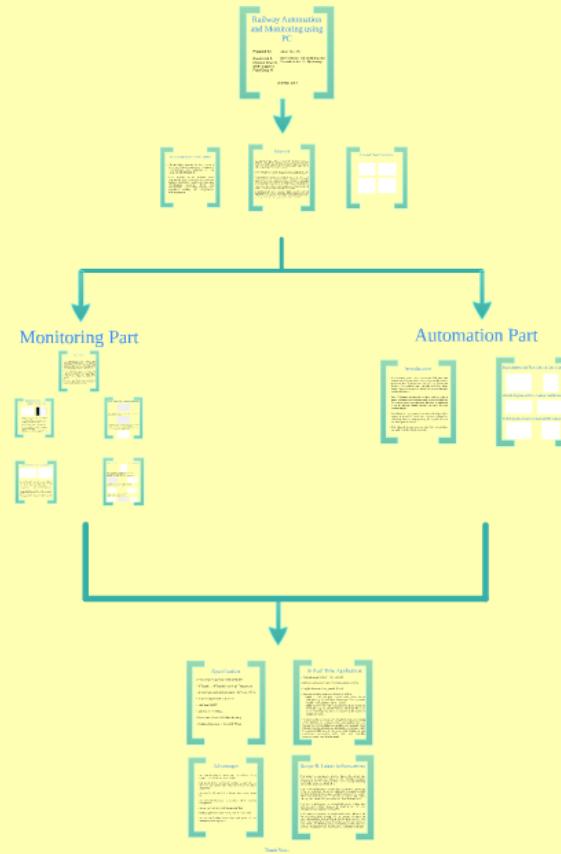
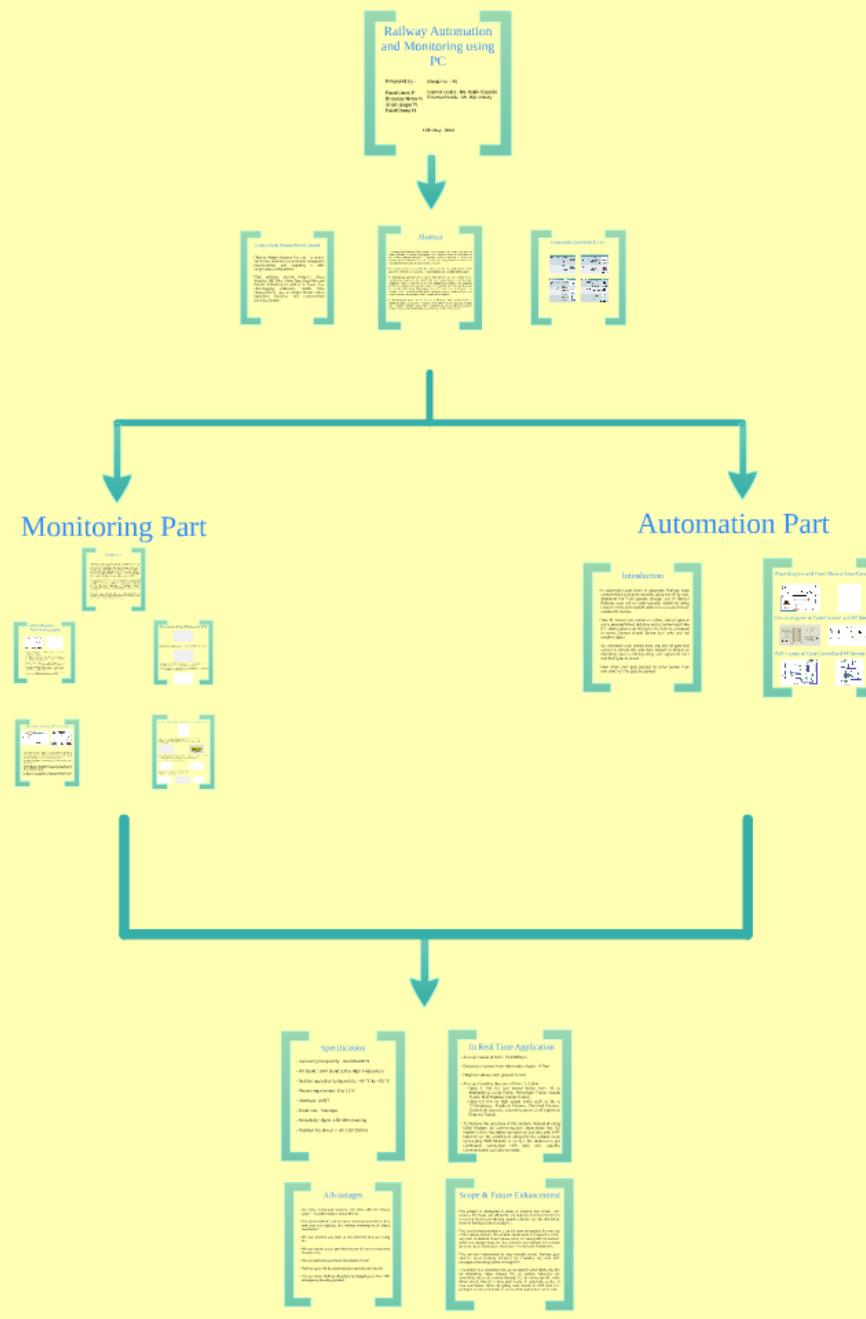


Railway Automation and Monitoring using PC



Railway Automation and Monitoring using PC



Thank You..

Railway Automation and Monitoring using PC

Prepared by:- Group No :- 45

Patel Urmil P. Internal Guide:- Mr. Naitik Kapadia
Bhavsar Nirav N. External Guide:- Mr. Biju Antony
Shah Sagar N.
Patel Deep H.

13th May 2014

13th May 2014



Techno Weigh Systems Private Limited

- "Techno Weigh Systems Pvt. Ltd.", is one of the trusted business organizations engaged in manufacturing and supplying a wide range Industrial Equipment.
- Their products are Net Weigher, Gross Weigher, IBC Filler, Valve Type Bag Filler and Robotic Palletizing. In addition to these, they offer Bagging Automatic, Solids Flow Measurement, Loss In Weight Feeder, Micro Ingredient Batching and Computerized Batching System.

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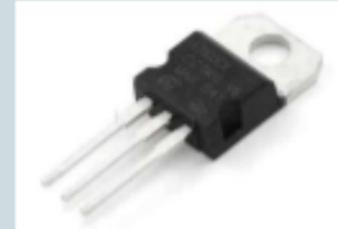
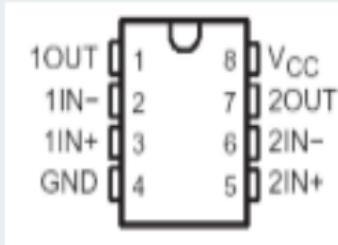
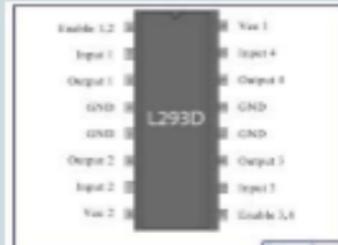
Components	Manufacture	Description	Figure & Use
P89V51RD2 Microcontroller	Philips	<ul style="list-style-type: none"> 8051 based 8-bit CMOS controller 22 I/O pins 3 Timer/Counters 64K Bytes ISP FLASH 1024 Bytes RAM 4 Byte I/O Ports 	 <p>Use: Gate Control</p>
ARM7 LPC 2148	Philips	<ul style="list-style-type: none"> 84-pin Low Power Microcontroller Flash Program Memory: 512KB On-chip static RAM: 40 KB I/O Pins: 45 Two 10-bit ADC's provide a total of 14 analog inputs Single 10 bit DAC provides variable analog output Timers: Two 32 bit 	 <p>Use: Train Control Unit</p>

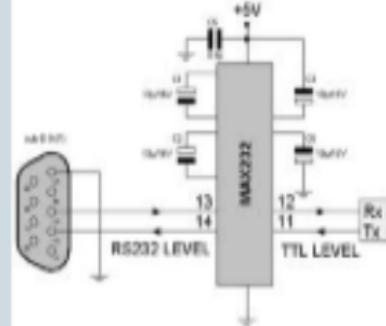
Components	Manufacture	Description	Figure & Use
GPS Receiver with Patch Antenna	Cirocomm	<ul style="list-style-type: none"> Single 5VDC supply TTL synchronous serial interface Data output Baud rate: 9600 bps High Sensitivity: Up to 150 dBm Position Accuracy: \leq 3m CEP 	 <p>Use: For Getting Position of Train</p>
GSM/GPRS RS232 Modem-SIM900A	SIMCom	<ul style="list-style-type: none"> Dual-Band GSM/GPRS: 900/1800 MHz Includes Powerful TCP/IP protocol stack for internet data transfer over GPRS. Input Voltage: 3V-12V DC. Operation temperature: -40°C to +65 °C 	 <p>Use: For Communicating From PC to Train unit</p>

