and humps and tilt and this information can be used by the Government to correct these roads effectively.

CHAPTER TWO

2.0 Literature Survey

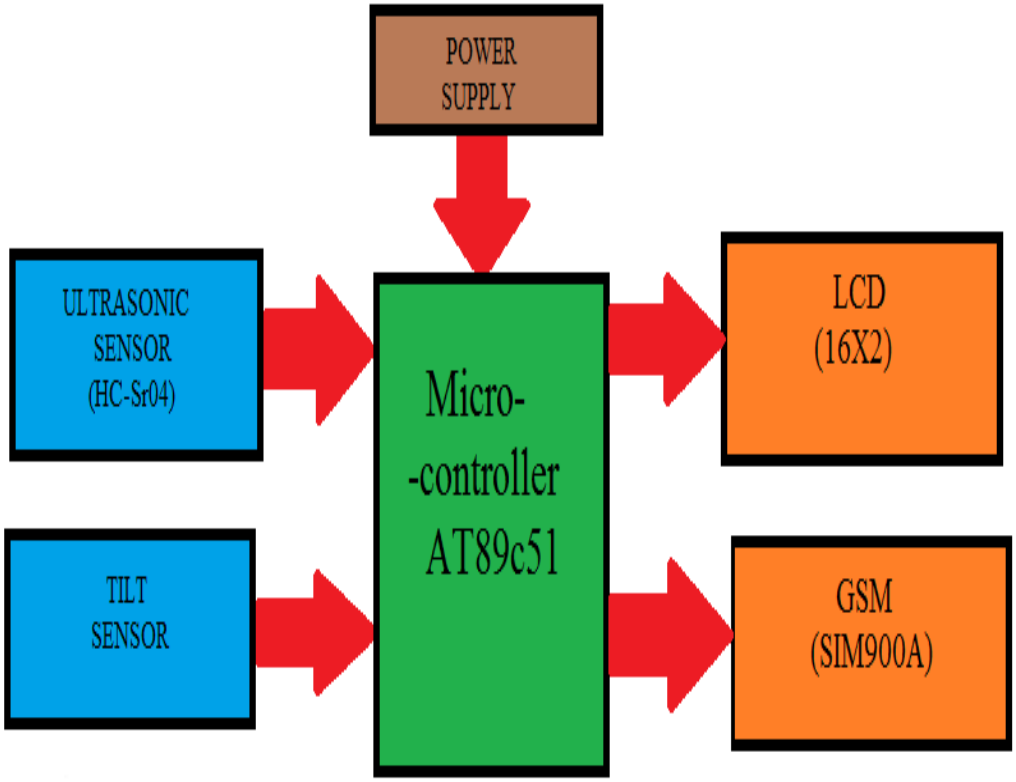
Aging roads and poor road maintenance systems result in a large number of potholes and tilt, whose number increase over time. In India, many accidents happen due to poor road conditions. In this survey, we analyse the systems of pothole and tilt detection previously implemented or proposed, ultimately aiming at improving road conditions and research made in the field of are interest and the results already published but tilt system is used only in aircraft now we used in car also to find tilt on road.

For pothole detection system, various sensing technologies can be used. Existing systems can be mainly categorized into vibration-based systems, laser-scanning based systems and vision-based systems. For tilt detection system, there are only few sensing technologies are used. In this project, we propose to use an ultrasonic sensor for pothole detection, Tilt sensor for tilt detection, The data of the pothole's and Tilt's location obtained through GPS and it's depth will then be collected over a specified route, GSM send a message to PWD and Driver, and LCD display the pothole height. This system is durable and accurate. It can also be used over a wide range. The overall cost of the system is considerably high. The size also is conveniently large...

The most common problem that is faced in India is the maintenance of roads. The maintenance of roads mostly focuses on improper roads which are due to potholes, tilts etc. Our project mainly aims at detection of potholes and tilt to avoid accidents & at the same time damage to the vehicle. We have used ultrasonic sensors for measuring the depth & height of the road surface. Tilt sensor for measuring tilt of the road surface the data which are sensed by the sensors include the depth of the potholes & tilt of the road & geographic location which is to be already stored in the database. This information serves as a valuable source to the government authorities' i.e. PWD office and vehicle drivers via GSM. The system can be further improved by providing voice messages to alert the driver.

