AUTOMATED RAILWAY GATE CONTROLLER

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Bachelor of Technology

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CERTIFICATE

This is to certify that project report entitled **"Automated Railway Gate Controller"**, submitted by **Sanya Gupta (111032)** and **Akanksha Harjai (111034)** in partial fulfillment for the award of degree of Bachelor of Technology in Electronics & Communication Engineering to Jaypee University of Information Technology, Waknaghat, Solan has been carried out under my supervision.

This work has not been submitted partially or fully to any other University or Institute for the award of this or any other degree or diploma.

Date: 26 ·5· 15

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ABSTRACT

The railway gate is to be controlled so that the road traffic can be checked. The opening and closing of the gate is to be done using DC motors and this DC motor is controlled by microcontroller. The signaling to the travelers on the road is controlled by the status of the trains. If the train is arriving, the red signal will be given and the gates will be closed. And after the train has crossed the level crossing, a green signal will appear and the gates will be opened.

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CHAPTER 1

Introduction

A level crossing is an intersection where a railway line crosses a road or path at the same level, as opposed to the railway line crossing over or under using a bridge or tunnel. The term also applies when a light rail line with separate right-of-way or reserved track crosses a road in the same fashion.

Railroad trains have a much larger mass relative to their braking capability, and thus a far longer braking distance than road vehicles. In general, trains do not stop at level crossings but rely on vehicles and pedestrians to clear the tracks in advance.

Level crossings constitute a significant safety concern internationally. In India numerous numbers of railways are running on track every day. Every year many people die at the level crossing of the rail-line due to the carelessness of the gate keeper. Also some major collisions occur when any vehicle gets stuck at the level crossing. The rate of these accidents is increasing day by day. That's why our concept is to make an automatic system to avoid the collisions at the level crossing of the rail-line. An automatic railway gate control system is an arrangement of physical components which sense the arrival of the train and make the gate pull up and pull down automatically. As a train approaches at the railway crossing from either side, the sensors placed at a certain distance from the gate detect the approaching train and accordingly controls the operation of the gate. Also an indicator light has been provided to alert the driver of the train if any vehicle or living object gets stuck at the level crossing of the rail-line. By employing the automatic gate control at the railway level crossing the arrival of the trains are detected by the IR sensors placed on either side of the gate. Once the arrival is sensed, the sensed signal is sent to the microcontroller and it checks the possible presence of any vehicle between the gates, again using sensor. Once no vehicle is sensed in between the railway gate then the motor is activated and the gates are closed. But if any obstacle is sensed it is indicated to the train drivers and necessary steps are taken according to solve the emergency problems. When the train is passed through using the same process gate is opened.

Earlier, railway gate is controlled manually all over the world. Now a day's many countries of the world are practicing automatic railway gate control system. But it was not the scenario in the late past. Walkie-talkie sets were provided to drivers and guards of all the trains for communication in static mode or at low speeds. VHF sets was also used at stations on board gauge double line or multiple line sections so that train crew can communicate with the nearest station masters in the case of emergencies. In early age, guards used conventional kerosene lit tail lamps to pass the signals to the driver after closing the gates at the railway level crossing. But this system has less reliability. Due the carelessness of the gate keepers and the guards many accidents took place in the past.

Now days, a reliable system has been designed to reduce the complexity. In this system when a train is about to its arrival at the railway crossing, the station master informs the gate keeper who stands at the side of the railway gate by calling him through telephone and then he closes the gate so that the traffic cannot pass through the rail-line. Sooner he passes this information to the station master using same process and the station master gives signal to the train to pass through. When the train passes through the level crossing completely gate keeper gives this information to the station master and the station master gives him the right to open the gate.

Sometimes vehicles get stuck at the level crossing of the rail-line; at that time there is huge chance of occurrence of accident. In fact, such situation triggered many accidents in the past. The ordinary system of railway gate control has no safety purpose as it is operated manually. In manual system, road users have to suffer many hours at the level crossing due to the laziness of the gatekeeper. And the more important thing there is no anti-collision system in manual operated railway gate control system.

1.1 Objective

The microcontroller (AT89S52) is used to demonstrate the integration of computer method in railway gate operation. The objectives of this project are:

- To develop a prototype of railway gate that function automatically by using microcontroller.
- To develop an interfacing program for the integration part of microcontroller operation.
- To design an automatic railway gate control by using microcontroller.

Furthermore, this project is aimed to replace the gatekeepers with an automatic system. It is developed to apply the structure of interfacing program in between to give a lot of advantages.

1.2 Scope of Work

This project covered the operation of automatic railway gate control by using microcontroller (AT89S52). The circuits involved such as power supply, IR sensor, light and buzzer, gate motor and LCD display. All of these operations will be combining to demonstrate the operation of microcontroller (89S52).

The operations of microcontroller works follow the instruction programmed. The combining circuits were constructed on Proteus software to seen whether that circuits was right or not. After that, the hardware part was constructed after all the simulation being done.

IR sensor circuit is providing signal to triggered the 89S52. The sensed signal wills activate the gate motor. Alarm and indication light circuit was provided as additional part of this system. Additional elements can be added without affecting the remaining elements. This allows the flexibility of the developed system.

CHAPTER 2

Technical Details

The presence of the train on the track is sensed by the IR sensors placed on the tracks and the output of the sensor if fed to the microcontroller at one of its ports. The microcontroller is already programmed to control the motors according to the input received from the IR sensors. The microcontroller gives the instructions to the motor driver to drive the motors accordingly, which leads to rotation of the railway gates.

2.1 Block Diagram

The following figure represents the block diagram of the project. Here, the train sensing block is connected to the microcontroller block which is further connected to the DC motor via motor driver block to drive the gates. Connections from the power supply block are given to the sensing, microcontroller and motor driver block.
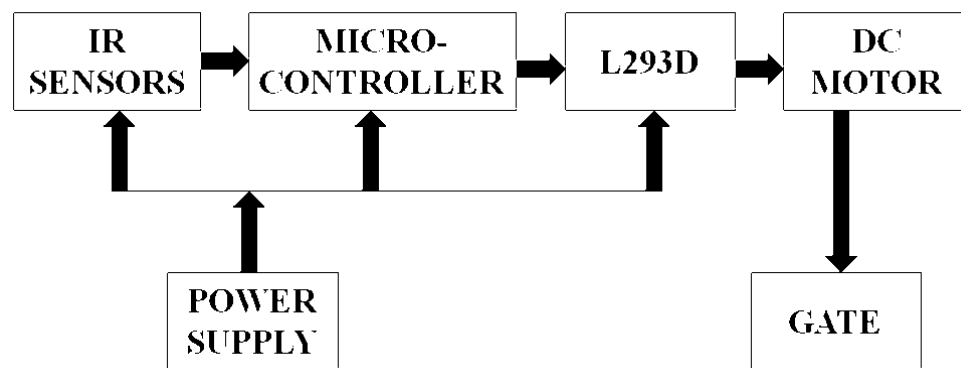

Figure 1: Block Diagram

2.2   Circuit Diagram

The following figure represents the circuit diagram of the project. The IR sensors are connected to the pins 1 and 2 of PORT 1 of the AT89S52 microcontroller.

