ABSTRACT

As we are aware that the number of accidents at railway crossing has been increasing lately, more precautionary measures are being undertaken. Accidents take place either due to the absence of crossing gates, or due to impatience and carelessness of pedestrians. . Whereas, there are places where the crossing gates at railroad is being controlled and managed by a guard. In such cases, threat may arise due to carelessness of the guard. So, our project aims at automating this process. Automatic Railway Gate Control (ARGC) is managed and controlled by microcontroller 8051 and is more reliable since there is no human intervention in the process. Our model, most primarily, is different from others in terms of the programming method and considering various possibilities that the actually railroad crossing system encounters. We have programmed 8051 using assembly language program (.asm). Infrared (IR) sensors are used which senses the presence of train and conveys the information to 8051. 8051 is programmed accordingly to open or close the gate whenever required.

PROJECT OBJECTIVE

This system is to manage the control system of railway gate using the microcontroller. The main purpose of this system is about railway gate control system and level crossing between railroad and highway for decreasing railroad-related accident and increasing safety

Project Components

Microcontroller Section

- AT89C51 MCU
- 11.0592 MHz Quartz Crystal
- 2 x 33pF Ceramic Capacitor
- 10μF / 16V Electrolytic Capacitor
- 10KΩ Resistors x 2
- AT89C51 Programmer Board
- LED (2)

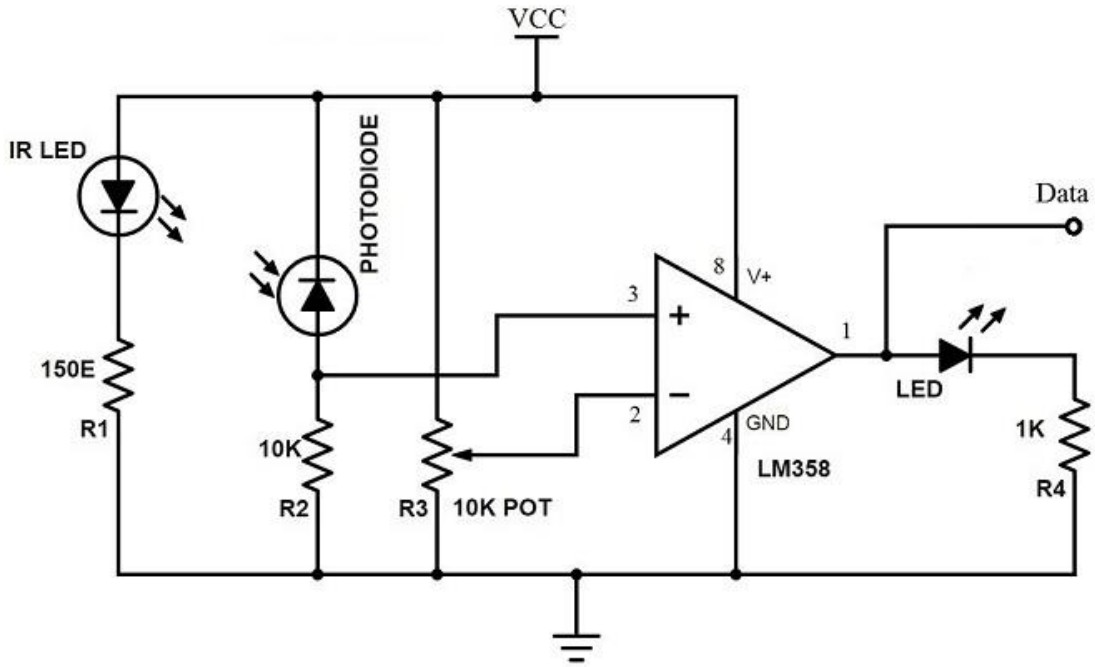
Sensor and Load Section

- 2 x Reflective Type IR Sensor
- 2 x 1KΩ Resistor
- L293D Motor Driver IC
- Motor

Component Description

IR Sensor

- An IR sensor is used in this project to sense the arrival and departure of the train.
- An IR Sensor generally comprises of two components: an IR Transmitter and an IR Receiver. An IR Transmitter is a device that emits IR Rays.
- Similarly, an IR Receiver is a device that detects the IR Rays. Photo Diodes are the most commonly used IR Receivers.
- The following image shows the circuit of IR Sensor used in this project.



L293D Motor Driver

L293D is a motor driver IC used in this project to control the gate motors.With the help of this motor driver IC, we can control two motors at a time with both forward and reverse direction control for individual motors.

Motor drivers are generally used to drive high current drawing devices like DC Motors, stepper motors, high intensity lights, etc. They act as simple current amplifiers as their input is a low current signal usually from a microcontroller and their output is a high current signal to drive the loads.