CHAPTER THREE

3.0 Block Diagram



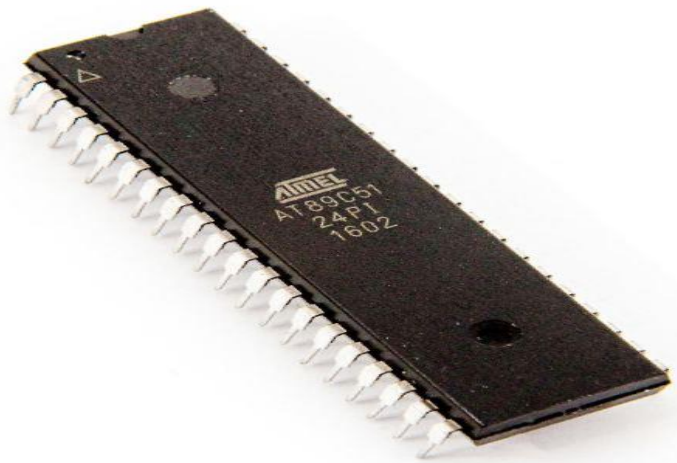
3.1 Block Diagram Description

Microcontroller (AT89C51):

The AT89C51 is an age old 8-bit microcontroller from the Atmel family. It works with the popular 8051 architecture and hence is used by most beginners till date. It is a 40 pin IC package with 4Kb flash memory. It has four ports and all together provide 32 Programmable GPIO pins. It does not have in-built ADC module and supports only USART communication. Although it can be interfaced with external ADC IC like the ADC084 or the ADC0808.

Features: -

- The operating voltage is from 2 – 5V.
- No. of I/O pins are 32.
- Timer/counter module is 16-bit (2).
- ROM is 4K.
- RAM IS 128 Byte.



Ultrasonic sensor: -

The HC-SR04 is an active ultrasonic sensor and contains a transmitter and a receiver. It is used to measure distance at which, objects are placed in front of it. The ultrasonic sensor transmits high frequency sound waves and waits for the reflected wave to hit the receiver. The distance is calculated based on the time taken by the ultrasonic pulse to travel a particular distance and it is waterproof.

Features:-

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

Tilt sensor:-

TILT SENSOR MODULE is a device used for knowing the planar movement. Although they are available in various types their basic function remains the same. Their function is to detect the plane shift from horizontal to vertical and send a signal when it happens. There are modules which could sense even small plane shifts but here we are going to discuss about simple TILT SENSOR module. Here we are going to use SW-520D TILT SENSOR MODULE.

Features:-

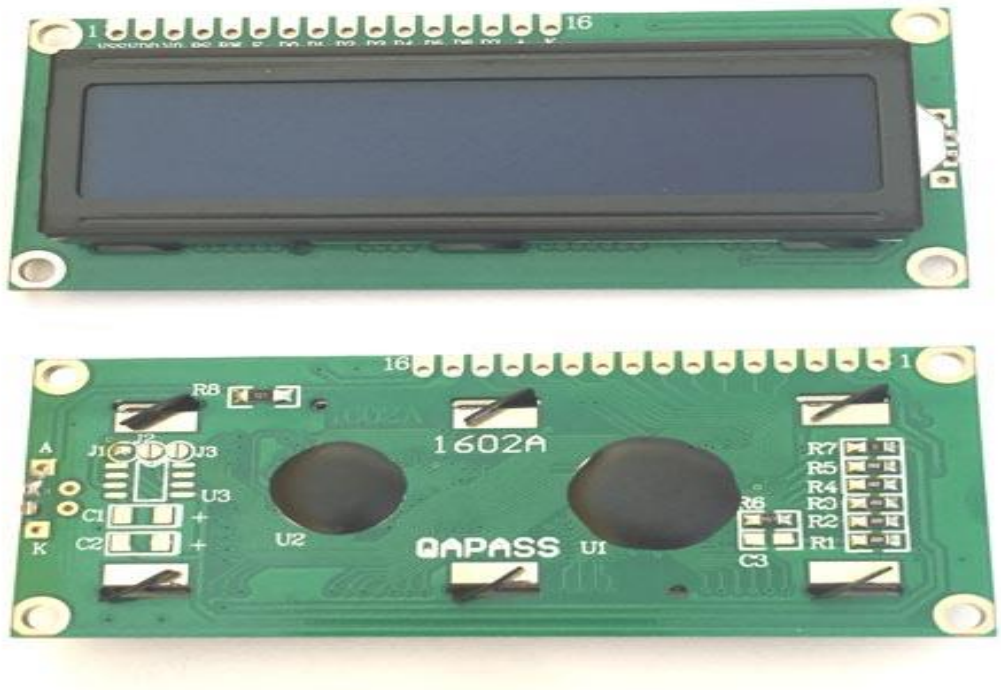
- Supply voltage: 3.3 V to 5V
- Output can be directly connected to controller
- TTL level output
- Maximum output current : 15mA
- Can work on low voltages
- Maximum operating temperature: 0°C to + 80°C
- Easy interface
- Long life.

