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RAILWAY AUTOMATION WITH TRACK-CUT DETECTION AND UNMANNED GATE CONTROL

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Abstract: There is an increasing with the number of accidents at railroad railings. Now a days we use different types of transport facilities like Track, bus, flight and car etc. but above these facilities we chose to travel with rail because by travelling through the rail is cheap, takes less time to deliver the our product, system and it is the cost efficient but the number of accident on railway track due to cracks on track and This paper deals about one of the efficient methods to avoid Train Collisions. Here we are using IR Sensor, here IR Sensor is use to detect the cracks on railway track

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I INTRODUCTION

The Indian Railways has one of the largest railway networks in the world, cross- crossing over 1, 15,000 km in distance, all over India. However, with regard to reliability and passenger safety Indian Railways is not up to global standards. Among other factors, cracks developed on the rails due to absence of timely detection and the associated maintenance pose serious questions on the security of operation of rail transport. A recent study revealed that over 25% of the track length is in need of replacement due to the development of cracks on it. Manual detection of tracks is cumbersome and not fully effective owing to much time consumption and requirement of skilled technicians. This project work is aimed towards addressing the issue by developing an automatic railway track crack detection system. This work introduces a project that aims in designing robust railway crack detection scheme (RRCDS) using TSOP IR RECEIVER SENSOR assembly system which avoids the train accidents by detecting the cracks on railway tracks. And also capable of alerting the authorities in the form of SMS messages along with location by using GPS and GSM modules. The system also includes distance measuring sensor which displays the track deviation distance between the railway tracks.

Transport is a key necessity for specialization that allows production and consumption of products to occur at different locations. Transport has throughout history been a spur to expansion as better transport leads to more trade. Economic prosperity has always been dependent on increasing the capacity and rationality of transport. But the infrastructure and operation of transport has a great impact on the land and is the largest drainer of energy, making transport sustainability and safety a major issue. In India, we find that rail transport occupies a prominent position in providing the necessary transport infrastructure to sustain and quench the ever- burgeoning needs of a rapidly growing economy. Today, India possesses the fourth largest railway network in the world. However, in terms of the reliability and safety parameters, we have not yet reached truly global standards. The GSM (Global System for Mobile Communications), GPS (Global Positioning System) and microcontroller based broken railway track detection when implemented is an efficient method of detection of cracks which is present in the tracks and thus avoiding derailment of the trains. This system is used in-between two stations which will detect the cracks present on the track using TSOP sensors which transmit sine waves for an ideal track. If a crack is detected then this sensor will send a signal to the Arduino Uno board which will activate the GPS receiver. The GPS receiver will pin point the exact location which will then be messaged to the authorities. Once the sensor sends a signal to the controller, the controller will initiate the webcam. The webcam will provide the live feed of the track. The live feed and the data from the GPS will be updated in the designed application of the wireless camera. This smart technology will be a part of the brave new digitalized world which will be able to prevent the loss of precious life or property as the above mentioned cases.

In case of rail gate control the presently existing system is that once the train leaves the station the stationmaster informs the gatekeeper about the arrival of the train through the telephone. Once the gatekeeper receives the information, he closes the gate depending on the time at which the train arrives. Hence if the train is late due to certain reason, then gate remain closer for a long time causing traffic near the gates. By employing the automatic railway gate control at the level crossing the arrival of the train is less compared to the manually operated gates and also reduces the human labor. This type of gates can be employed in an unmanned level crossing where the chances of accident are higher and reliable operation is required. Since the operation is automatic, error due to manual operation is prevented. Automatic railway gate control is highly economical microcontroller based

arrangement, designed for use in almost all the unmanned level crossing in the country.

II PROBLEM STATEMENT

A broken train speaks about one of the world's major causes of more expensive and dangerous rail accidents. Taking into account incidents in general, all considered in us alone, for every three days there is more than one major demolition, consistently over 10 years. Accessible interventions when the broken track clashes in different countries are disrupted do not sufficiently help to understand the political, social and ecological effects. In the current framework, when the track is open, the framework is forced to hurry up and out along the track at irregular intervals. Often, it will send an exception flag to the technician using a remote module just in case something stands out divided on the line. Divisions are detected by IR sensors and the error flag is conveyed.