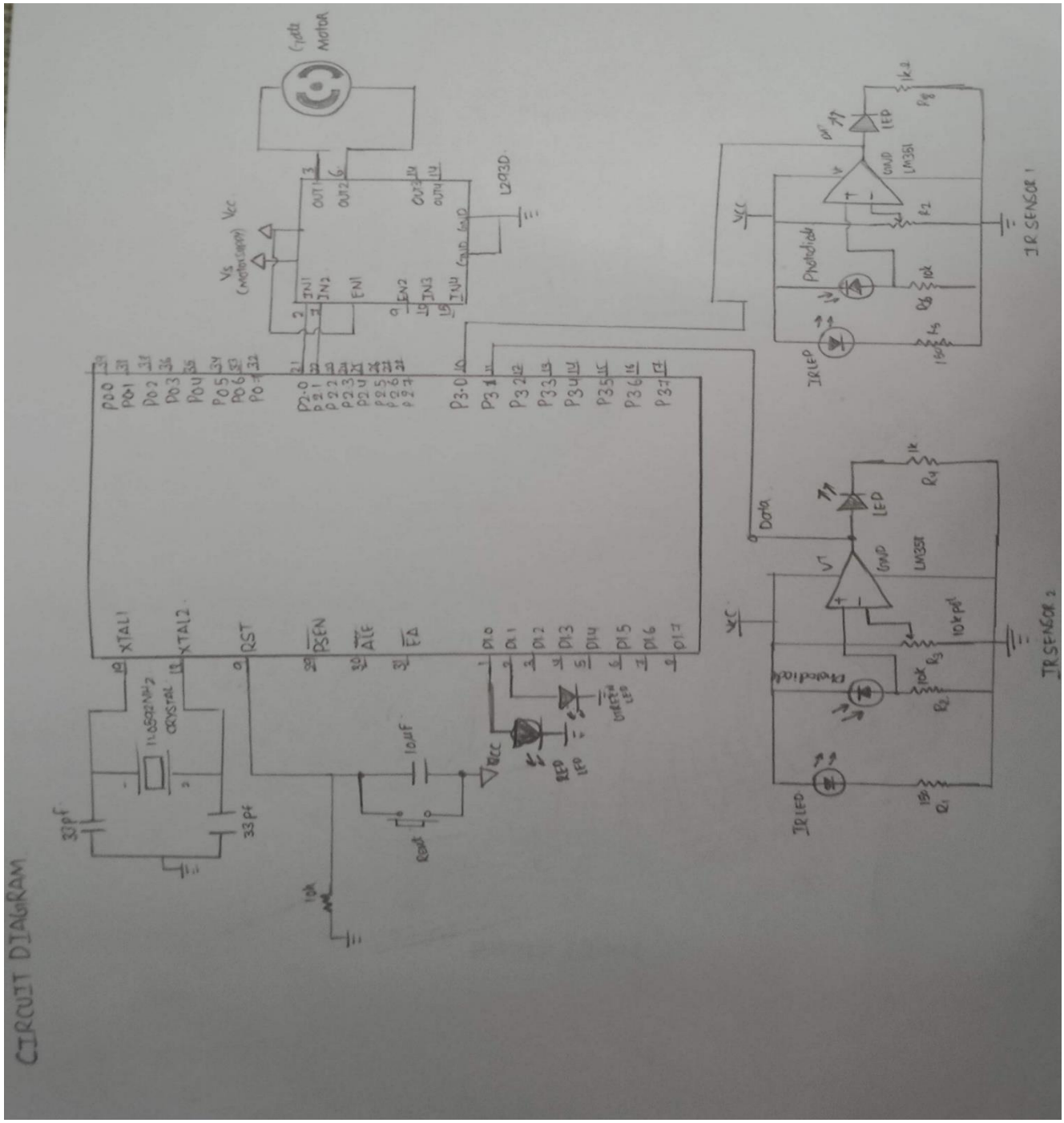
The basic operating mode of an H-bridge is fairly simple if Q1 and Q4 are turned on the left lead of the motor will be connected to the power supply, while the right lead is connected to ground Current starts blowing through the motor which energizes the motor in (let's say) the forward direction and the motor shaft starts spinning.

The function of IN1 and IN2 pins is show below Table

Function of IN1 and IN2 pins

IN1 / P2.0	IN2 / P2.1	Motor Status
Low	Low	Stops
Low	High	Clockwise
High	Low	Anti - Clockwise
High	High	Stop

CIRCUIT DIAGRAM



WORKING:

. Basically the circuit consists of IR LED-Photodiode pairs arranged in such a way that each pair is on either side of the track . When the train cuts the IR Sensor 1, the sensor senses its presence and notifies the 8051 microcontroller by sending an electrical signal. Usually, crossing gates are closed when train interrupts IR sensor 1 and are opened only when the train passes by the IR sensor 2. This is the basic principle of operation but there exists few other possibilities too. All the possibilities are taken under consideration while programming 8051. Various possibilities are as follows

Case 1:

Assuming the length of train is very long, the train cuts IR sensor 1 and gates are closed. Then it travels and interrupts IR sensor 2. Now both IR sensors are being blocked. As train passes further, IR sensor 1 is no longer blocked by the train but IR sensor 2 is still being blocked. Eventually train moves further and IR sensor 2 is no more interrupted and the gates are closed. Therefore, the gates will be opened only when both IR sensors are not blocked.

Case 2:

There is a possibility that train passes IR sensor 1 and waits in between. So in such cases, the gates must remain close and

open only when the train completely passes through IR sensor 2.