Liquid Crystal Display (LCD):-

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical, easily programmable, have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

Features:-

- Operating Voltage is 4.7V to 5.3V
- Current consumption is 1mA without backlight
- Alphanumeric LCD display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is build by a 5×8 pixel box
- Can work on both 8-bit and 4-bit mode
- It can also display any custom generated characters
- Available in Green and Blue Backlight

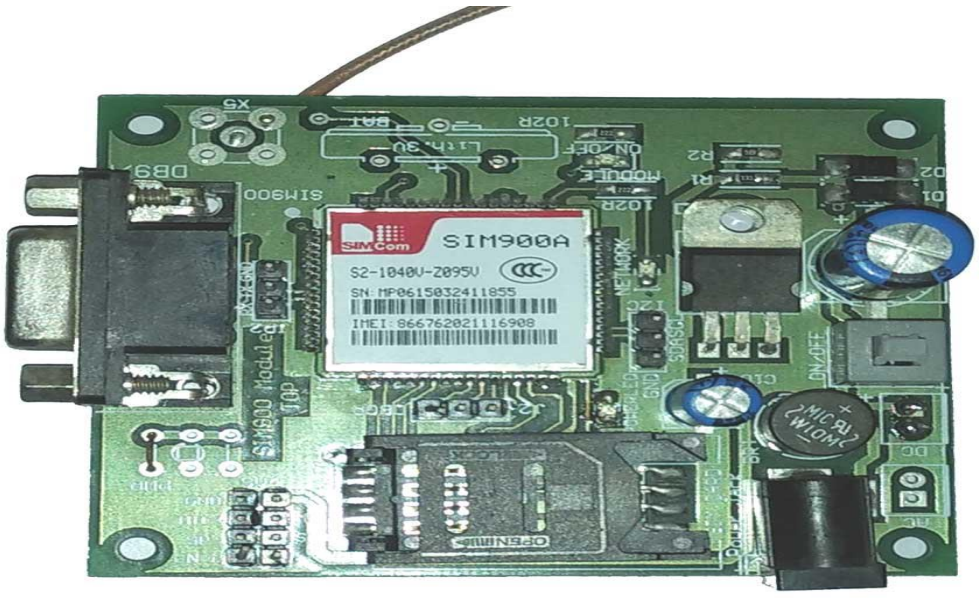


GSM module SIM900a:-

The SIM900A is a readily available GSM/GPRS module, used in many mobile phones and PDA. The module can also be used for developing IOT (Internet of Things) and Embedded Applications. SIM900A is a dual-band GSM/GPRS engine that works on frequencies EGSM 900MHz and DCS 1800MHz. SIM900A features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