Two 33pF capacitors are connected to the XTAL1 (pin 19) and XTAL2 (pin 18) of the microcontroller through a 12Mhz Crystal Oscillator which generates a clock signal to execute the instructions of the microcontroller. The microcontroller according to the program programmed in it gives the output at PORT2 which is connected to pin 10 and pin 15 of the motor driver IC L293D. DC motor to rotate the railway gates is connected at pin 11 and pin 14 of the motor driver IC.
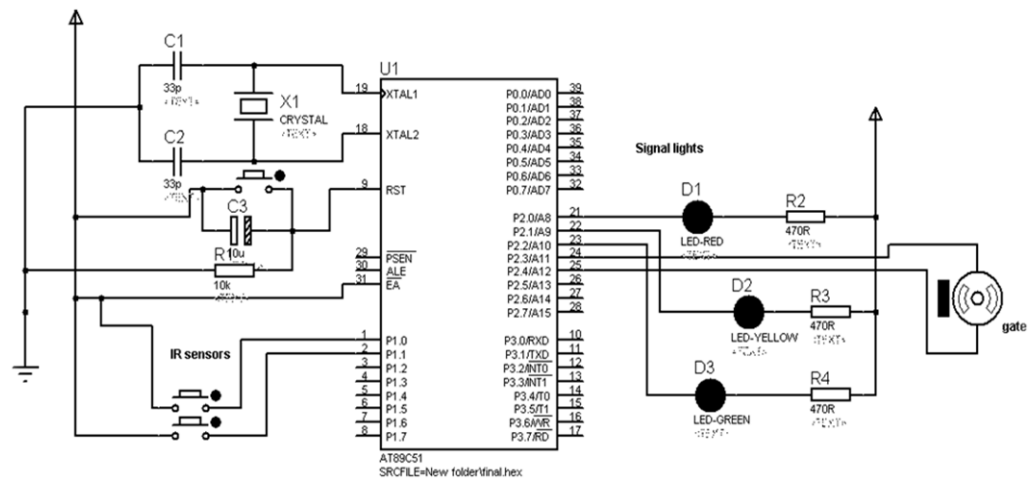
Figure 2: Circuit Diagram

2.3 Component Description

According to the circuit diagram mentioned above, following are the components required to implement it :

- ATMEL 89S52 Microcontroller   1
- L293D Motor Driver IC   1
- 7805 voltage regulator IC   1
- LM 358 op-amp IC   1
- 220 ohms resistance   4
- 10K resistance   2
- 33M resistance   2
- Variable resistor   1
- 0.1uF capacitor   2
- 330uF capacitor   1
- LEDs   6
- 12MHz crystal   1
- Push to on switch   1
- DC motor   1
- Battery 9V   1

2.3.1 Microcontroller-89S52

- 4K Bytes of In-System Reprogrammable Flash Memory

- Fully Static Operation: 0 Hz to 24 MHz

- 128 x 8-bit Internal RAM

- 32 Programmable I/O Lines

- Two 16-bit Timer/Counters

- Six Interrupt Sources

- Programmable Serial Channel

- Low-power Idle and Power-down Modes

The AT89S52 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications.
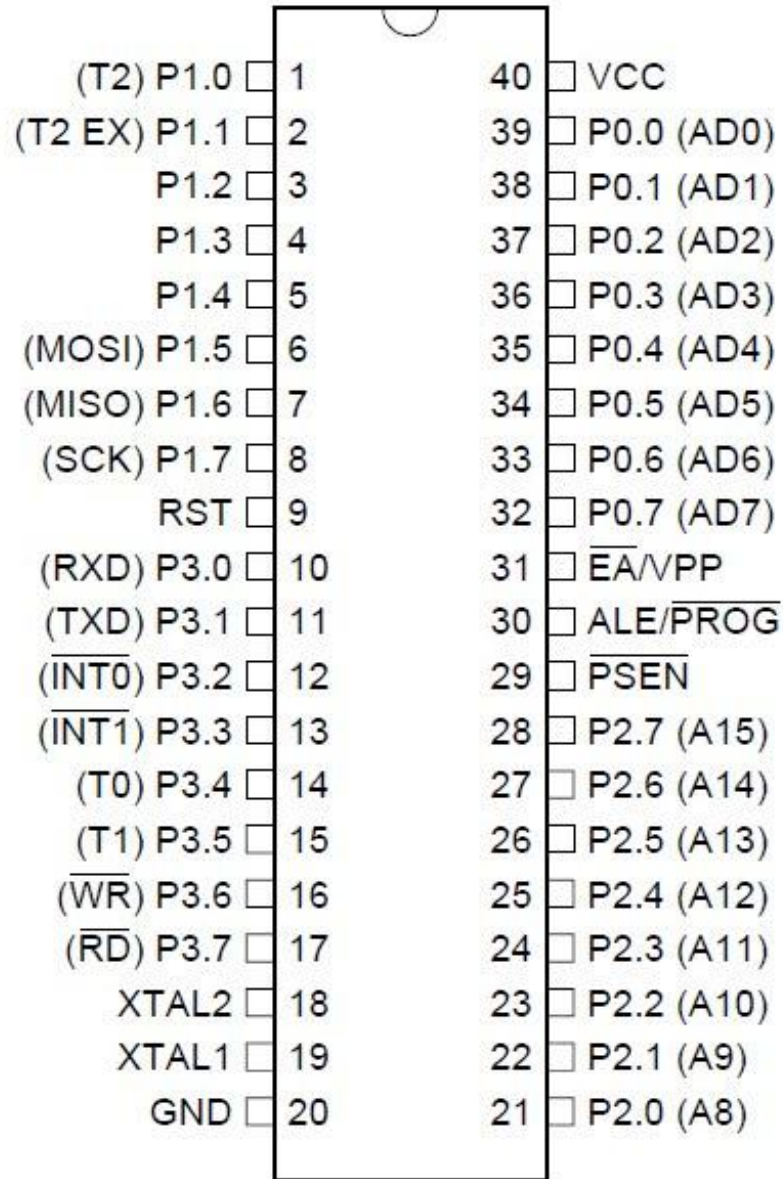
Figure 3: AT89S52 Pin Description

Pin Functions

VCC: - Supply voltage.

GND: - Ground.

Port 0

Port 0 is an 8-bit open-drain bi-directional I/O port. As an output port, each pin can sink eight TTL inputs. When 1s are written to port 0 pins, the pins can be used as high impedance inputs.

Port 0 may also be configured to be the multiplexed low order address/data bus during accesses to external program and data memory. In this mode P0 has internal pull ups. Port 0 also receives the code bytes during Flash programming, and outputs the code bytes during program verification. External pull ups are required during program verification.

Port 1

Port 1 is an 8-bit bi-directional I/O port with internal pull ups. The Port 1 output buffers can sink/source four TTL inputs. When 1s are written to Port 1 pins they are pulled high by the internal pull ups and can be used as inputs.

As inputs, Port 1 pins that are externally being pulled low will source current because of the internal pull ups. Port 1 also receives the low-order address bytes during Flash programming and verification.