Case 3:

There is a possibility that there is only single engine passing through the sensors. When it blocks IR sensor 1 and moves a little further, IR sensor 1 is again unblocked. Now, the engine is somewhere between IR sensors 1 and 2 but both sensors are unblocked. As per case 1, when both IR sensors are open, the gates shall be opened. That logic is very dangerous in this case because the engine is running somewhere between the two sensor pairs but the gates are open. In order to tackle this issue, a new algorithm is designed. In the new algorithm, the gates will be opened only when there is a block-unblock transition in IR sensor 2 equivalent a similar transition in IR sensor 1.

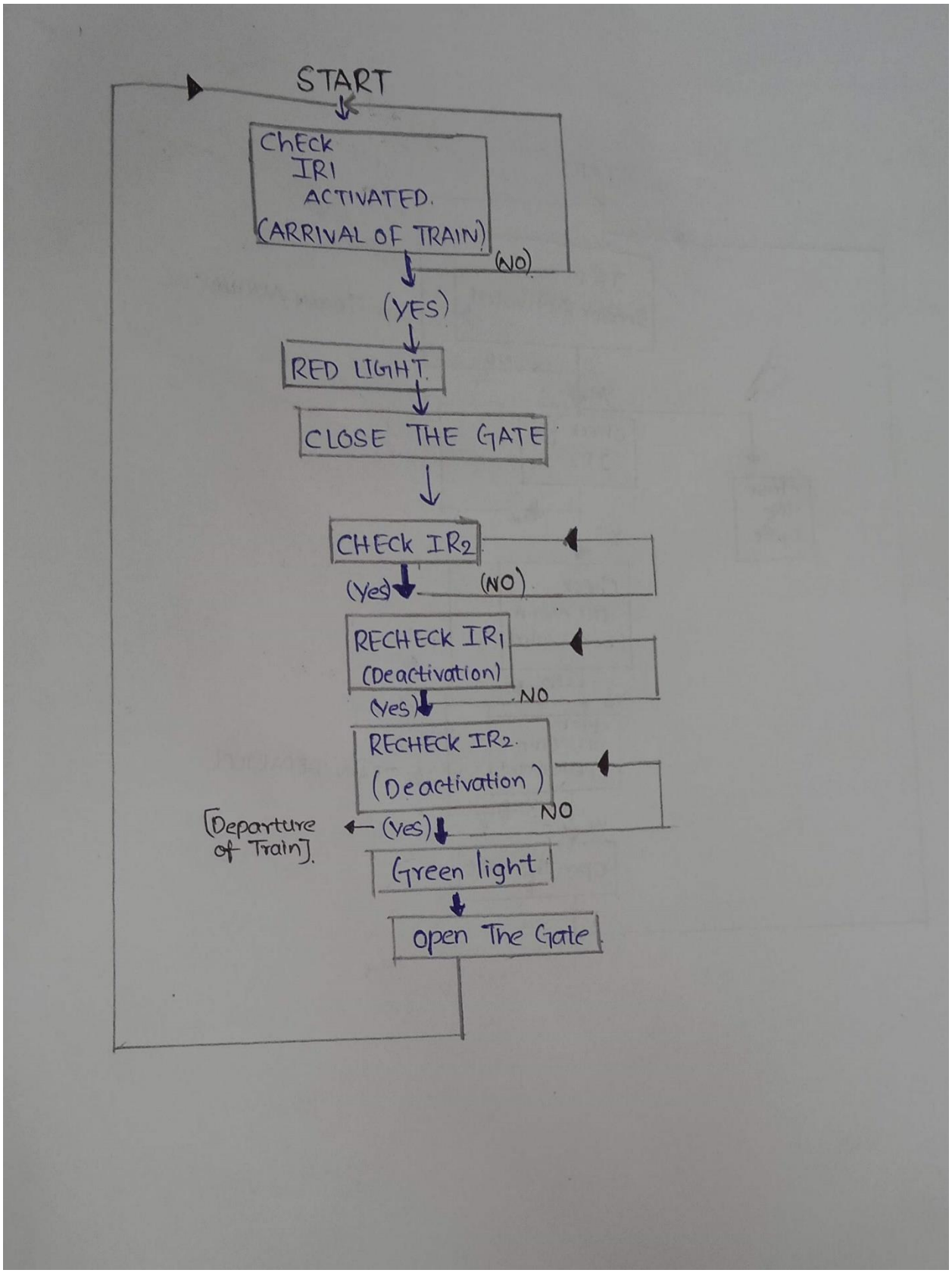
CODE

```
Start: MOV P3, #0FFH        ;      IR connected to Port3. No
block, IR's     output is logic1. (Only for software simulation
purpose)
CLR P2.0                    ;connected to IN1 of L293D
CLR P2.1                    ;connected to IN2 of L293D
CheckIR:
MOV R7, P3                  ;IR (1) read.
MOV A, R7
RRC A
```