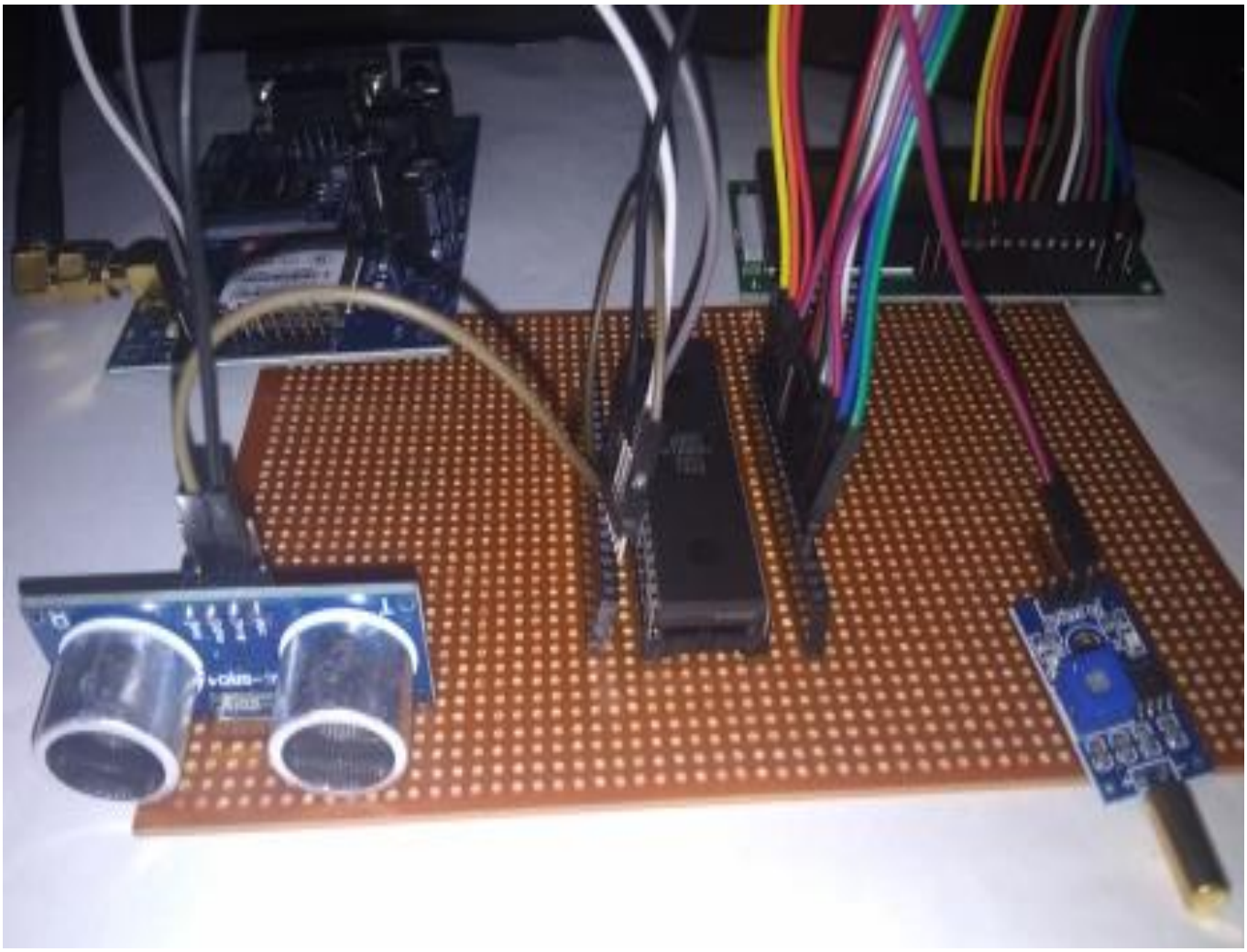
Features:-

- Single supply voltage: 3.4V – 4.5V
- Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
- Frequency bands: SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.
- GPRS connectivity: PRS multi-slot class 10 (default), GPRS multi-slot class 8 (option)
- Transmitting power: Class 4 (2W) at EGSM 900, Class 1 (1W) at DCS 1800
- Operating Temperature: -30ºC to +80ºC
- Storage Temperature: -5ºC to +90ºC
- Features display interface
- Features Real Time Clock
- Supports UART interface
- Supports single SIM card