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LM7805 Voltage Regulator	Fairchild Semiconductor	<ul style="list-style-type: none"> It gives out well regulated +5V output, output current capability of 100mA. Built-in overheat protection shuts down output when regulator IC gets too hot. 	 <p>Use: To regulate 5V DC</p>
LM358 Comparator	Fairchild Semiconductor	<ul style="list-style-type: none"> LM358 has two built-in comparators They are operated from a single power supply voltage. It is a device that compares two voltages or current and outputs a digital signal indicating which is larger. Max Rating: 2V to 36V 	 <p>Use: IR sensors</p>
L293D H-Bridge	Texas Instruments	<ul style="list-style-type: none"> An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. It allows DC motors to run forwards and backwards. 	 <p>Use: For controlling motor of Train & Gate Control</p>

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Stepper Motor	Omega Engineering	<ul style="list-style-type: none"> It is a brushless DC electric motor that divides a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor. 	 <p>Use: In Track Change and Gate Control</p>
DC Motor	Omega Engineering	<ul style="list-style-type: none"> 10000PM 12V DC motors with Gearbox 20gsm torque No-load Current = 60 mA(Max) Load current = 300 mA(Max) 	 <p>Use: For driving Train</p>
RS-232 Serial Cable & MAX232 IC	Texas Instruments	<ul style="list-style-type: none"> The MAX232 IC converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. 	 <p>Use: For programming purpose from PC to Microcontroller</p>

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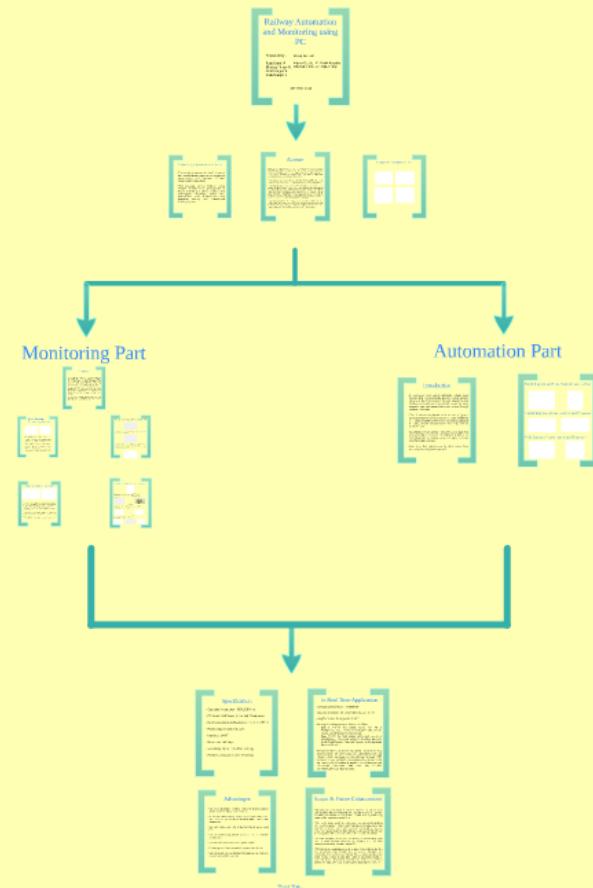
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Railway Automation and Monitoring using PC



Monitoring Part

Introduction

In Monitoring part to implement the task of controlling train we have created a Visual Basic application on PC. This application will show complete graphical User interface having visual buttons to control train and will also show the location of train which is seen by GPS Module located on train unit. So when the user presses any button from VB application, some message (SMS) will be sent to train unit via GSM module connected with PC.

On receiving SMS (Train Unit) the microcontroller used is 89C52 which has two serial port one serial port GSM module is connected for receiving message which is send from the PC side, and depending on message received, microcontroller will decide what parameters of train are to be controlled.

On second serial port GPS Module is connected which will receive the location of train and that location is send to PC side by GSM module connected on first serial port.

Block Diagram: Transmitting Section



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- A VB Application is created on PC which will show complete graphical User interface having controls like Starting of Train, Stopping of Train, Speeding up of Train, Slowing down of Train.
- With the help of this GUI we can control train using parameter by sending SMS, and can also see the location of train via Google Map.
- So whenever any button like Start is pressed, some message is send to train unit and depending on code written for that message in Microcontroller, train will start.
- Similarly Speed of train is controlled by sending specific message depending on the number will be inserted in text box of Set Speed.

Train Controlling GUI Created in VB

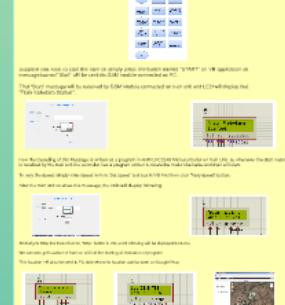


Receiver Section (Train unit)



- Step of the location of the train is captured by GPS module connected on one serial port which will then be decoded by microcontroller and coordinates and that coordinates will be displayed on LCD and will also be send to PC by GSM module connected on other serial port.
- Then GSM module will receive the message transmitted by GSM module connected to PC.
- LPC7148 will decode that message and according to the program written in it it will generate control signals, and send it to Motor driver (L293D) for driving motor at desired speed.
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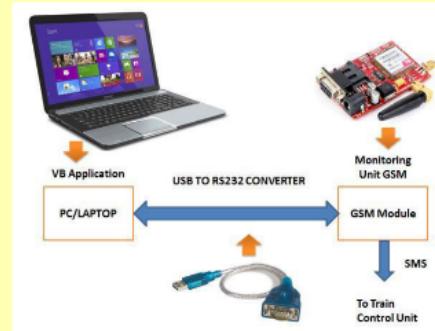
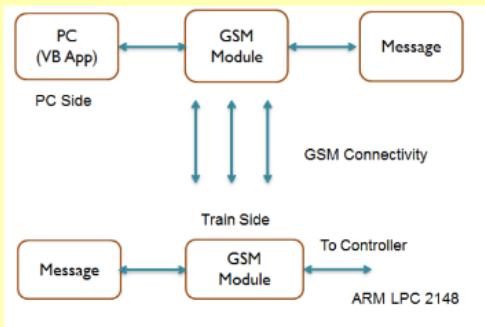
Explaining Concept of both Transmitting and Receiving Section



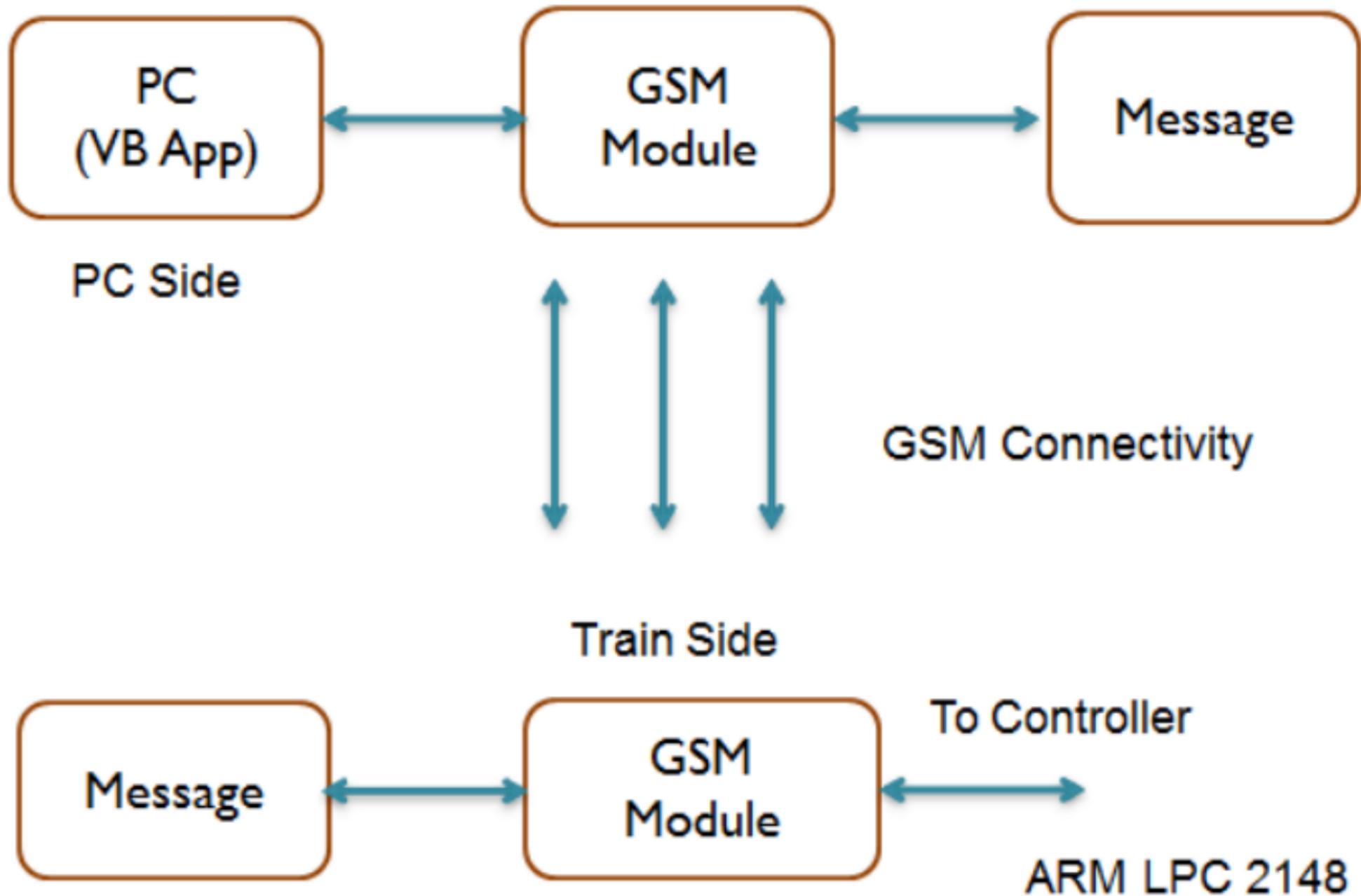
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VB Application