Figure 2. Railway Track Crack

III OBJECTIVES

The main objective of this project is to detect the crack's present on the railway track.

To reducing the demand of gate keeper.

SYSTEM DESIGN

3.1ULTRASONIC SENSOR

The ultrasonic sensor is an electronic device that detects a specific object's distance by generating ultrasound sound waves and transforms the sound transmitted into an electrical signal waves. Ultrasonic waves can travel quicker than electrical signal (i.e., sound which could be listened by humans).

Figure 3.1 Ultrasonic Sensor

The ultrasonic sensor HC SR04 has a module of 4 pins whose pin names are Vcc, trigger, ground and echo.

3.2ARDUINO UNO

Arduino is an easier-to-use, programmable circuit with open source hardware and software. It is very strong in nature, and can effectively support devices. This concentrates on the ATmega328. It has 14 digital I / O connectors, 6 analog outputs, a USB interface, an ICSP connector, a power jack and a reset switch.

Figure.3.2. Arduino Uno

3.3. GSM MODULE

The figure shown below is the module GSM SIM 900 (Global mobile communication system). A GSM module is a designated device with a serial link, USB, Bluetooth or a mobile phone which offers support for GSM modems. A GSM module allows programs like SMS to transmit and receive messages over the modem interface.

Figure.3.3. GSM Module

The costs for receiving and sending this message is the same as the the directly incurred on a mobile phone. A GSM modem must be consistent with a "expanded set of AT instructions" for sending / receiving Text messages to do so.

3.3. GPS MODULE

The Global Positioning System is denoted as GPS, It is a satellite communication system used to identify a path of an object on the earth.

Figure.3.4. GPS Module

IJESC, May 2020 26053 http:// ijesc.org/

A GPS receiver measures its location precisely by transmitting 123234the signals sent by GPS satellites well above Earth. The position is then shown on a latitude and longitudeview or map view.

3.4. IR SENSOR

The infrared obstacle sensor module is equipped with an integrated IR transmitter and IR receiver which sends IRenergy and checks for reflected IR energy to identify any obstacles in front of the machine.

Figure. 3.5. IR Sensor Module

The sensor has an integrated potentiometer that allows the user to change the range of detections. The sensor does have a very stable and secure response even under low light conditions.

3.5.DC MOTOR

A DC motor is the device which is used to convert Electrical power to a mechanical power. The DC motor speed can be regulated by a dynamic supply voltage, or by adjusting the current strength in its field windings.

Figure.3.6 DC Motor

The stronger the voltage at the input, the greater the engine velocity. The concept proposed uses 2 direct current motors of300 rpm

3.7 PCB

PCB means printed circuit board PCB is one of the most importantelements in any electronic system. They accomplish the interconnection the between component mounted on them in particular manner PCB consist of conductive circuit pattern which is applied to one or both sided of an insulating base copper is most widely used for conductor material. Aluminum nickel, silver, brass is used for same special application.

The thickness of conducting material depends upon the current carrying capacity of circuit. Thus a thicker conductor layer will have mare current carrying capacity once the PCB is manufactured the current carrying capacity is depends on which of conductor track.

3.8 LCD DISPLAY

LCD modules are very commonly used in most embedded projects, the reason being its cheap price, availability and programmer friendly. Most of us would have come across these displays in our day to day life, either at PCO's or calculators. The appearance and the pin outs have already been visualized above now let us get a bit technical.

16×2 LCD is named so because; it has 16 Columns and 2 Rows.There are a lot of combinations available like, 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. A Single character with all its Pixels is shown in the below picture.

Figure. 3.8LCD Display

3.9 MICROCONTROLLER:

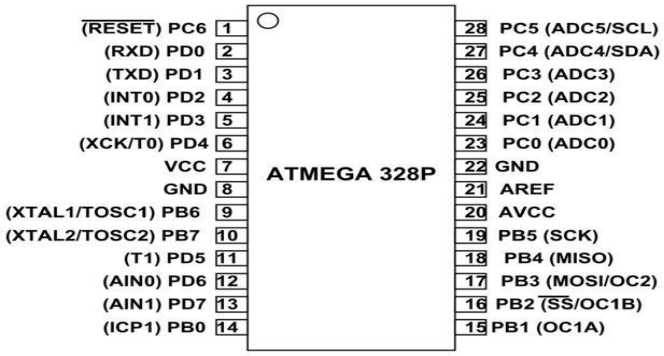


Fig 3.9 pin diagram of Microcontroller

ATmega328 is an 8-bit and 28 Pins AVR Microcontroller, manufactured by Microchip, follows RISC Architecture and has a flash type program memory of 32KB.