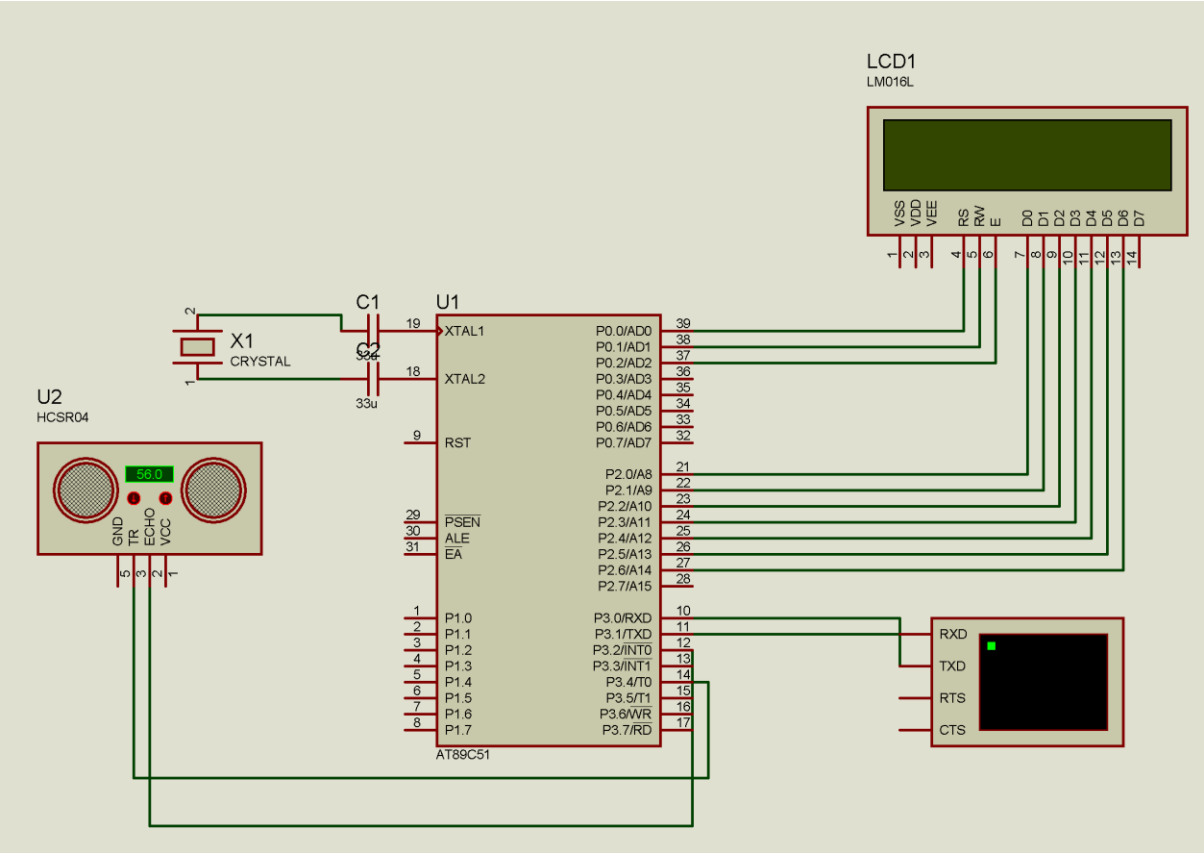
3.2 Hardware Design

(Project hardware photo)



CAPTER FOUR

4.0 Circuit Diagram



4.1 Component Description

1. **Microcontroller (AT89C51)**
   - The operating voltage is from 2 – 5V.
   - No. of I/O pins are 32.
   - Timer/counter module is 16-bit (2).
   - ROM is 4K.
   - RAM IS 128 Byte.

2. **Ultrasonic sensor**: -
   - Operating voltage: +5V
   - Theoretical Measuring Distance: 2cm to 450cm
   - Practical Measuring Distance: 2cm to 80cm
   - Accuracy: 3mm
   - Measuring angle covered: <15°
   - Operating Current: <15mA
   - Operating Frequency: 40Hz
   -

3. **Tilt sensor**:-
   - Supply voltage: 3.3 V to 5V
   - Output can be directly connected to controller
   - TTL level output

4. **Liquid Crystal Display (LCD):**
   - Operating Voltage is 4.7V to 5.3V
   - Current consumption is 1mA without backlight
   - Alphanumeric LCD display module, meaning can display alphabets and numbers

5. **GSM module SIM900a:-**
   - Single supply voltage: 3.4V – 4.5V
   - Power saving mode: Typical power consumption in SLEEP mode is 1.5mA
   - Frequency bands: SIM900A Dual-band: EGSM900, DCS1800. The SIM900A can search the two frequency bands automatically. The frequency bands also can be set by AT command.

4.2 Circuit Working

- Ultrasonic sensor detects the pothole and humps on road and it sends the data to 8051.
- Tilt sensor detect the tilt on road and it sends the data to 8051.
- 8051 send the details of pothole and hump and tilt to LCD module. LCD Module displays that data.
- When switch is ON, if ultrasonic sensor finds any pothole or hump it sends the message to the road authority by using GSM Module.
- If tilt sensor finds any tilt it sends the message to the road authority by using GSM Module.
- Driver should ON the switch when he starts the vehicle. If we are not providing switch, it will always send the message unnecessarily even car is in OFF. That's why we kept switch there.