USB TO RS232 CONVERTER

PC/LAPTOP

Monitoring
Unit GSM

GSM Module

SMS

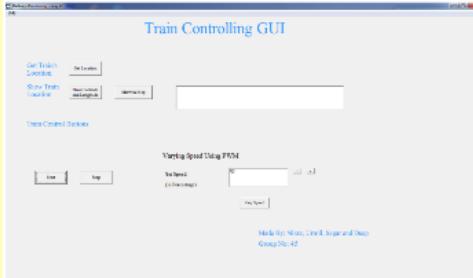


To Train
Control Unit



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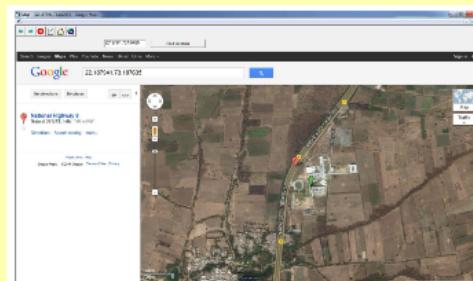


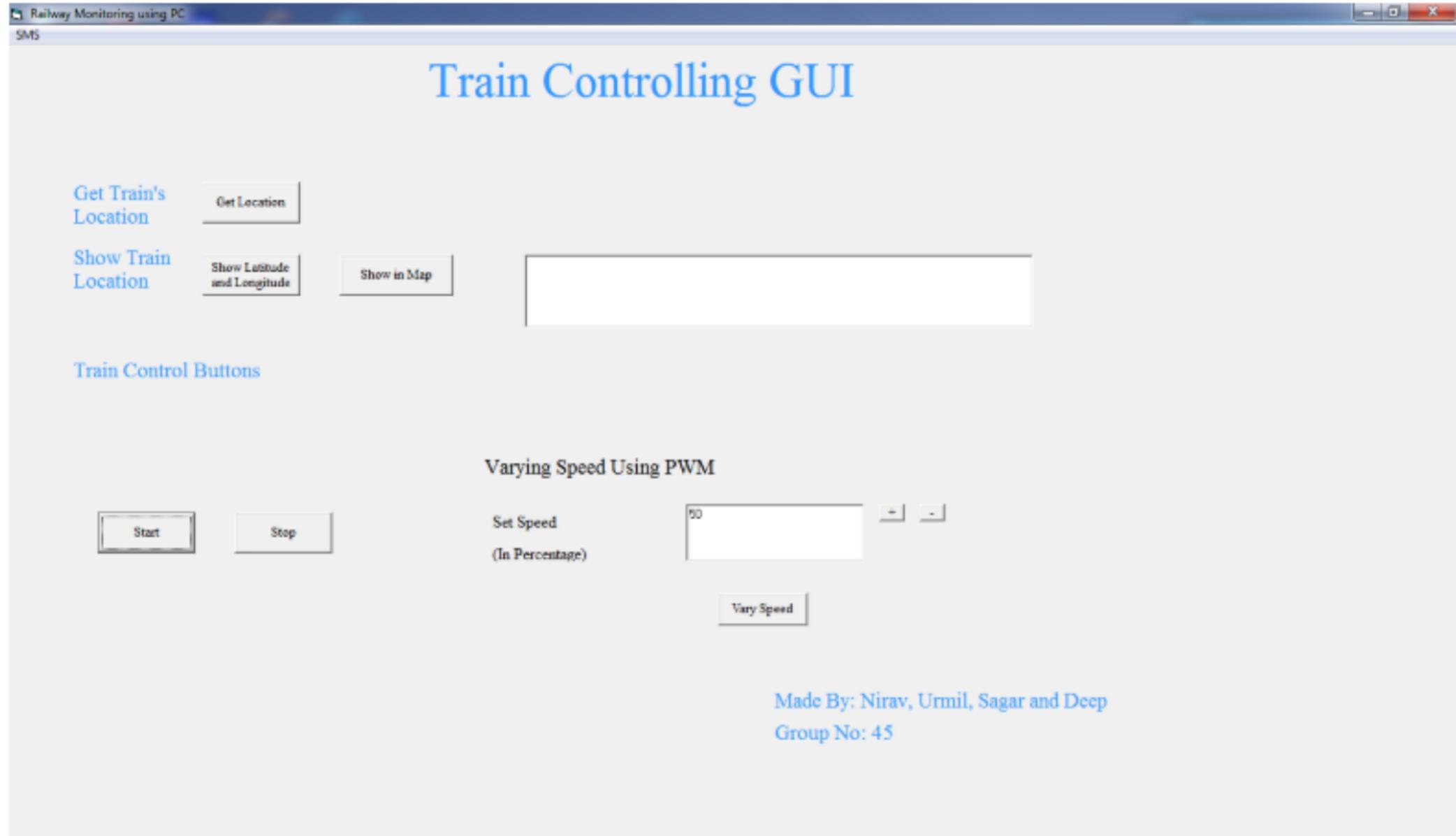
So, whenever any control button is pressed some message is send via GSM module connected through Serial port using AT Commands.



The message that was send by GSM module will be received by another GSM module on train unit and depending on message received Train is controlled.

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Train Controlling GUI

Get Train's
Location

[Get Location](#)

Show Train
Location

[Show Latitude
and Longitude](#)

[Show in Map](#)



Train Control Buttons

[Start](#)

[Stop](#)

Varying Speed Us

Set Speed
(In Percentage)



[Vary Speed](#)

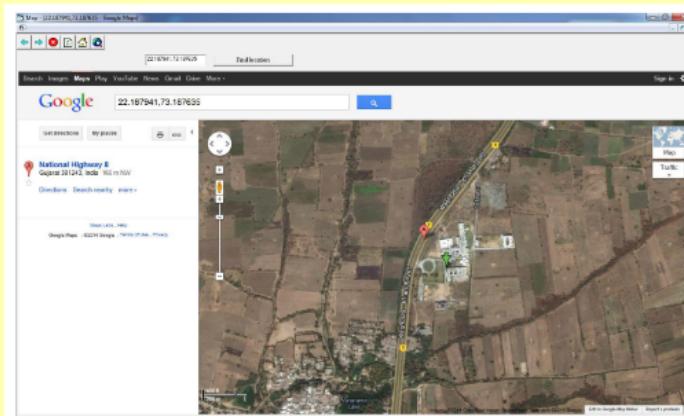
Made By: Nirav, Urmil, Sagar and Deep
Group No: 45