Port 2

Port 2 is an 8-bit bi-directional I/O port with internal pull ups. The Port 2 output buffers can sink/source four TTL inputs. When 1s are written to Port 2 pins they are pulled high by the internal pull ups and can be used as inputs.

As inputs, Port 2 also receives the high-order address bits and some control signals during Flash programming and verification.

Port 3

Port 3 is an 8-bit bi-directional I/O port with internal pull ups. The Port 3 output buffers can sink/source four TTL inputs. When 1s are written to Port 3 pins they are pulled high by the internal pull ups and can be used as inputs. As inputs, Port 3 pins that are externally being pulled low will source current because of the pull ups.

Port 3 also serves the functions of various special features of the AT89S52 as listed below:

Port Pin Alternate Functions

- P3.0 RXD (serial input port)

- P3.1 TXD (serial output port)

- P3.2 INT0 (external interrupt 0)

- P3.3 INT1 (external interrupt 1)

- P3.4 T0 (timer 0 external input)

- P3.5 T1 (timer 1 external input)

- P3.6 WR (external data memory write strobe)

- P3.7 RD (external data memory read strobe)

Port 3 also receives some control signals for Flash programming and verification.

RST

Reset input. A high on this pin for two machine cycles while the oscillator is running resets the device.

ALE/PROG

Address Latch Enable output pulse for latching the low byte of the address during accesses to external memory. This pin is also the program pulse input (PROG) during Flash programming.

PSEN

Program Store Enable is the read strobe to external program memory.

EA/VPP

External Access Enable. EA must be strapped to GND in order to enable the device to fetch code from external program memory locations starting at 0000H up to FFFFH.

XTAL1

Input to the inverting oscillator amplifier and input to the internal clock operating circuit.

XTAL2

It is the output from the inverting oscillator amplifier.

2.3.2 Motor Driver - L293D

The L293D is a16 pin motor driver IC. The L293 and L293D are quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All the inputs are TTL compatible. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for

solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression. A VCC1 terminal, separate from VCC2, is provided for the logic inputs to minimize device power dissipation. The L293 and L293D are characterized for operation from 0°C to 70°C.

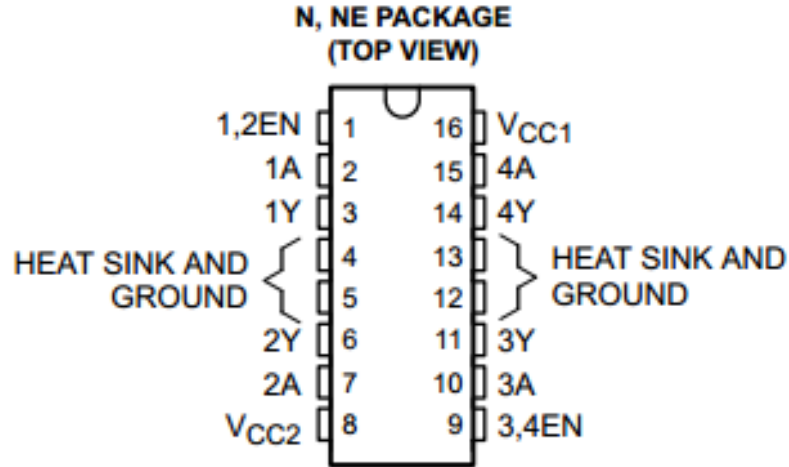Pin diagram of motor driver is given as:-

Figure 2: L293D Pin Description

Table 1: L293D Pin Functions

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc 2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc 1

2.3.3 Power Supply

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. Here in our application we need a 5v DC power supply for all electronics involved in the project. This requires step down transformer, rectifier, voltage regulator and filter circuit for generation of 5v DC power. A brief description of all the components are given as follows:

Transformer

Transformer is a device that transfers electrical energy from one circuit to another through inductively coupled conductors— the transformer's coils or "windings". A varying current in the first or "primary" winding creates a varying magnetic field in the core (or cores) of the transformer. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the "secondary" winding. This effect is called mutual induction.

Figure 5: Transformer

If a load is connected to the secondary circuit, electric charge will flow in the secondary winding of the transformer and transfer energy from the primary circuit to the load connected in the secondary circuit. The secondary induced voltage V_s, of an ideal

transformer, is scaled from the primary V_p by a factor equal to the ratio of the number of turns of wire in the irrespective windings:

$$\frac{V_S}{V_P} = \frac{N_S}{N_P}$$

By appropriate selection of the number of turns, a transformer thus allows an alternating voltage to be stepped up - by making N_s more than N_p or stepped down, by making N_s less than N_p.

Bridge Rectifier

A bridge rectifier makes use of our diodes in a bridge arrangement to achieve full - wave rectification. This is a widely used configuration, both with individual diodes wired as shown and with single component bridges where the diode bridge is wired internally.

Basic Operation

In the diagrams below, when the input connected to the left corner of the diamond is positive, and the input connected to the right corner is negative, current flows from the upper supply terminal to the right along the red (positive) path to the output, and returns to the lower supply terminal via the blue (negative) path.
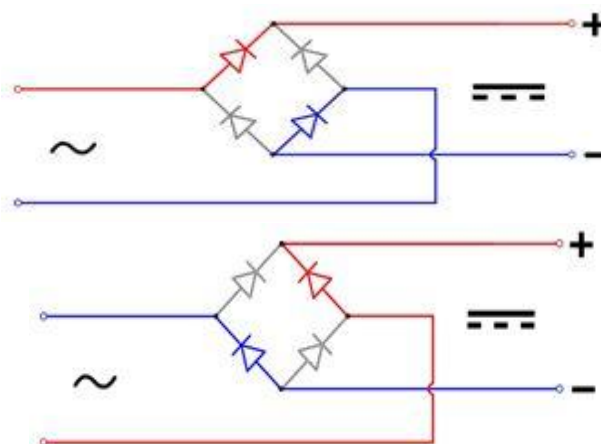

Figure 6: Rectification Operation

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When the input connected to the left corner is negative, and the input connected to the right corner is positive, current flows from the lower supply terminal to the right along the path to the output, and returns to the upper supply terminal via the blue path.

In each case, the upper right output remains positive and lower right output negative. Since this is true whether the input is AC or DC, this circuit not only produces a DC output from an AC input, it can also provide what is sometimes called "reverse polarity protection". That is, it permits normal functioning of DC - powered equipment when batteries have been installed backwards, or when the leads (wires) from a DC power source have been reversed, and protects the equipment from potential damage caused by reverse polarity.