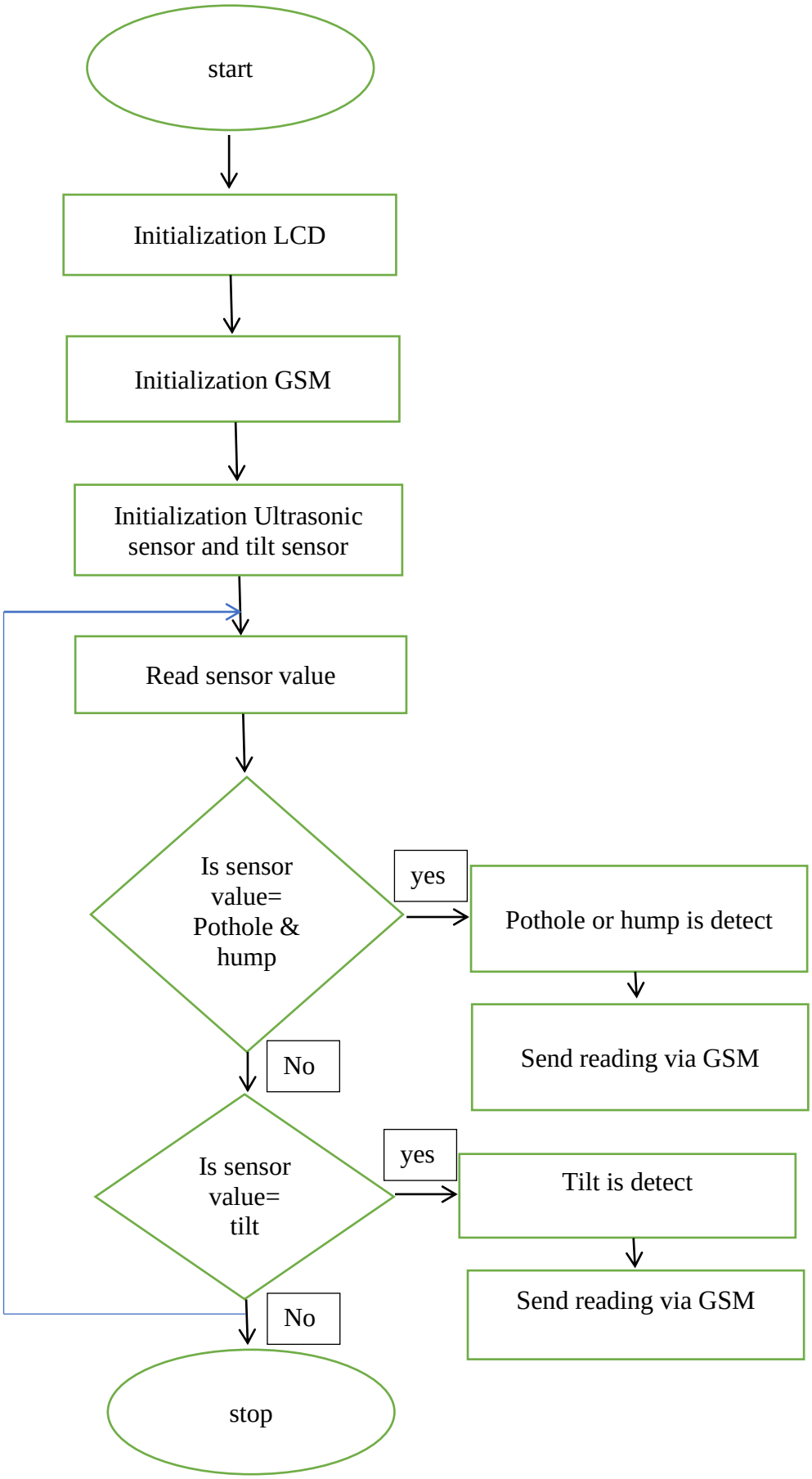
CHAPTER FIVE

5.0 Software Design

KEIL Software

- Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development.
- The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all 8051 derivatives and help you get your projects completed on schedule.