It has an EEPROM memory of 1KB and its SRAM memory is of 2KB.

It has 8 Pin for ADC operations, which all combines to form PortA(PA0 – PA7).

It also has 3 built-in Timers, two of them are 8 Bit timers while the third one is 16-Bit Timer.

You must have heard of Arduino UNO, UNO is based on atmega328Microcontroller. It's UNO's heart.

It operates ranging from 3.3V to 5.5V but normally we use 5V as astandard.

IV BLOCK DIAGRAM

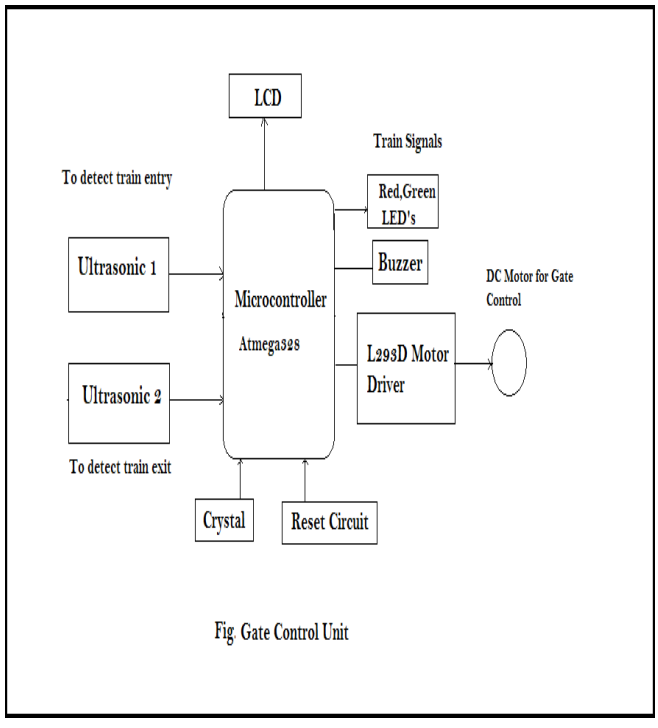


Fig 4.1 Block Diagram of Railway safety using track monitoring