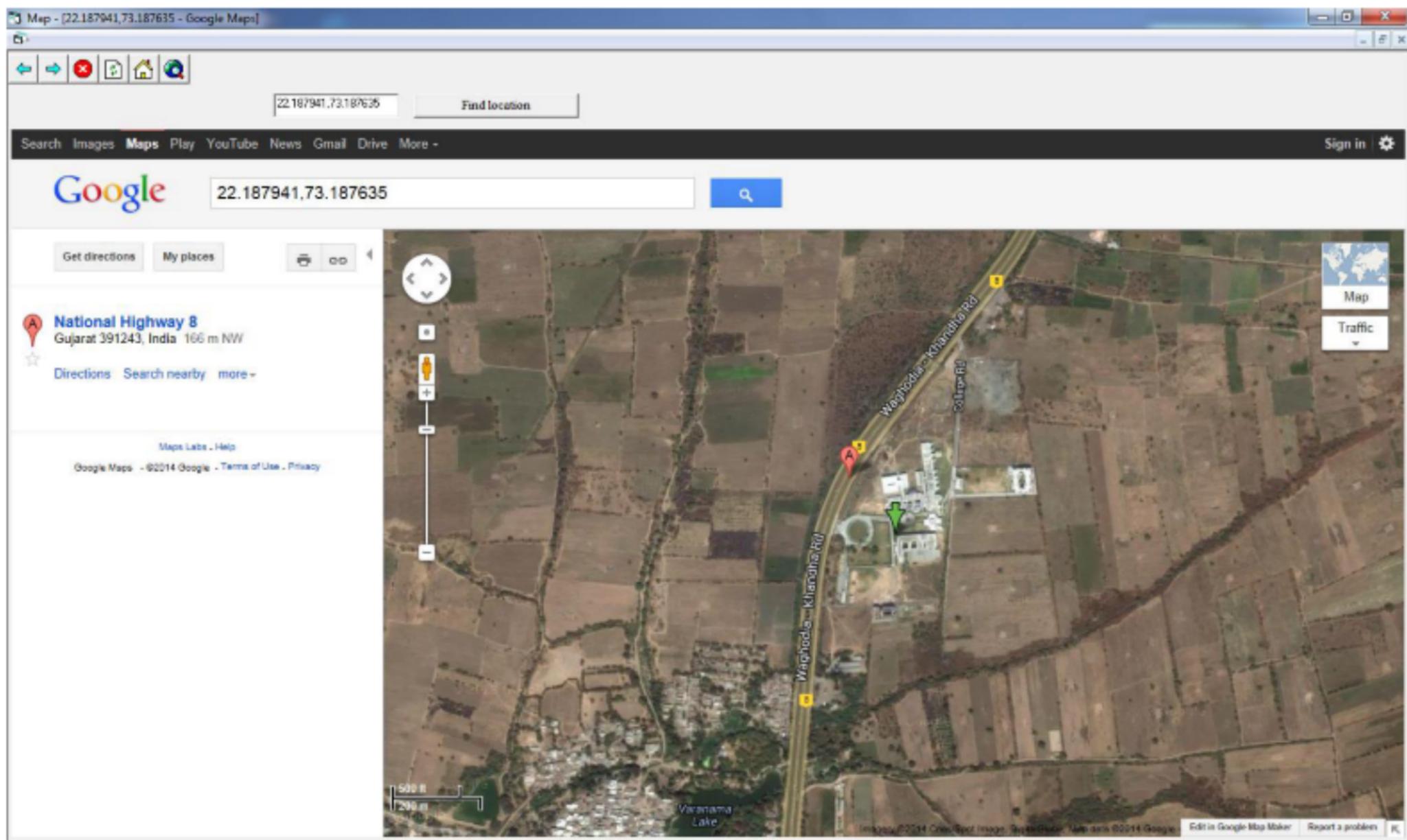
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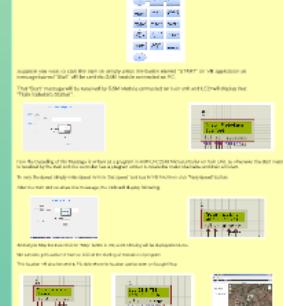


Receiver Section (Train unit)

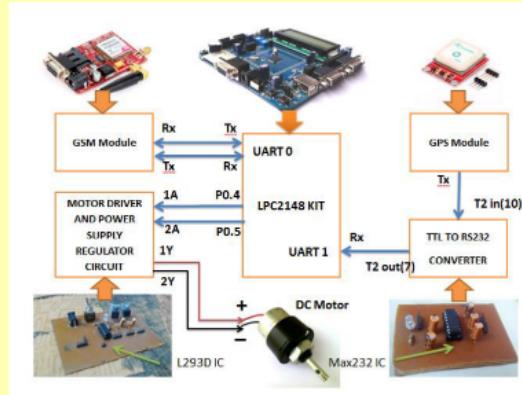
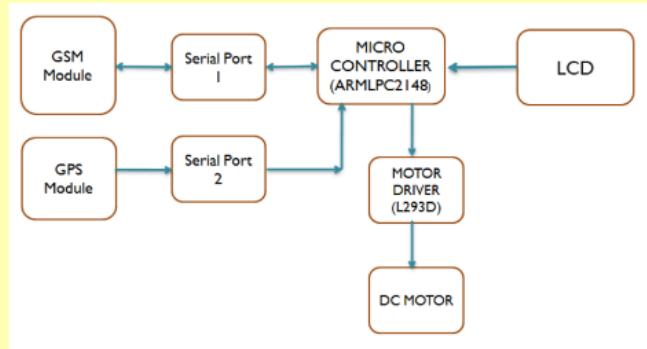


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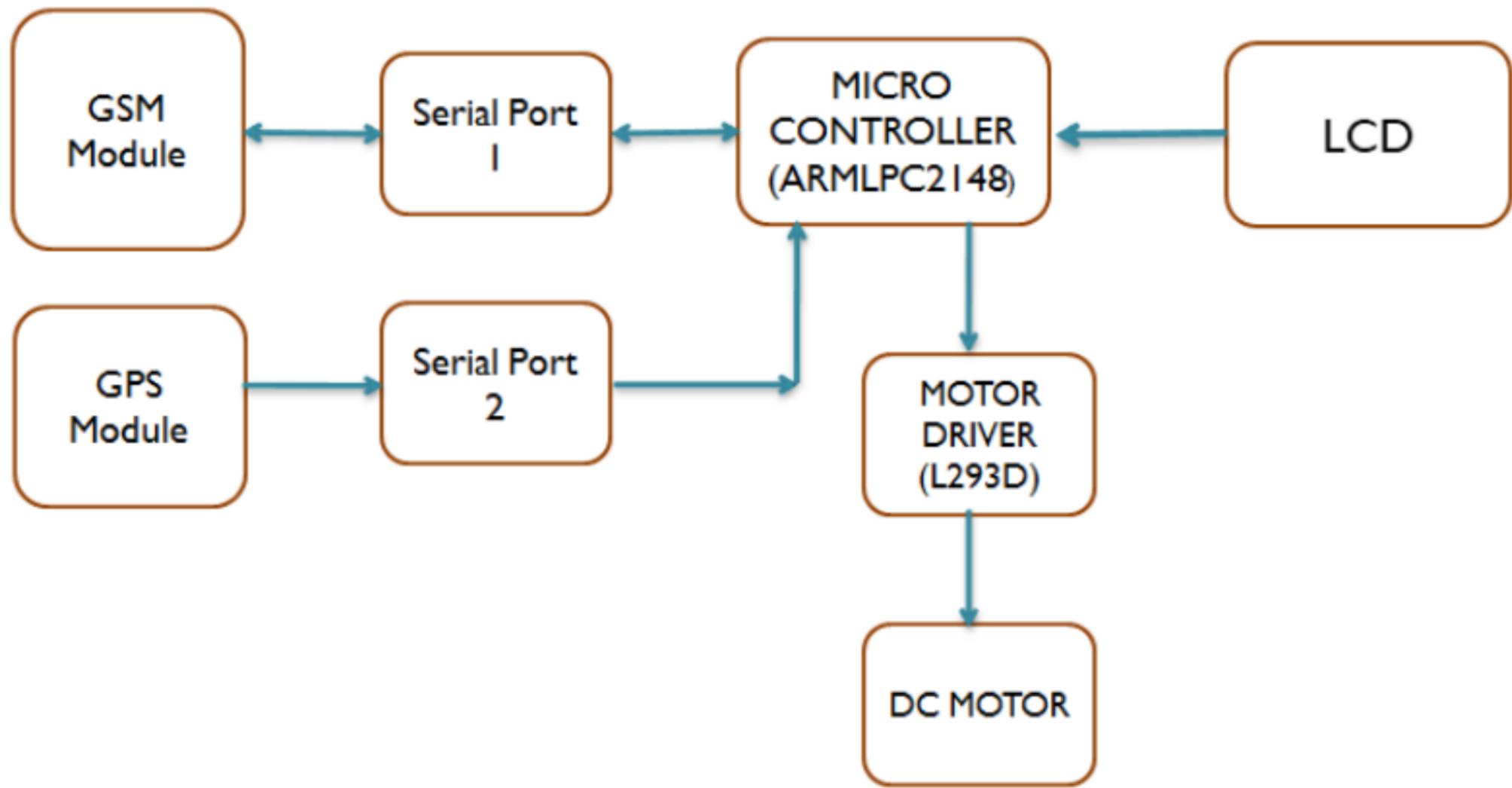
Explaining Concept of both Transmitting and Receiving Section