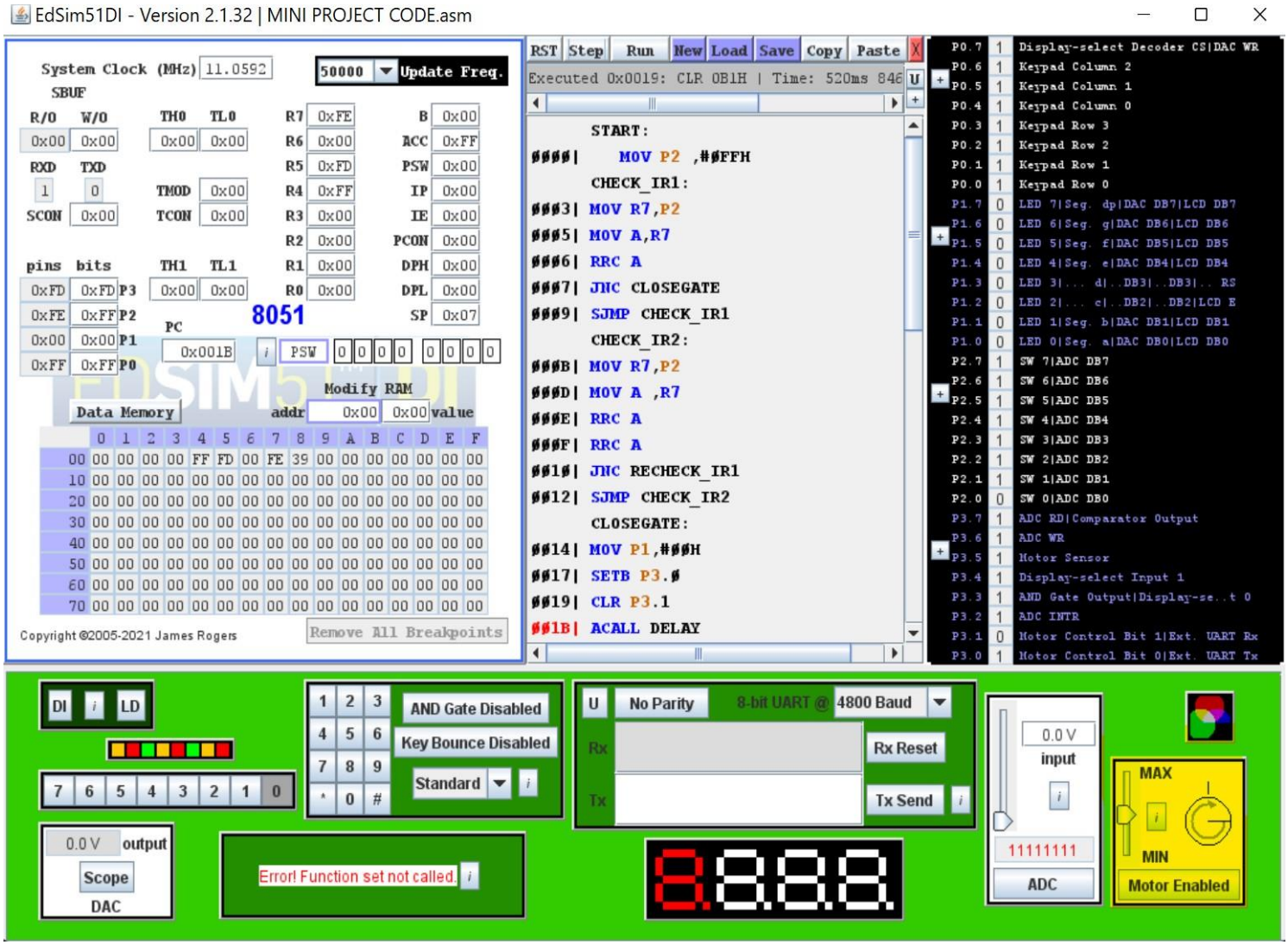
```
JNC MotorForward;              ;Jump when CY=0 i.e. IR is blocked.
SJMP CheckIR
BACK1: MOV R7, P3 ;IR(2) read.
MOV A, R7
RRC A
RRC A
JNC motorReverse_Check_FirstIR
SJMP BACK1
MotorForward:
SETB P1.0
SETB P2.0                      ;This loop closes the gate.
CLR P2.1
ACALL DELAY1
CLR P2.0
SJMP BACK1
MotorReverse_Check_FirstIR:
MOV R5,P3
MOV A,R5
RRC A
JNC MotorReverse_Check_FirstIR    ;Keep looping when IR (1)
                                  is cut. Go down once train crosses IR (1)
SecondIR_Check:
MOV R4,P3                      ;Check IR (2) after making sure that
                               train has crossed IR(1)
```

```
MOV A,R4
RRC A
RRC A
JNC SecondIR_Check   ;Keep looping when IR(2) is cut. Go
 CLR P1.0                          down when train crosses IR(2)
CLR P2.0                        ;This loop opens the gate.
SETB P2.1
ACALL DELAY1
CLR P2.1
SETB P1.1
ACALL DELAY1
CLR P1.1
SJMP Start
DELAY1:MOV R4,#14H              ;Delay program
OneSec:MOV TMOD,#01H
MOV TL0,#0AFH
MOV TH0,#3CH
SETB TR0
WAIT:JNB TF0,WAIT
CLR TR0
CLR TF0
DJNZ R4,OneSec
RET
END
```