5.1 Flow Chart



5.2 Algorithm

1. Start
2. Initialize the LCD
3. Initialize the GSM
4. Check the distance measured from Ultrasonic sensor
5. Check the tilt label from tilt sensor
6. Sensor read value
7. If sensor value=pothole
8. If pothole detect and send SMS to PWD office using GSM.
9. If No go to next step
10. If sensor value=tilt
11. If tilt detect then send SMS to PWD office using GSM.
12. If No go to step 6
13. stop

5.3 Program

```
#include<reg51.h>
#include<ULTRASONIC.h>
#include<GSM.h>
#include<LCD.h>
#define NUMBER "797757****"
void delay (unsigned int);
sbit trig=P3^5;
sbit echo=P3^2;
sbit tilt=P0^3;
sbit rs=P0^0;
sbit rw=P0^1;
sbit en=P0^2;
sbit D0 = P2^0;
sbit D1 = P2^1;
sbit D2 = P2^2;
sbit D3 = P2^3;
sbit D4 = P2^4;
sbit D5 = P2^5;
sbit D6 = P2^6;
sbit D7 = P2^7;
void lcd_init();
void cmd(unsigned char a);
void data(unsigned char b);
void lcd_delay();
void main()
{
   ultrasonic_int();
   lcd_init();
   show("welcome");
   for()
         {
      data('0.');
      delay();
         }
         while(1)
         {
    if ((range>20) && (range<50))
        {
            cmd(0x80);
            show("Pothole Detected");
            distance=(range*time)
            distance=(distance * value) /2.0;
            hole=((range/10)%10)+48;
            hole=(range%10)+48;
            hole='P';
            hole='O';
            hole= 'T';
```

```
            hole='H';
            hole='O';
            hole='L';
            hole='E';
            cmd(0xc0);
            show("Sending message!");
            sms (NUMBER,hole);
            cmd(0x80);
            show("Message Sent!!!!");
            delay();
            }
Else
 {
            cmd(0xc0);
            show("<<Drive Safely>>");
        }
void delay(unsigned int t)
{
unsigned int i, j;
for(i=0;i<=600;i++)
for(j=0;j<=t:j++);
}
```

CHAPTER SIX

6.0 Component List with Cost

Sr.no	Components	Qty.	Cost
1	Microcontroller (89c51)	1	40
2	Ultra-Sonic Sensor (HC-Sr04)	1	80
3	Tilt Sensor	1	80
4	GSM (SIM900A)	1	800
5	LCD (16x2)	1	90
6	Jumper wire f to f	As per required	100
7	Crystal oscillator (12mhz)	1	150
8	Capacitor (33pf)	2	2
9	Microcontroller Socket	1	4
10	General purpose pcb	1	150
Total			1,496

CHAPTER SEVEN

7.1 Advantages

- It provides timely alerts about potholes and tilts.
- The major benefit of our project will be in rainy season as this will be very helpful to take an action to furnish better road quality, as the bad roads will be detected by our system.
- Accidents due to pothole can be avoided.
- Driver will be intimated about potholes.
- Enhanced safety and security provided.
- Reduced traffic
- Prevents accident

7.2 Limitations

- GSM cannot be used in applications where immediate result is required as it may not work if there are no signals.
- ultrasonic sensors operate using sound, they are completely non-functional in a vacuum as there is no air for the sound to travel through.

CHAPTER EIGHT

8.0 Applications

- It can be used in railways for identification of cracks.
- It can be used in bridges and flyovers.

8.1 Future Scope

- In future we can use this system widely for safety and maintenance of roads.
- Potholes can be auto detected using acceleration data collected using vehicle mounted wireless sensors.
- It can be further implemented by using IOT technique.
- The proposed system can be further improved to display alerts such as 'Bad road ahead' in order to help the driver be more alert while driving/riding on such roads.

CHAPTER NINE

9.0 Result

If Pothole or Tilt is detect the value is shown on lcd and send the SMS to PWD office and Driver.

9.1 Conclusion

The proposed system basically serves the following purposes: The proposed system will detect the potholes and humps and tilt on the road and save the information in the server. The potholes are detected and its height and depth and size are measured using ultrasonic sensors and tilt are detect and its tilt are measured using tilt sensor. The GSM sent the SMS to PWD office and LCD display the value.

CHAPTER TEN

10.0 Reference and Bibliography

- www.google.com
- http://www.ijircce.com/upload/2017/ncraet/1_BKEC-107
- Automatic%20Detection%20and%20Noti%EF%AC%81cation%20of%20Potholes%20and%20Humps%20on%20Roads%20to%20Aid%20Drivers.pdf
- https://pdfs.semanticscholar.org/5222/9fa99f8dcaa783be7215ee0bca63b1d97e54.pdf 154.pdf
- Hump And Pothole Detection on Roads using 8051 | EmbeTroincX
- Proposed model fixed on two wheeler bike for testing. (b) Detection... | Download Scientific Diagram