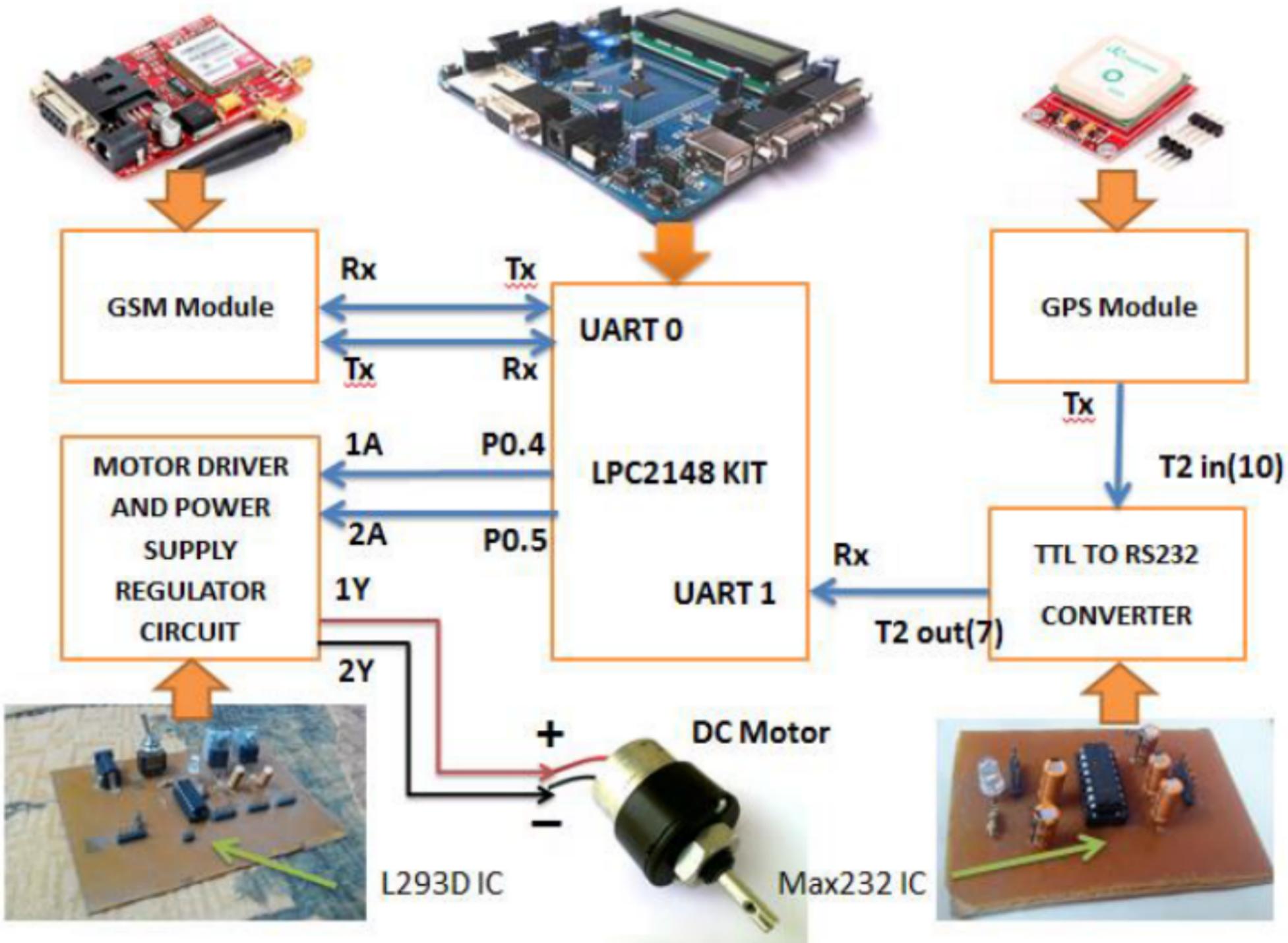


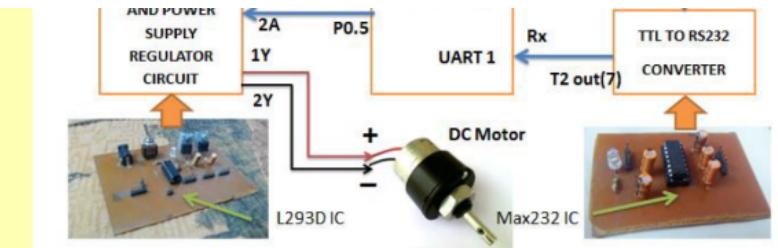
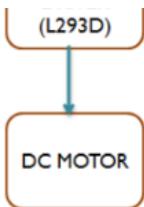
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Explaining Concept of both Transmitting and Receiving Section



Suppose you want to start the train so simply press the button named "START" on VB application so message named "Start" will be sent via GSM module connected on PC.

That "Start" message will be received by GSM Module connected on train unit and LCD will display that "Train Vadodara Started".



Now the Decoding of this Message is written as a program in ARM LPC2148 Microcontroller on train Unit, so whenever the start message is received by the train unit the controller has a program written to rotate the motor clockwise and train will start.

To vary the speed simply write speed in % in 'Set speed' text box in VB And then click "Vary speed" button.

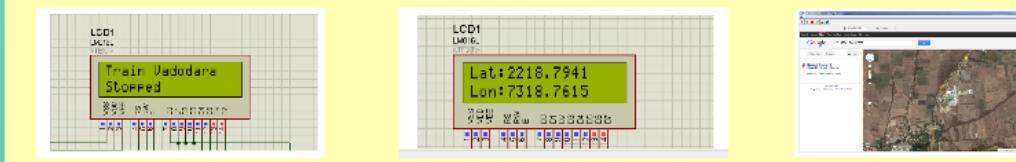
After the train unit receives this message, the LCD will display following:



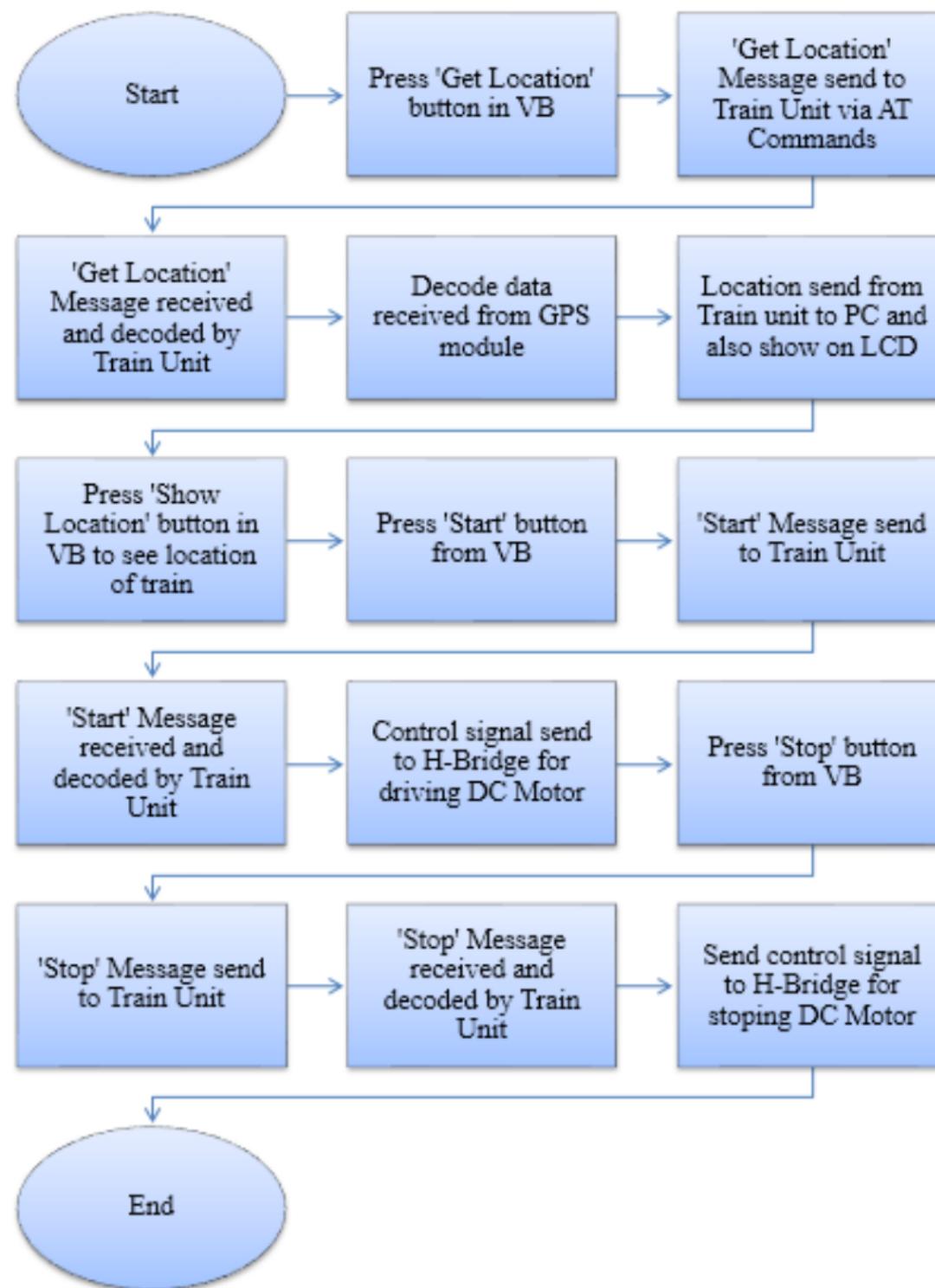
Similarly to Stop the train Click on "Stop" button in VB, and Following will be displayed on LCD.