FLOW CHART

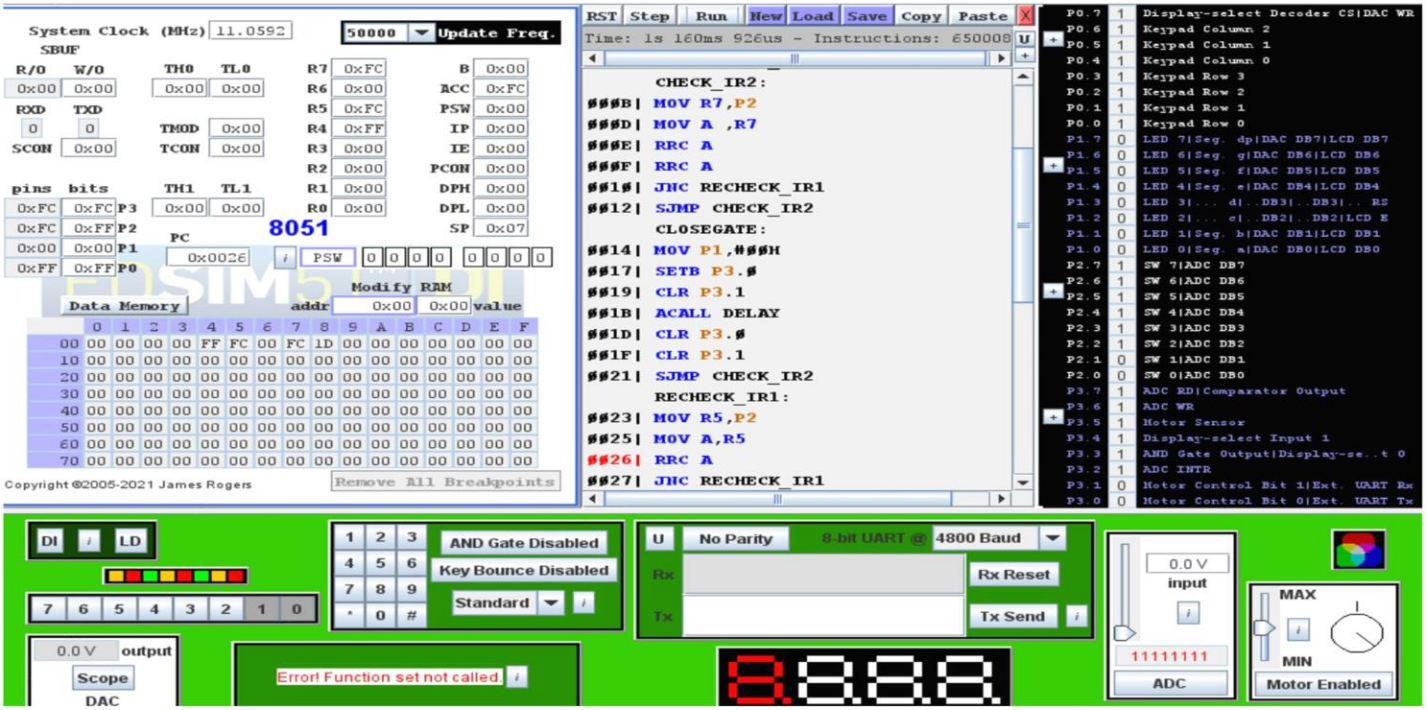

START
CHECK IR1 ACTIVATED. (ARRIVAL OF TRAIN)
(NO)
(YES)
RED LIGHT
CLOSE THE GATE
CHECK IR2
(Yes)
(NO)
RECHECK IR1 (Deactivation)
(Yes)
NO
RECHECK IR2. (Deactivation)
NO
[Departure of Train].
(Yes)
Green light
open The Gate