Output Smoothing

For many applications, especially with single phase AC where the full - wave bridge serves to convert an AC input into a DC output, the addition of a capacitor may be desired because the bridge alone supplies an output of fixed polarity but continuously varying or "pulsating" magnitude.
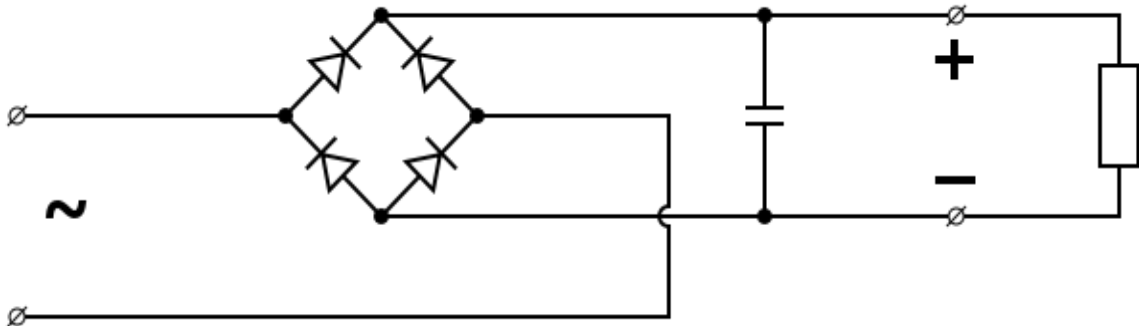

Figure 7: Output Smoothing of Rectifier

The function of this capacitor, known as a reservoir capacitor (or smoothing capacitor) is to lessen the variation in (or 'smooth') the rectified AC output voltage waveform from the bridge. One explanation of 'smoothing is that the capacitor provides a

low impedance path to the AC component of the output, reducing the AC voltage across, and AC current through, the resistive load. In less technical terms, any drop in the output voltage and current of the bridge tends to be canceled by loss of charge in the capacitor. This charge flows out as additional current through the load. Thus the change of load current and voltage is reduced relative to what would occur without the capacitor. Increases of voltage correspondingly store excess charge in the capacitor, thus moderating the change in output voltage / current.

Regulator IC (78xx)

It is a three pin IC used as a voltage regulator. It converts unregulated DC current into regulated DC current.

Normally we get fixed output by connecting the voltage regulator at the output of the filtered DC. It can also be used in circuits to get a low DC voltage from a high DC voltage (for example we use 7805 to get 5V from 12V). It is a fixed (78xx,79xx) and positive voltage regulator. 7805 gives fixed 5V DC voltage if input voltage is in (7.5V, 20V).
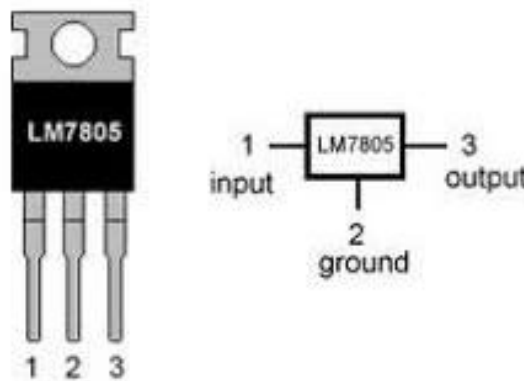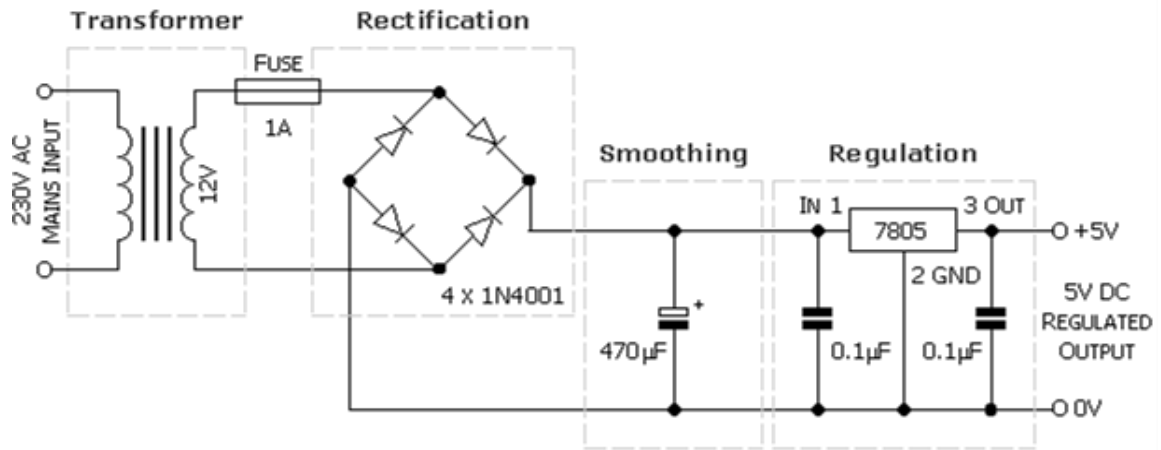

Figure 8: Regulator

Figure 9: Power Supply Circuit Diagram

2.3.4   Other Components

- **IR Sensors**

An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation.

Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

Figure 10: IR Sensors

- **Capacitors**

Electrolytic Capacitors

An electrolytic capacitor is a capacitor that uses an electrolyte (an ionic conducting liquid) as one of its plates to achieve a larger capacitance per unit volume than other types, but with performance disadvantages. All capacitors conduct alternating current (AC) and block direct current (DC) and can be used, amongst other applications, to couple circuit blocks allowing AC signals to be transferred while blocking DC power, to store energy, and to filter signals according to their frequency.

Ceramic Capacitors

A ceramic capacitor is a fixed value capacitor in which ceramic material acts as the dielectric. It is constructed of two or more alternating layers of ceramic and a metal layer acting as the electrodes. The composition of the ceramic material defines the electrical behavior and therefore applications. Ceramic capacitors are divided into two application classes: Class 1 ceramic capacitors offer high stability and low losses for resonant

circuit applications. Class 2 ceramic capacitors offer high volumetric efficiency for buffer, by-pass and coupling applications.

- **Resistors:**

    A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. The current through a resistor is in direct proportion to the voltage across the resistor's terminals. This relationship is represented by Ohm's law:

$$I = \frac{V}{R}$$

where I is the current through the conductor in units of amperes, V is the potential difference measured across the conductor in units of volts, and R is the resistance of the conductor in units of ohms.

    The ratio of the voltage applied across a resistor's terminals to the intensity of current in the circuit is called its resistance, and this can be assumed to be a constant (independent of the voltage) for ordinary resistors working within their ratings. Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel-chrome).

- **Crystal Oscillator:**

    A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. This frequency is commonly used to keep track of time, to provide a stable clock

signal for digital integrated circuits, and to stabilize frequencies for radio transmitters and receivers. The most common type of piezoelectric resonator used is the quartz crystal, so oscillator circuits incorporating them became known as crystal oscillators, but other piezoelectric materials including polycrystalline ceramics are used in similar circuits.

- **LM358 IC**

  It consists of two independent, high-gain frequency-compensated operational amplifiers designed to operate from a single supply or split supply over a wide range of voltages.