We can also get location of train on LCD at the starting of execution of program

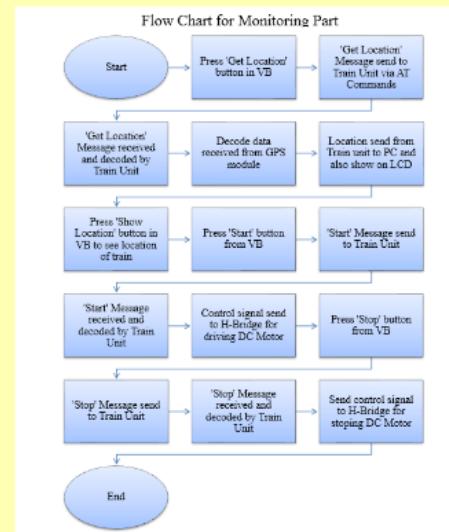
This location will also be send to PC side where its location can be seen on Google Map.



Flow Chart for Monitoring Part

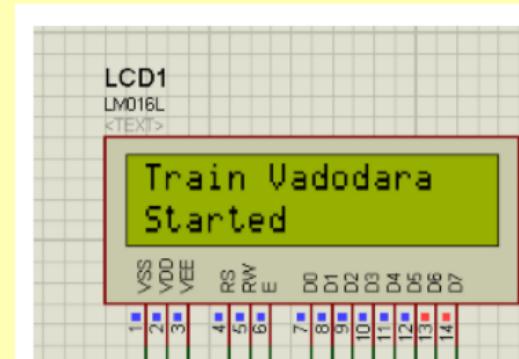
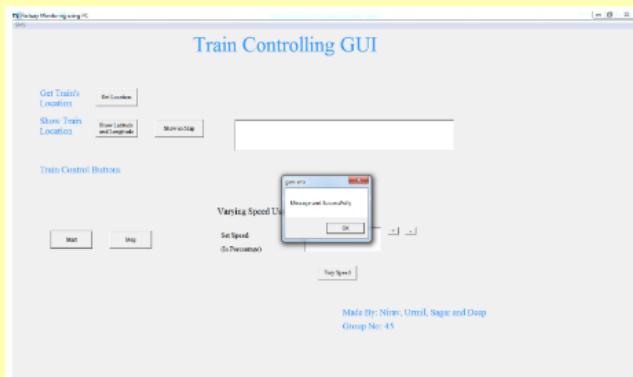


Explaining Concept of both Transmitting and Receiving System



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Get Location

Show Train
Location

Show Latitude
and Longitude

Show in Map



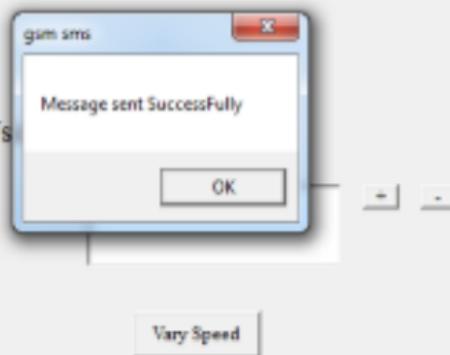
Train Control Buttons

Start

Stop

Varying Speed Us

Set Speed
(In Percentage)



Vary Speed

Made By: Nirav, Urmil, Sagar and Deep
Group No: 45

LCD1

LM016L

<TEXT>

Train Vadodara
Started

VSS
>YDD

YEE
RS

RWY

w

00 01 02 03 04 05 06 07

1 2 3

4 5 6

7 8 9

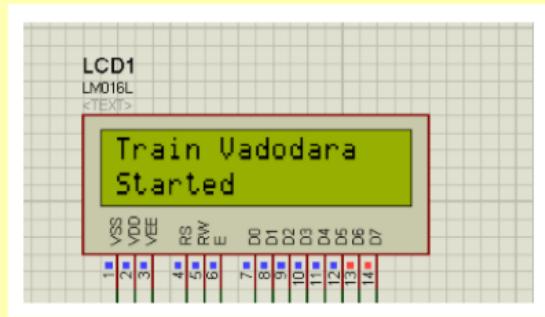
10 11

12 13

14

Suppose you want to start the train so simply press the button named “START” on VB application so message named “Start” will be sent via GSM module connected on PC.

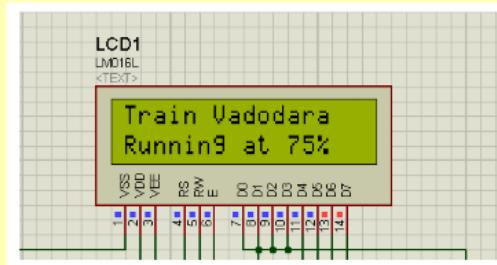
That “Start” message will be received by GSM Module connected on train unit and LCD will display that “Train Vadodara Started”.



Now the Decoding of this Message is written as a program in ARM LPC2148 Microcontroller on train Unit, so whenever the start message is received by the train unit the controller has a program written to rotate the motor clockwise and train will start.

To vary the speed simply write speed in % in ‘Set speed’ text box in VB And then click “Vary speed” button.

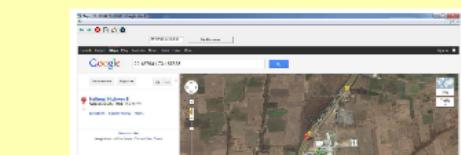
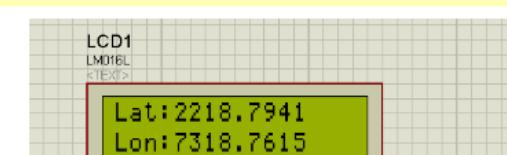
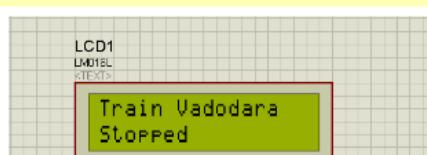
After the train unit receives this message, the LCD will display following:



Similarly to Stop the train Click on “Stop” button in VB, and Following will be displayed on LCD.

We can also get location of train on LCD at the starting of execution of program

This location will also be send to PC side where its location can be seen on Google Map.



Train Controlling GUI

Get Train's
Location

[Get Location](#)

Show Train
Location

[Show Latitude
and Longitude](#)

[Show in Map](#)



Train Control Buttons

[Start](#)

[Stop](#)

Varying Speed Using PWM

Set Speed

(In Percentage)

75

[+]

[-]

[Vary Speed](#)

Made By: Nirav, Urmil, Sagar and Deep
Group No: 45



Final Files

Report_Final.docx

Report.docx [Co...]

DocPad - D:\DO...

Railway Monitori...