EDSIM51 SIMULATIONS

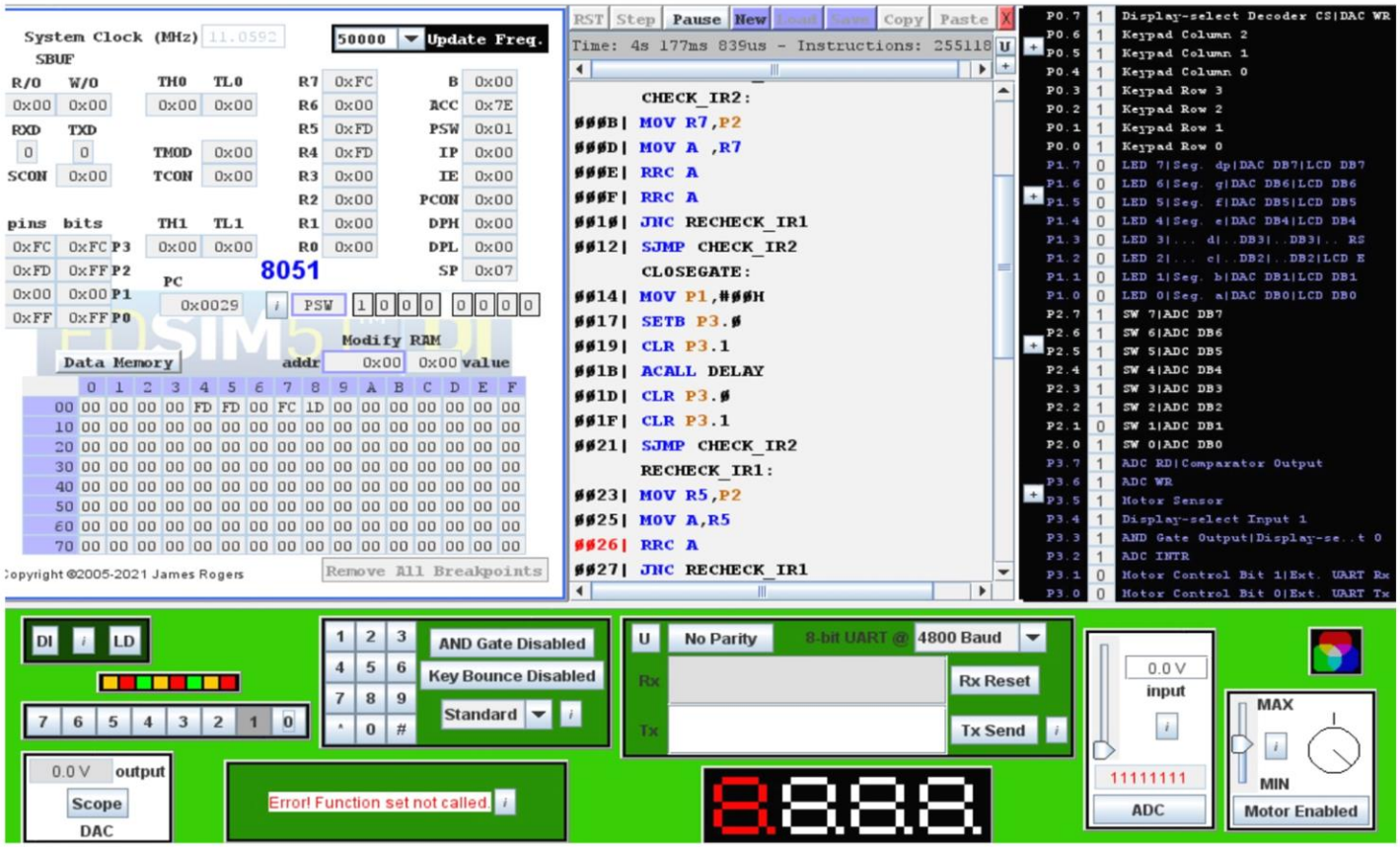


IR sensor 1 detected the train .so the gate is closed with the help of the motor.

2)