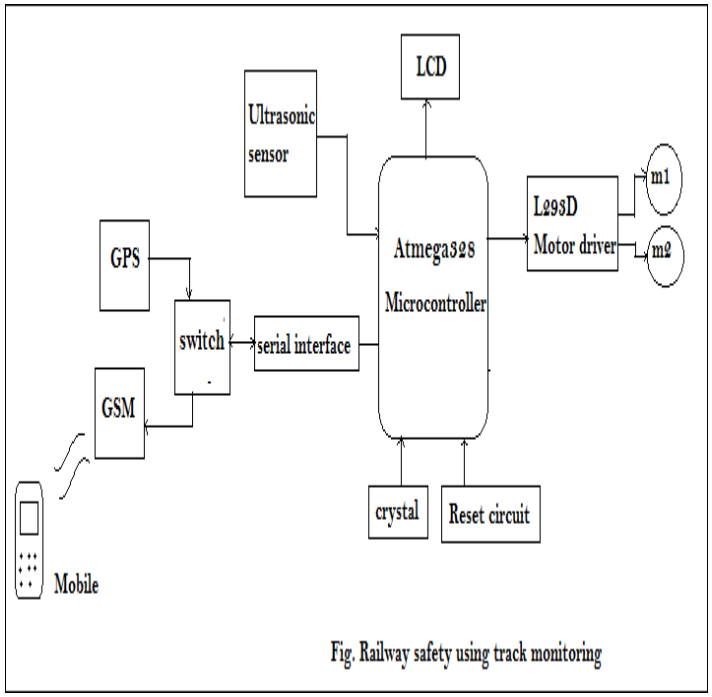


Fig 4.2 Block diagram of automatic gate control unit

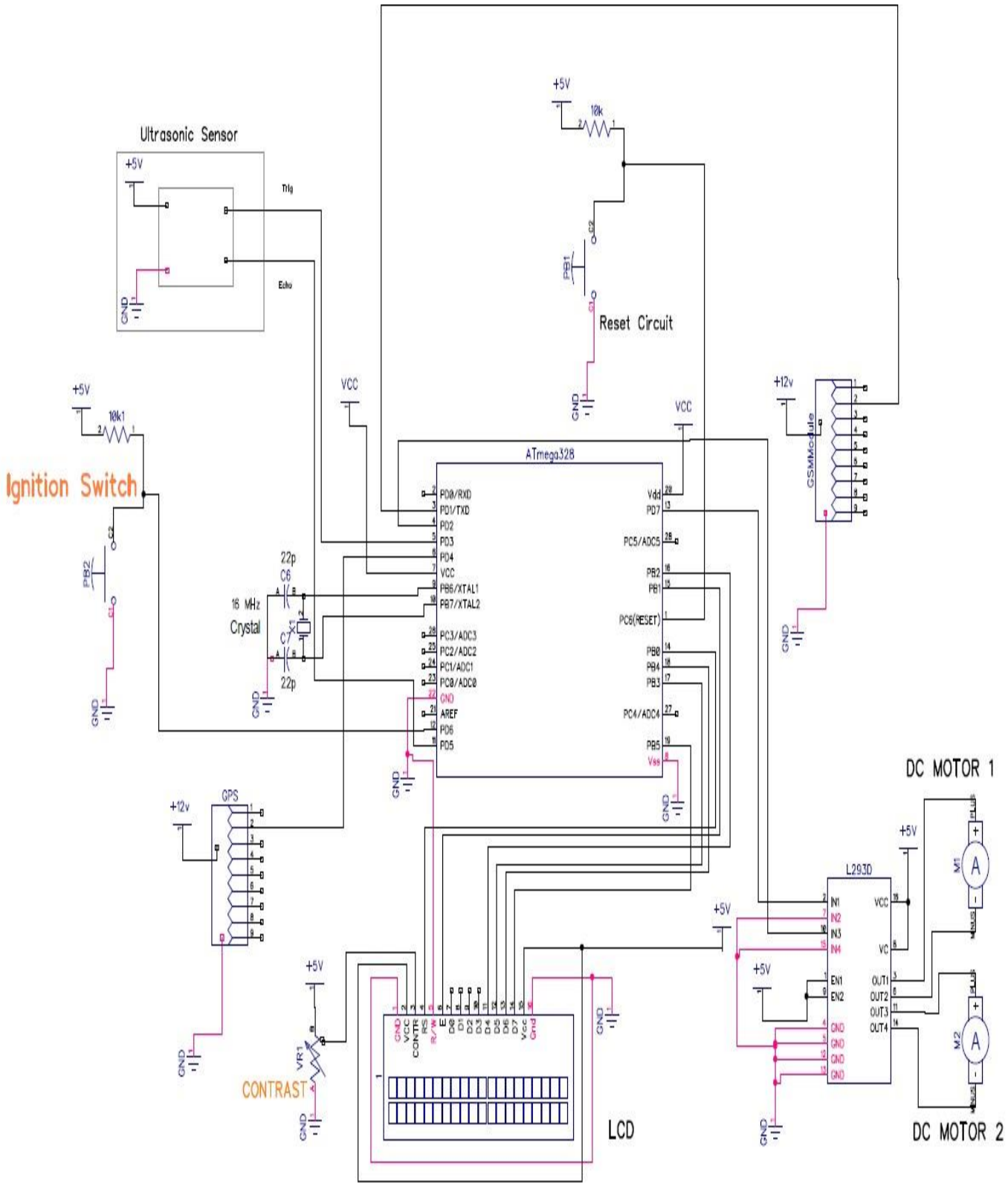
Above diagram shows the block diagram of the proposed work "railway track crack identification system". In this system we are using Arduino Uno microcontroller, which acts as a brain of the system. This microcontroller controls the circuit function. Various components are interfaced with this microcontroller to perform desired operation of the system.