  Wide Supply Ranges

  - Single Supply : 3V to 32 V

  - Dual Supplies : ±1.5 V to ±16 V
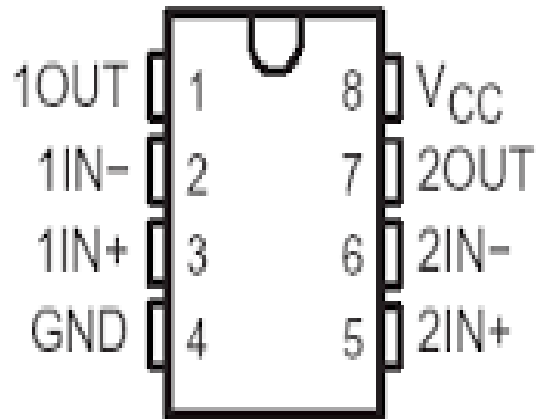
Figure 11: LM358 pin description

- **DC Motor**

    A DC motor is a device that converts direct current (electrical energy) into mechanical energy. The construction of a dc motor contains a current carrying armature which is connected to the supply end through commutator segments and brushes and placed within the north south poles of a permanent or an electro-magnet.

    DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. If the direction of current in the wire is reversed, the direction of rotation also reverses. When magnetic field and electric field interact they produce a mechanical force, and based on that the working principle of dc motor established.

    Fleming's left hand rule says that if we extend the index finger, middle finger and thumb of our left hand in such a way that the current carrying conductor is placed in a magnetic field (represented by the index finger) is perpendicular to the direction of current (represented by the middle finger), then the conductor experiences a force in the direction (represented by the thumb) mutually perpendicular to both the direction of field and the current in the conductor.

- **LED**

    A light-emitting diode (LED) is a two-lead semiconductor light source. It is a pn-junction diode, which emits light when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called electroluminescence, and the color of the light (corresponding to the energy of the photon) is determined by the energy band gap of the semiconductor.

- **Battery 9V**

    The nine-volt battery in its most common form was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top. This type is commonly used in pocket radios, paintball guns, and small electronic devices. They are also used as backup power to keep the time in certain electronic clocks. This format is commonly available in primary carbon-zinc and alkaline chemistry, in primary lithium iron disulfide, and in rechargeable form in nickel-cadmium, nickel-metal hydride and lithium-ion. Mercury oxide batteries in this form have not been manufactured in many years due to their mercury content.

CHAPTER 3

Software and Coding

3.1   Keil uVision 3

Keil IDE is a windows operating system software program that runs on a PC to develop applications for ARM microcontroller and digital signal controller. It is also called Integrated Development Environment or IDE because it provides a single integrated "environment" to develop code for embedded microcontroller.

Following are the steps:

- Keil uVision Program is opened which is Text Editor of Keil-ARM used for writing C Language Source Code Program.

Figure 12: Keil uVision 3

- Default value is set to translate uVision3 Code to use with Keil uVision3 Program and Keil ARM.
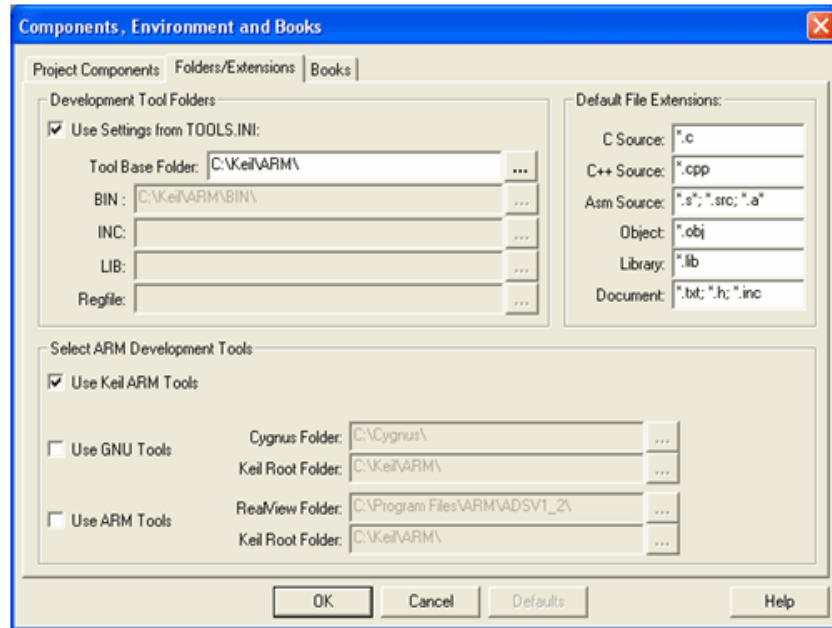
Figure 13: Setting Values in Keil uVision 3

- A new project file is created and source code is written in C language.
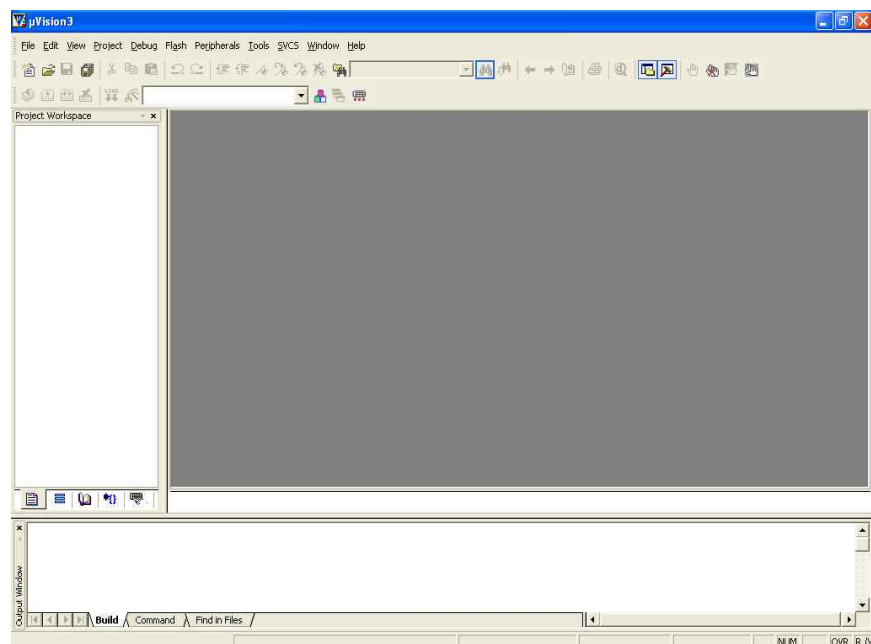
Figure 14: Creating a New File in Keil uVision 3

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- All target files are rebuilt to get a .hex file.