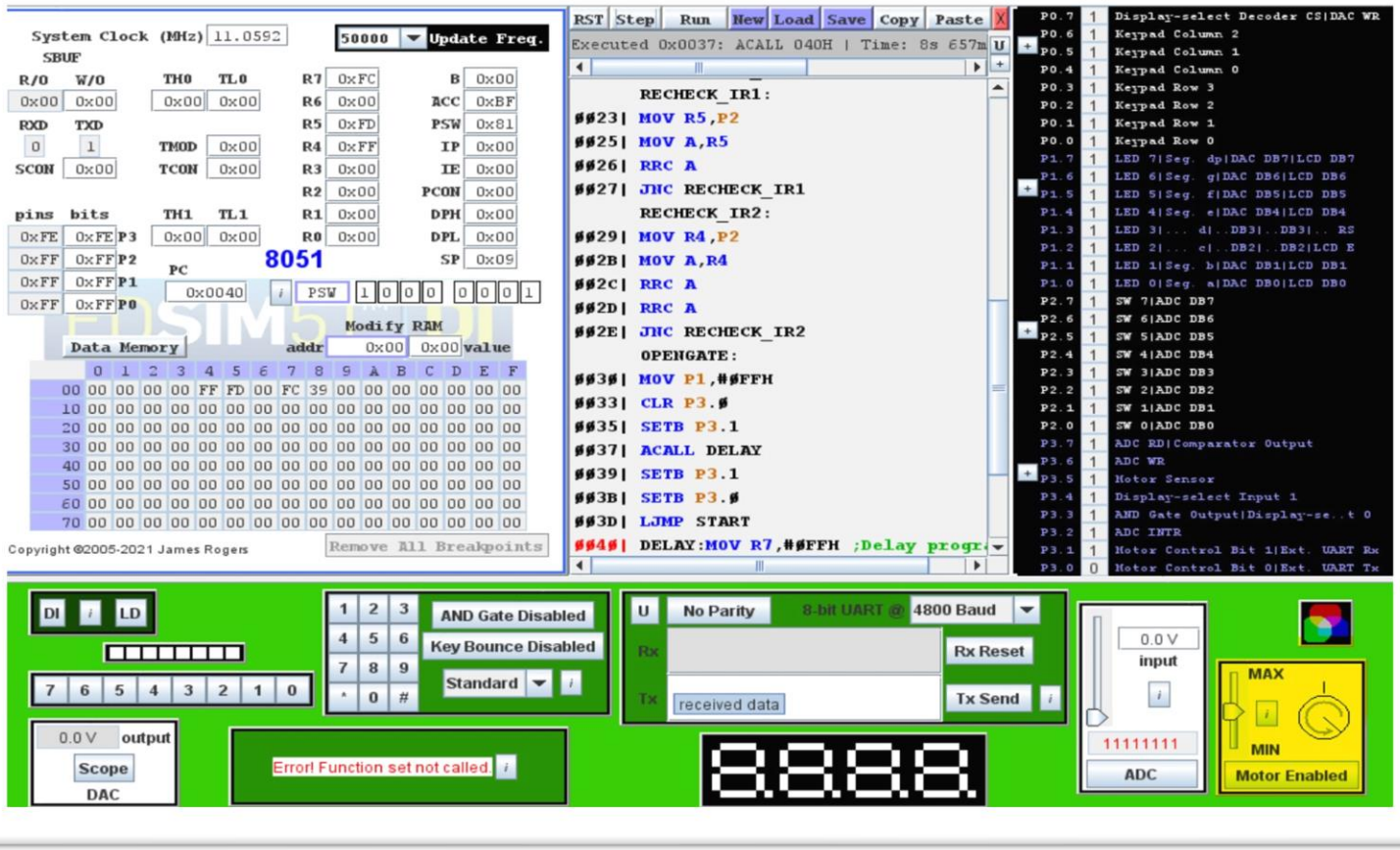

System Clock (MHz) 11.0592
50000 Update Freq.
8051
Data Memory
Modify RAM
Copyright ©2005-2021 James Rogers
Remove All Breakpoints
RST Step Run New Load Save Copy Paste
Time: 1s 160ms 926us - Instructions: 650008
CHECK_IR2:
MOV R7,P2
MOV A ,R7
RRC A
RRC A
JNC RECHECK_IR1
SJMP CHECK_IR2
CLOSEGATE:
MOV P1,#00H
SETB P3.0
CLR P3.1
ACALL DELAY
CLR P3.0
CLR P3.1
SJMP CHECK_IR2
RECHECK_IR1:
MOV R5,P2
MOV A,R5
RRC A
JNC RECHECK_IR1
Display-select Decoder CS|DAC WR
Keypad Column 2
Keypad Column 1
Keypad Column 0
Keypad Row 3
Keypad Row 2
Keypad Row 1
Keypad Row 0
LED 7|Seg. dp|DAC DB7|LCD DB7
LED 6|Seg. g|DAC DB6|LCD DB6
LED 5|Seg. f|DAC DB5|LCD DB5
LED 4|Seg. e|DAC DB4|LCD DB4
LED 3|... d|..DB3|..DB3|.. RS
LED 2|... e|..DB2|..DB2|LCD E
LED 1|Seg. b|DAC DB1|LCD DB1
LED 0|Seg. a|DAC DB0|LCD DB0
SW 7|ADC DB7
SW 6|ADC DB6
SW 5|ADC DB5
SW 4|ADC DB4
SW 3|ADC DB3
SW 2|ADC DB2
SW 1|ADC DB1
SW 0|ADC DB0
ADC RD|Comparator Output
ADC WR
Motor Sensor
Display-select Input 1
AND Gate Output|Display-se..t 0
ADC INTR
Motor Control Bit 1|Ext. UART Rx
Motor Control Bit 0|Ext. UART Tx
AND Gate Disabled
Key Bounce Disabled
Standard
No Parity
8-bit UART @ 4800 Baud
Rx Reset
Tx Send
0.0 V input
11111111
ADC
MAX
MIN
Motor Enabled
0.0 V output
Scope
DAC
Error! Function set not called.

3)


System Clock (MHz) 11.0592
50000 Update Freq.
8051
Data Memory
Modify RAM
Copyright ©2005-2021 James Rogers
Remove All Breakpoints
RST Step Pause New Load Save Copy Paste
Time: 4s 177ms 839us - Instructions: 255118
CHECK_IR2:
MOV R7,P2
MOV A ,R7
RRC A
RRC A
JNC RECHECK_IR1
SJMP CHECK_IR2
CLOSEGATE:
MOV P1,#00H
SETB P3.0
CLR P3.1
ACALL DELAY
CLR P3.0
CLR P3.1
SJMP CHECK_IR2
RECHECK_IR1:
MOV R5,P2
MOV A,R5
RRC A
JNC RECHECK_IR1
Display-select Decoder CS|DAC WR
Keypad Column 2
Keypad Column 1
Keypad Column 0
Keypad Row 3
Keypad Row 2
Keypad Row 1
Keypad Row 0
LED 7|Seg. dp|DAC DB7|LCD DB7
LED 6|Seg. g|DAC DB6|LCD DB6
LED 5|Seg. f|DAC DB5|LCD DB5
LED 4|Seg. e|DAC DB4|LCD DB4
LED 3|... d|..DB3|..DB3|.. RS
LED 2|... e|..DB2|..DB2|LCD E
LED 1|Seg. b|DAC DB1|LCD DB1
LED 0|Seg. a|DAC DB0|LCD DB0
SW 7|ADC DB7
SW 6|ADC DB6
SW 5|ADC DB5
SW 4|ADC DB4
SW 3|ADC DB3
SW 2|ADC DB2
SW 1|ADC DB1
SW 0|ADC DB0
ADC RD|Comparator Output
ADC WR
Motor Sensor
Display-select Input 1
AND Gate Output|Display-se..t 0
ADC INTR
Motor Control Bit 1|Ext. UART Rx
Motor Control Bit 0|Ext. UART Tx
AND Gate Disabled
Key Bounce Disabled
Standard
No Parity
8-bit UART @ 4800 Baud
Rx Reset
Tx Send
0.0 V input
11111111
ADC
MAX
MIN
Motor Enabled
0.0 V output
Scope
DAC
Error! Function set not called.