The hardware components used in this system requires regulated power supply for the operation. This power is provided by the rechargeable battery connected in the system. The battery will be charged through solar power with the help of solar panel connected. In this system we have interfaced two TSOP IR sensors with the microcontroller for the distance and detection of the crack present in the track of the railway line. To communicate the received information, we make use of a GSM modem. The GSM module is being used to send the current latitude and longitude data to the relevant authority as an SMS. This GSM module is interfaced with the microcontroller through a matching circuit MAX232. A GPS receiver is also interfaced with the microcontroller to determine the exact location of the crack on the railway track. This GPS receiver will provide the longitude and latitude parameter values to the controller.

Two DC motors are used to move the robot in forward direction. These motors are interfaced and controlled through the microcontroller. To operate these motors through a microcontroller a driver circuit is required for interfacing between microcontroller and motors.

The architecture of the proposed system also consists of a 16x2 LCD display, interfaced with the microcontroller for the display purpose. This LCD display will display the longitude and latitude values of the crack detected by the system

V CIRCUIT DIAGRAM



VI RESULT

Here the proposed module is made up of hardware which was previously explained in the description of the system design hardware

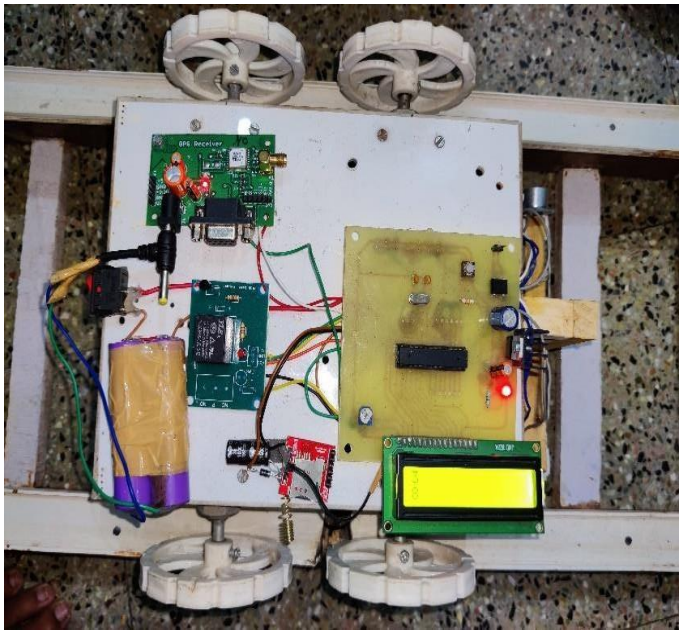


Figure 6.1- Hardware Module

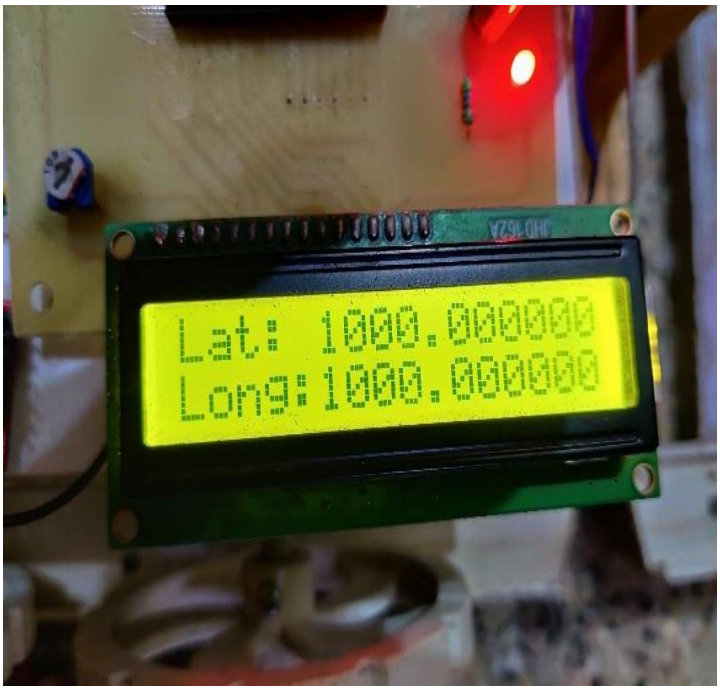


Figure 6.2- Arduino Display screen

Above figure6.2 shows latitudinal and longitudinal position at the point where a crack or obstacle is detected.