3.2 AVRDUDE

AVRDUDE is a utility to download/upload/manipulate the ROM and EEPROM contents of AVR microcontrollers using the in-system programming technique.
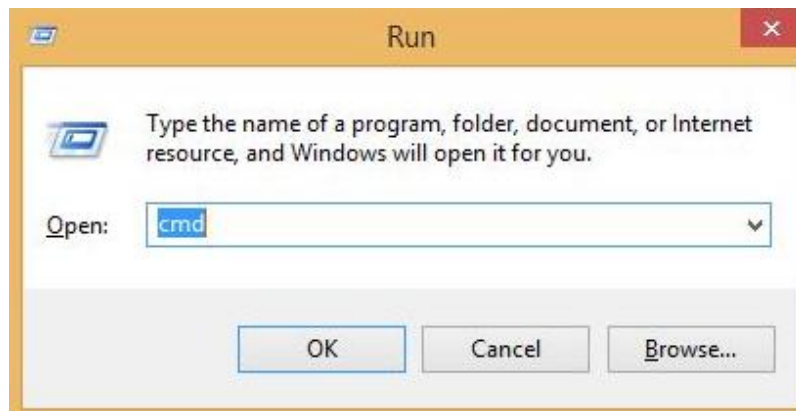
Figure 15: Running AVR Dude

Figure 16: Options in AVR Dude

3.3   Programming

```c
#include<reg51.h>

sbit led_red= P3^0;
sbit led_yellow=P3^1;
sbit led_Green=P3^2;

sbit sw1=P2^2;
sbit motor1=P2^0;
sbit motor2=P2^1;
sbit sw2=P2^3;

void delay(unsigned int);
void right_train();
void left_train();

void main()
{
        sw2=1;
        sw1=1;
        led_Green=0;
        while(1)
        {
                sw1=sw2=0;
                if((sw1==1)||(sw2==1))
                {
                        right_train();
                        while((sw2==1)||(sw1==1));
                                led_red=1;
                                led_yellow=0;
```

```c
                              left_train();
                              led_yellow=1;
                              led_Green=0;


              }
              else if(sw2==1&&sw1==0)
              {
                      right_train();
                      while((sw1==1)||(sw2==1));
                              led_red=1;
                              led_yellow=0;
                              left_train();
                              led_yellow=1;
                              led_Green=0;

              }
        }
}

void right_train()
{
      led_Green=1;
      led_red=0;
      motor1=1;
      motor2=0;
      delay(100);
      motor1=0;
      motor2=0;
}
```

```
void left_train()
{
        led_Green=1;
        led_red=0;
        motor1=0;
        motor2=1;
        delay(100);
        motor1=0;
        motor2=0;
}
```

CHAPTER 4

Methodology

4.1 Circuit Designing and Testing

Proteus (*PRO*cessor for *TE*xt Easy to *US*e)

Proteus is a Virtual System Modeling and circuit simulation application. The suite combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs. Proteus also has the ability to simulate the interaction between software running on a microcontroller and any analog or digital electronics connected to it. It simulates Input / Output ports, interrupts, timers, USARTs and all other peripherals present on each supported processor.

Proteus is the best simulation software for various designs with microcontroller. It is mainly popular because of availability of almost all microcontrollers in it.
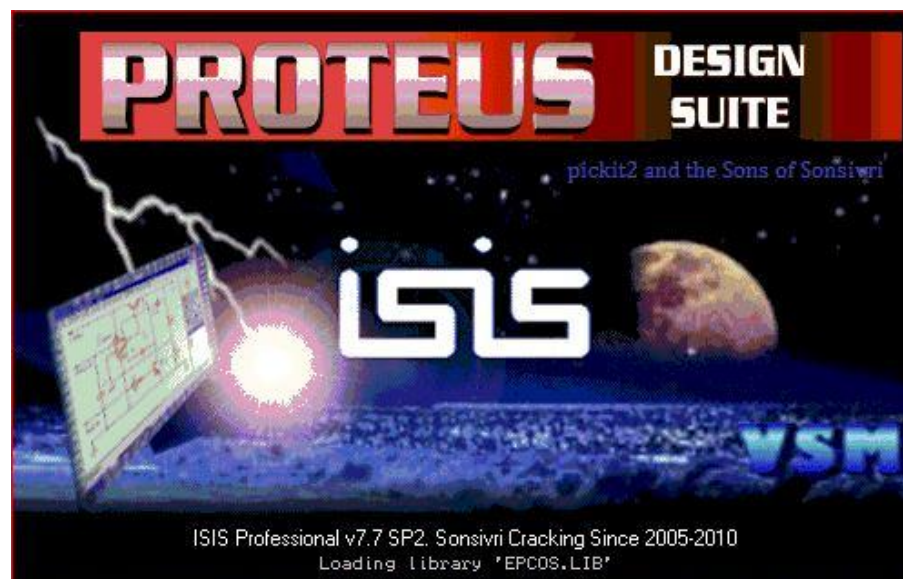

Figure 17: Proteus

Following are the steps to design the circuit in Proteus:
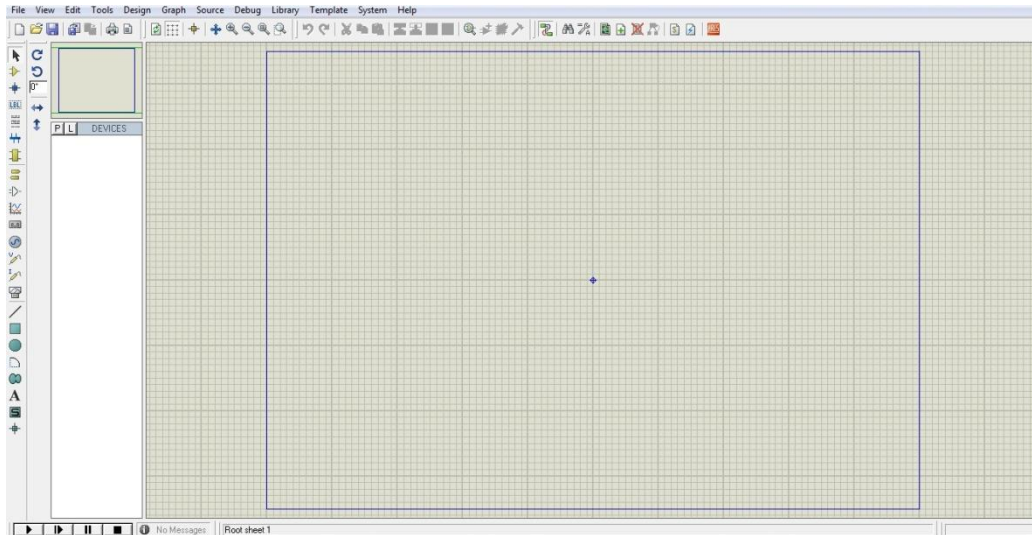
- A new file in Proteus is opened.

Figure 18: Creating a file in Proteus

- The required components are searched and placed on the screen.

- The connections are established.

- Now, the .hex file obtained from Keil uVision 3 is added to the microcontroller and then the file is saved.