3:56 PM
23-Apr-14

LCD1

LM016L

<TEXT>

Train Vadodara
Running at 75%

VSS VDD VEE RS RW E D0 D1 D2 D3 D4 D5 D6 D7

1 2 3 4 5 6 7 8 9 10 11 12 13 14

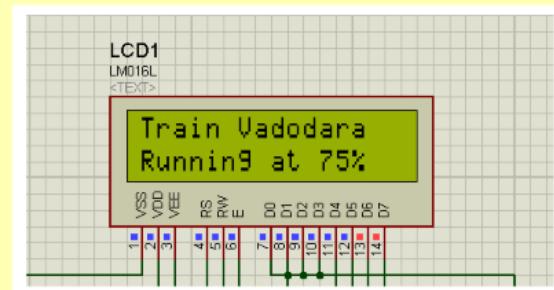
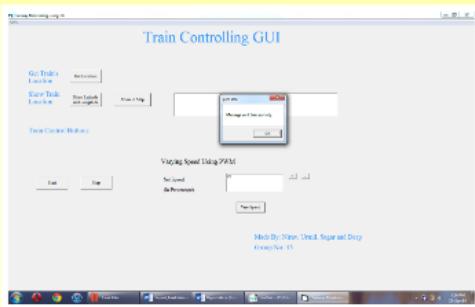




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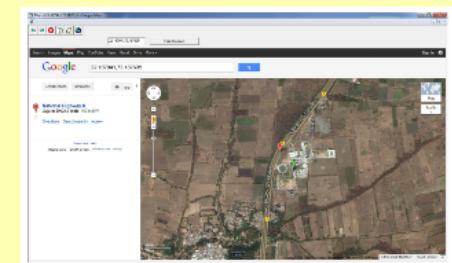
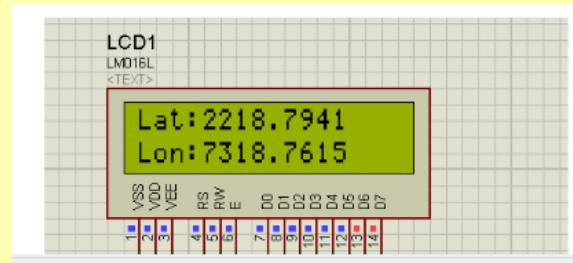
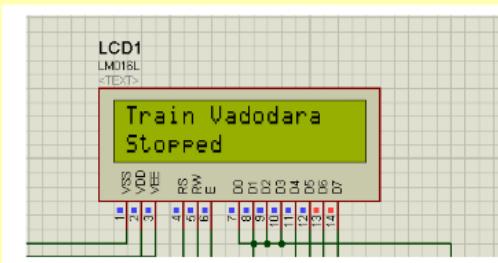
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This location will also be send to PC side where its location can be seen on Google Map.



LCD1

LM016L

<TEXT>

Train Vadodara
STOPPED

VSS VDD VEE RS RW E D0 D1 D2 D3 D4 D5 D6 D7

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Location can be seen on Google Map.

LCD1

LM016L

<TEXT>

Lat: 2218.7941

Lon: 7318.7615

VSS
VDD
VEE

RS
RW

E
D0

D1

D2

D3

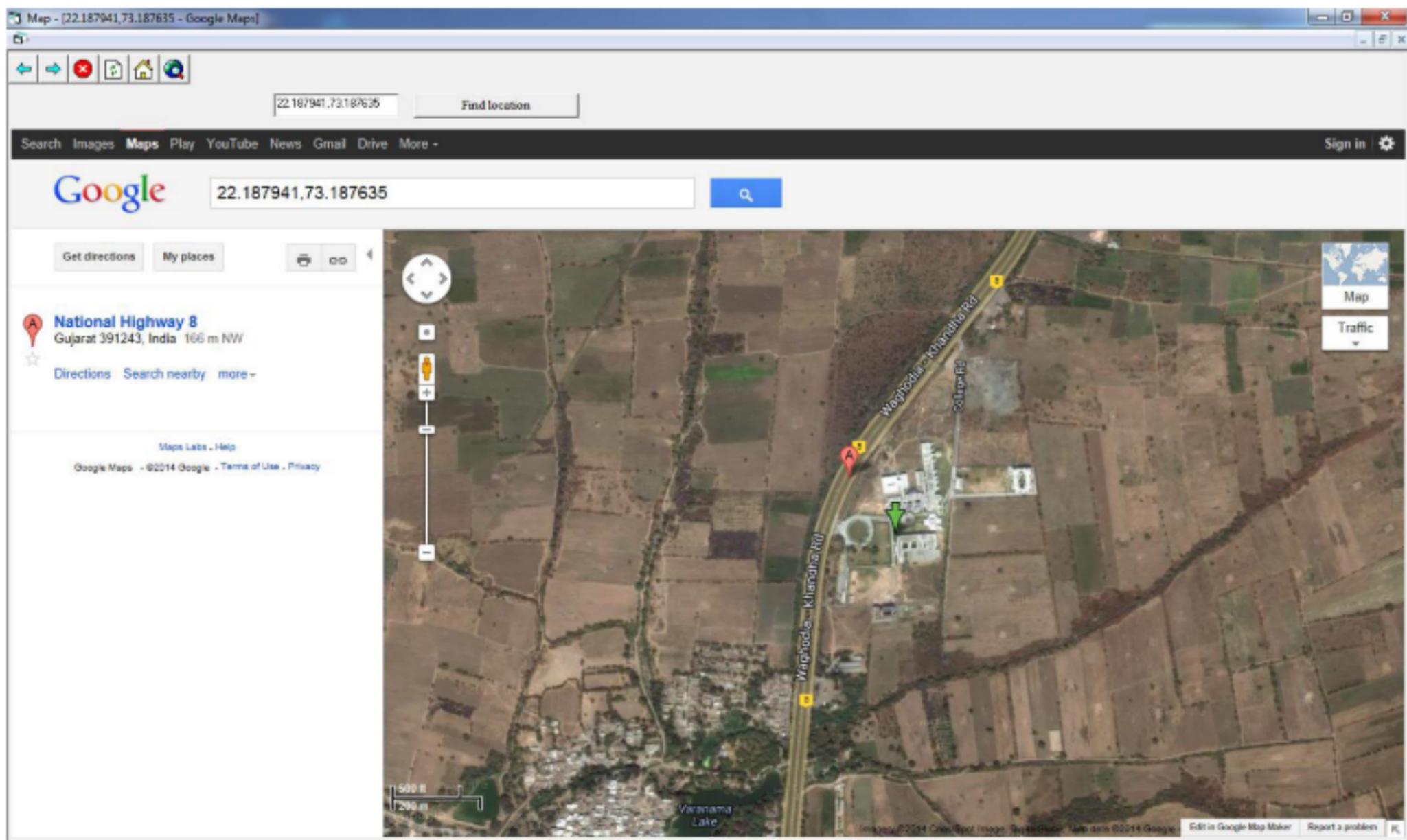
D4

D5

D6

D7





Monitoring Part

Introduction

In Monitoring part to implement the task of controlling train we have created a Visual Basic application on PC. This application will show complete graphical User interface having visual buttons to control train and will also show the location of train which is seen by GPS Module located on train unit. So when the user presses any button from VB application, some message (SMS) will be sent to train unit via GSM module connected with PC.

On receiver side (Train Unit) the microcontroller used is 89C51 which has two serial ports one serial port GSM module is connected for receiving message which is send from the PC side, and depending on message received, microcontroller will decide what parameters of train are to be controlled.

On second serial port GPS Module is connected which will receive the location of train and that location is send to PC side by GSM module connected on first serial port.

Block Diagram: Transmitting Section



- The main application sending messages (SMS) for controlling train through PC is created in VB.
- A VB Application is created on PC which will show complete graphical User interface having controls like Starting of Train, Stopping of Train, Speeding up of Train, Slowing down of Train.
- With the help of this GUI we can control train using parameter by sending SMS, and can also see the location of train via Google Map.
- So whenever any button like Start is pressed, some message is send to train unit and depending on code written for that message in Microcontroller, train will start.
- Similarly Speed of train is controlled by sending specific message depending on the number will be inserted in text box of Set Speed.

Train Controlling GUI Created in VB

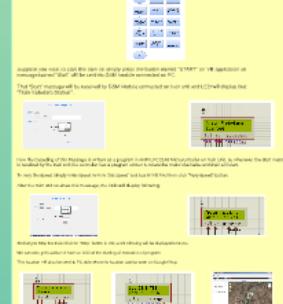


Receiver Section (Train unit)



- Step of the location of the train is captured by GPS module interfaced on one serial port which will then be decoded by microcontroller into coordinates and that coordinates will be displayed on LCD and will also be send to PC by GSM module connected on other serial port.
- Then GSM module will receive the message transmitted by GSM module connected to PC.
- LPC7148 will decode that message and according to the program written in it it will generate control signals, and send it to Motor driver (L293D) for driving motor at desired speed.
- Also the LCD on ARM module will show us the message that we have sent from the PC unit which is helpful to understand the position of train.