Figure 6.3 shows the SMS obtained on the mobile phone wherethe location of crack is detected

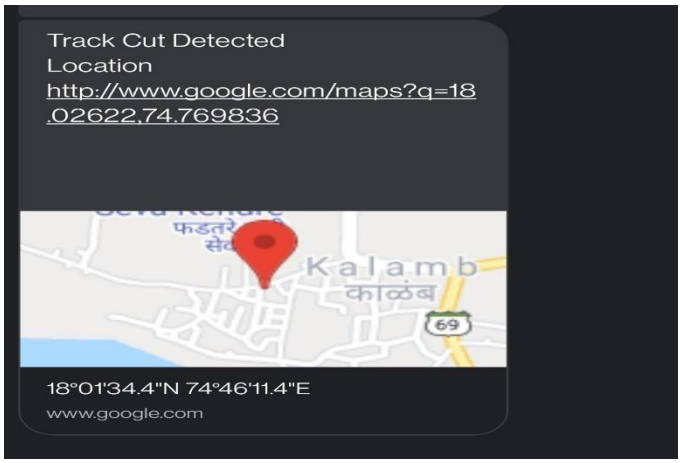


Figure 6.3 SMS received on mobile phone

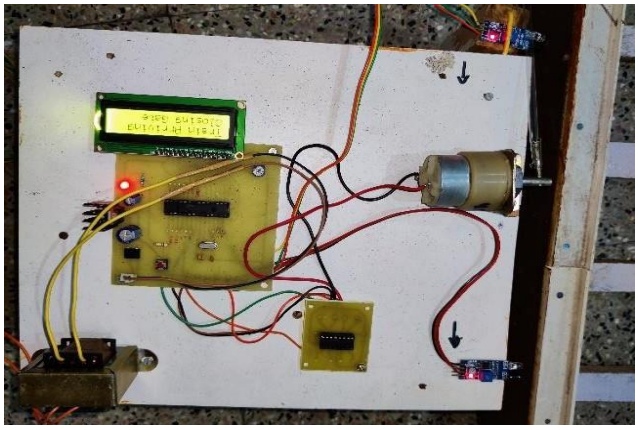


Figure 6.4- Hardware of Gate control unit

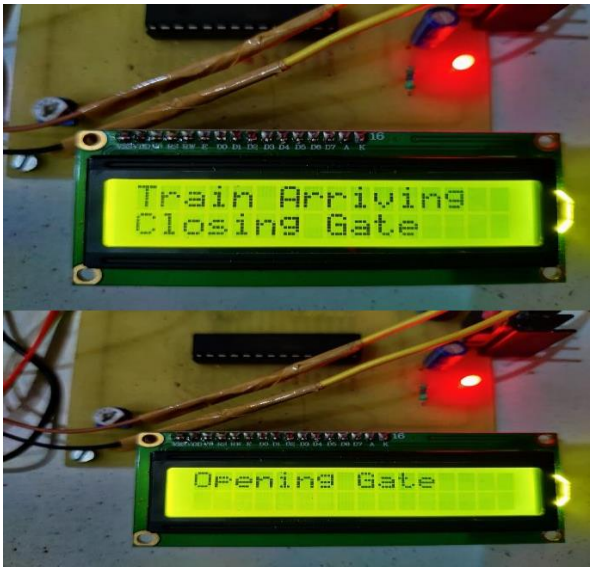


Figure 6.5 – Opening or closing Gate Show onDisplay Screen

VII CONCLUSION

- *Using this Project, we can find out cracks on railway track.*
- *By finding those crack we will avoid misshapen in future.*
- *By avoiding those misshapen accident's, we will save many lives and Government property too.*
- *At railway gate crossing avoid the accident by using automatic gate control*

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