2) IR SENSOR 2 has detected the train .the gate should not be opened now because we have to confirm that train has completely left.

3)ir sensor 1 is unblocked .



4) ir sensor 2 is unblocked ,we have ensured that train has completely left .so,the gate is opened.

INFERENCE:

Designed an automatic railway gate control system which automatically controls the gate on arrival and departure of train .

ADVANTAGES:

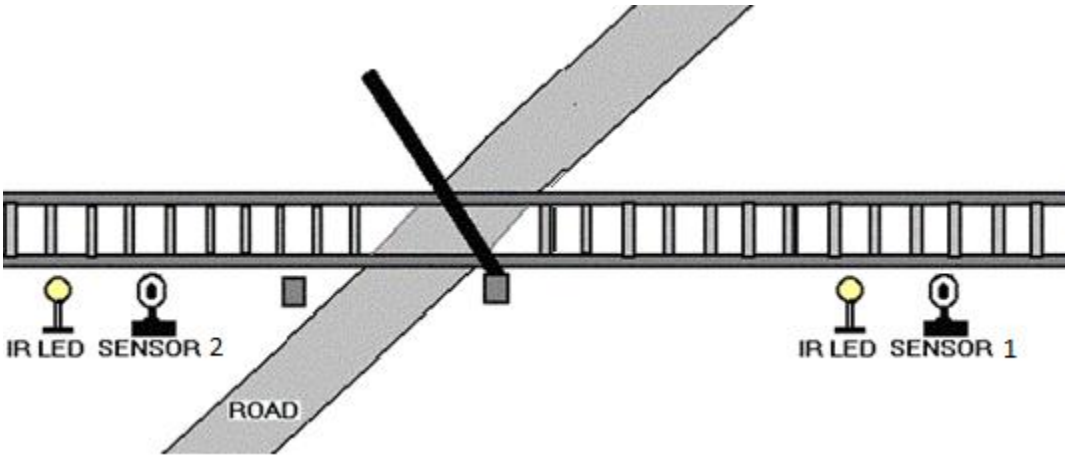
1.Reduces chances of human error

2.less time consuming

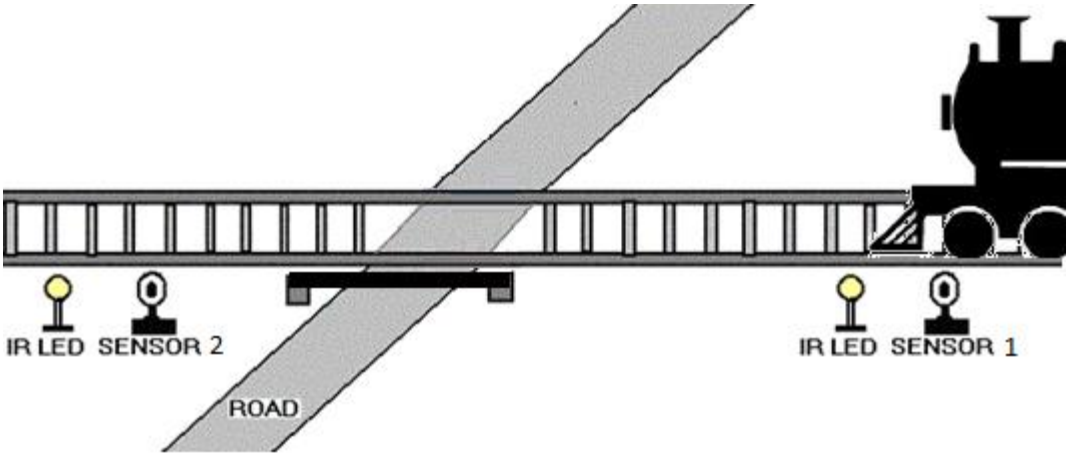
Limitations

- The system can be implemented more efficiently by incorporating more efficient sensor network.

- SCHEMATIC DIAGRAM



- If the sensor 1 detects the arrival of the train, microcontroller starts the motor with the help of motor driver in order to close the gate.



- The gate remains closed as the train passes the crossing.

- When the train crosses the gate and reaches second sensor, it detects the train and the microcontroller will open the gate.