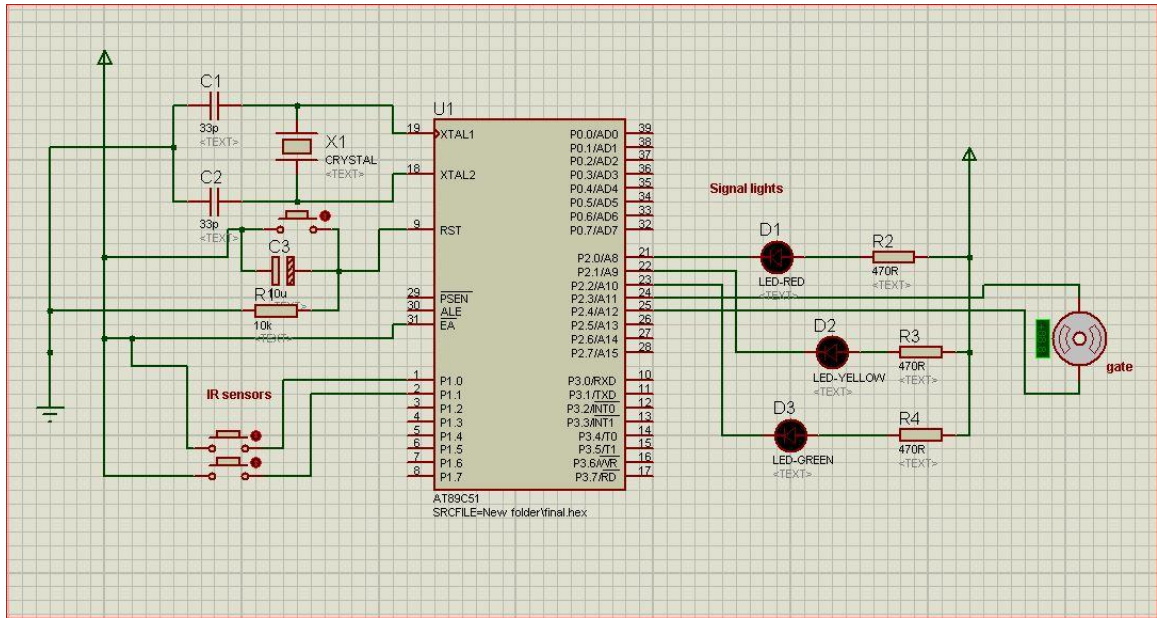- The file is played and results are verified.

Figure 19: Hardware simulation in Proteus

4.2   Soldering

Soldering is a process in which two or more metal items are joined together by melting and flowing a filler metal (solder) into the joint, the filler metal having a lower melting point than the adjoining metal. Soldering differs from welding in that soldering does not involve melting the work pieces. In brazing, the filler metal melts at a higher temperature, but the work piece metal does not melt. In the past, nearly all solders contained lead, but environmental concerns have increasingly dictated use of lead-free alloys for electronics and plumbing purposes.
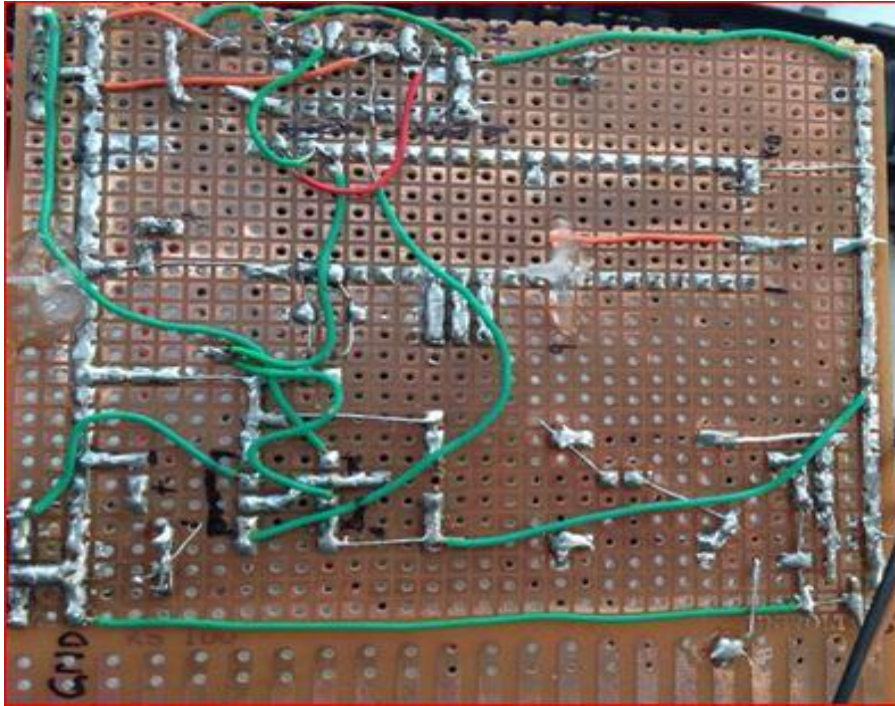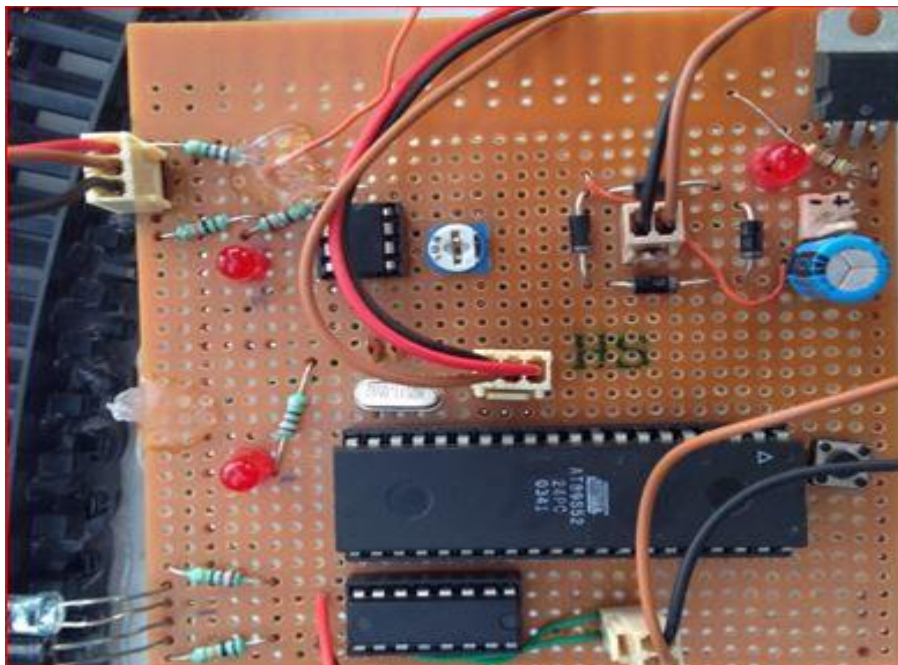
Figure 20: Soldered PCB

Figure 21: Components on PCB

4.3 Working

Microcontroller 89S52

- The port 1 is receiving the input from the IR sensors.

- The program for Microcontroller is written in embedded c language using the Keil uVision3 Software.

- AVRDUDE software is used to burn the hex file using the At Tiny programmer into the microcontroller.

- According to the program the output is drawn from the microcontroller to drive the motors.

- Also, red, green and yellow LEDs are attached to PORT 3 of the microcontroller.

- PORT 3 is set as output port; the output from this port is fed to the motor driver circuit which controls the motor and movement from the gate.

Motor Driver L293D

- There are 4 input pins for this l293d, pin 2, 7 on the left and pin 15, 10 on the right.

- Right input pins will regulate the rotation of motor connected.

- The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

L293D Logic Table

Motor is connected on right side. For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.

• Pin 10 = Logic 1 and Pin 15 = Logic 0 | Clockwise Direction

• Pin 10 = Logic 0 and Pin 15 = Logic 1 | Anticlockwise Direction

• Pin 10 = Logic 0 and Pin 15 = Logic 0 | Idle [No rotation] [Hi-Impedance state]

• Pin 10 = Logic 1 and Pin 15 = Logic 1 | Idle [No rotation]

CHAPTER 5

Results and Conclusion

5.1 Results

- Initially, the three LEDs glow showing that the power supply and the two pairs of IR sensors are working.
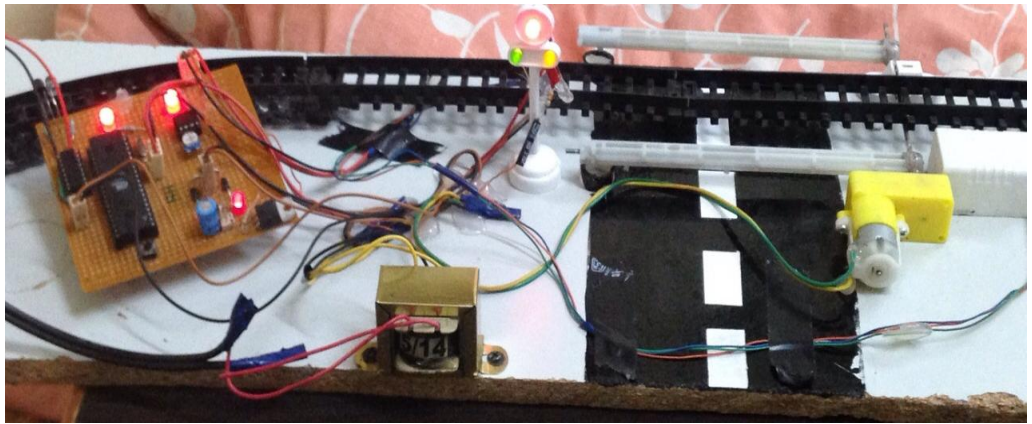

Figure 22: Initial startup

- On detecting the presence of the train, the corresponding LED blinks and the gates close. Also, the red LED starts glowing on the traffic lights.
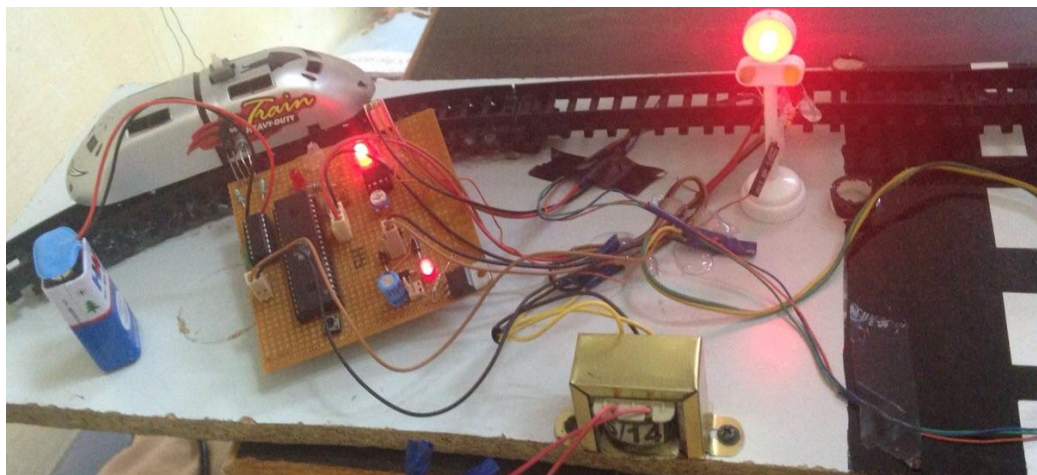

Figure 23: Detection of the train

- After the train crosses, the gates open and the green LED starts glowing on the traffic lights.
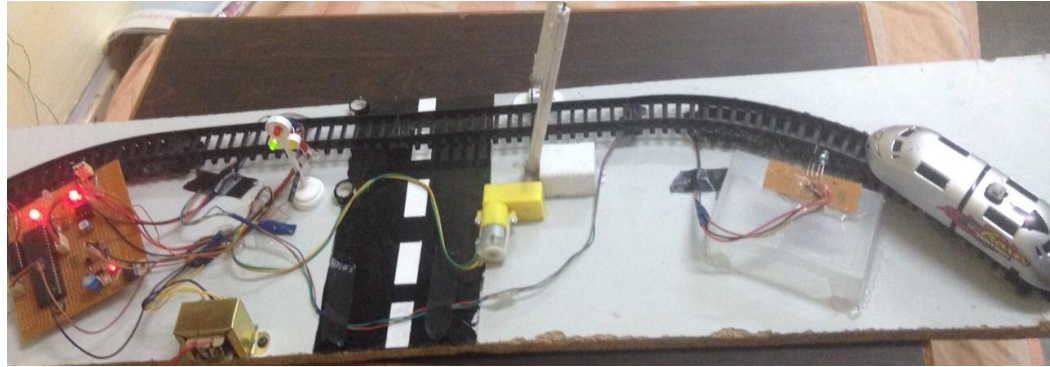

Figure 24: Opening of the gates

5.2 Future Work

- In the practical implementation of this project, pressure sensors will have to be used rather than IR sensors. Pressure sensors will be able to detect the presence of a train more accurately as compared to IR sensors which can falsely detect any object as the train. In our working model, we have used IR sensors because the required pressure for the pressure sensors to work could not be achieved.

- Track Switching
Using the same principle as that for gate control, we have developed a concept of automatic track switching. Considering a situation where in an express train and a local train are travelling in opposite direction on the same track, the express train is allowed to travel on the same track and the local train has to switch on to the other track, indicator lights have been provided to avoid collision. Here the operation is performed using a stepper motor.

5.3 Conclusion

At present, all the existing system is being operated manually. The station master informs the gatekeeper about the arrival of the train and after that he closes the gates. Sometimes, the train arrives late and the gate remains closed for a long time, thus disturbing the traffic. The time for which it is closed 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 accidents are higher and reliable operation is required. Since the operation is automatic, error due to manual operation is prevented.

References

- Data sheet of - CM358, 89S52, L293D

- www.electronicsforu.com

- http://www.evelta.com/

- http://www.micahcarrick.com/tutorials/avr-microcontroller-tutorial

- Ahmed Salih Mahdi., *"Automatic Railway Gate and Crossing Control based Sensors & Microcontroller"*, International Journal of Computer Trends and Technology (IJCTT) – volume 4 Issue 7–July 2013

- Atul Kumar Dewangan, Meenu Gupta, Pratibha Patel, "*Automation of Railway Gate Control Using Microcontroller*", International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 3, May - 2012 ISSN: 2278-0181

- Subrata Biswas, Rafiul Hoque Bhuiyan, Samiul Hoque, Robiul Hasan, Tanzila Nusrat Khan, "*Pressure Sensed Fast Response Anti-Collision System for Automated Railway Gate Control*", American Journal of Engineering Research (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-02, Issue-11, pp-163-173

- "The 8051 Microcontroller and Embedded Systems" By Muhammad Ali Mazidi and Janice Gillispie Mazidi. Pearson Education.