Explaining Concept of both Transmitting and Receiving Section

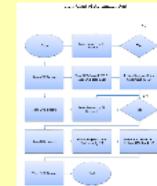
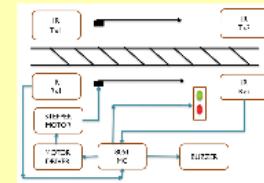


Automation Part

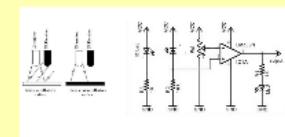
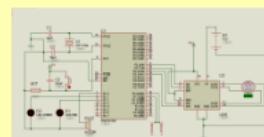
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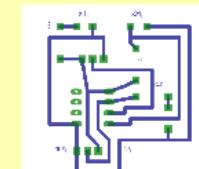
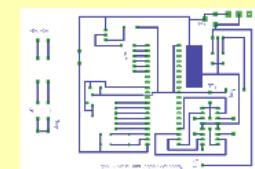
Block diagram and Flow Chart of Gate Control :



Circuit diagram of Gate Control and IR Sensor:



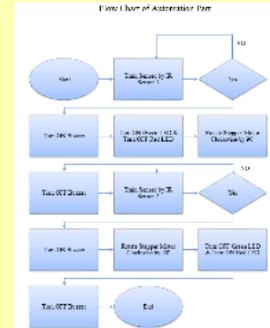
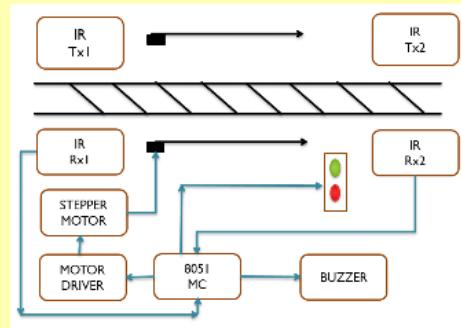
PCB Layout of Gate Control and IR Sensor:



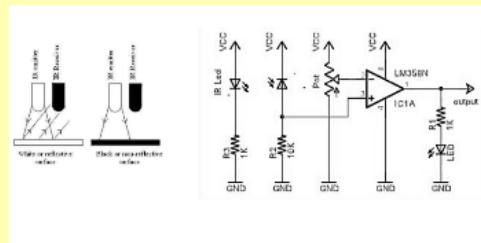
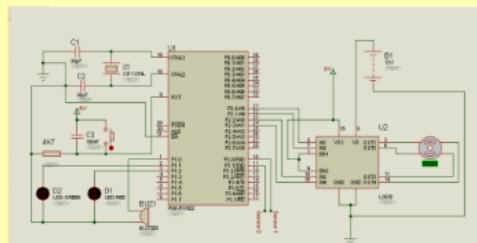
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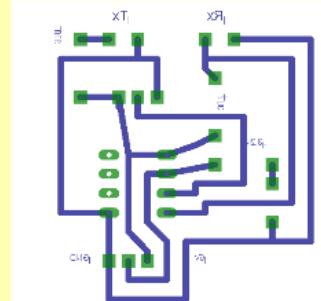
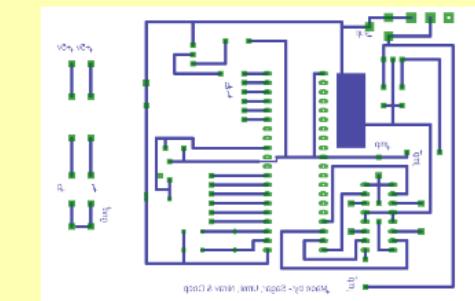
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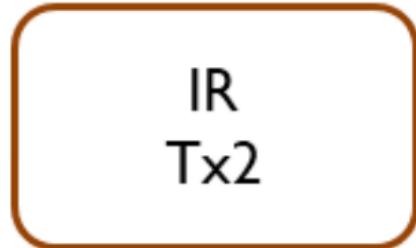
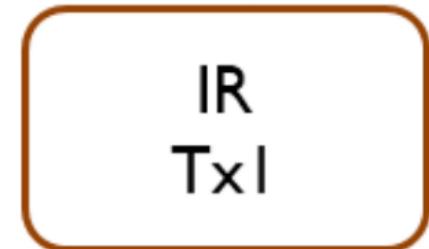


Circuit diagram of Gate Control and IR Sensor:



PCB Layout of Gate Control and IR Sensor:





IR
Rx1



IR
Rx2

STEPPER
MOTOR

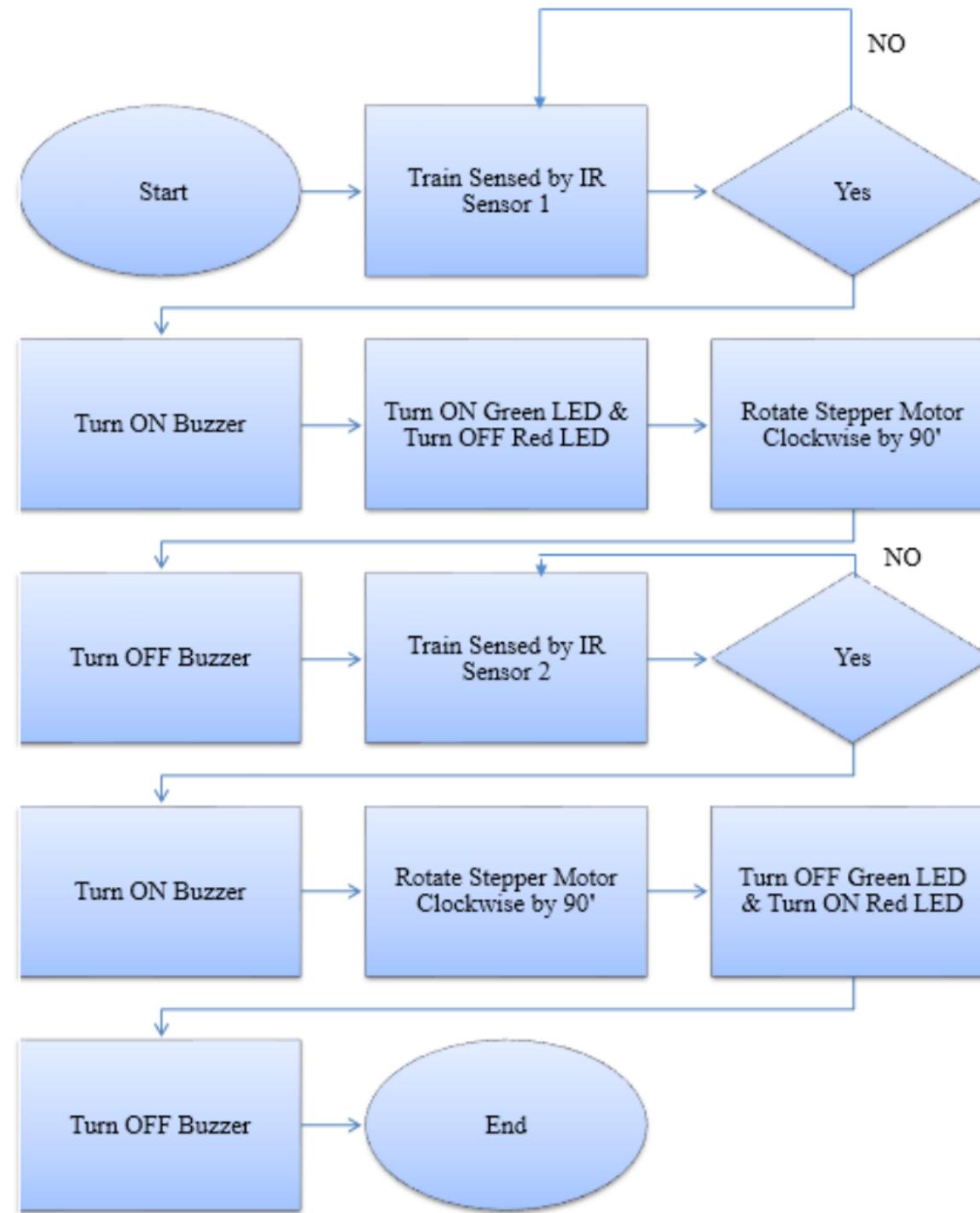
MOTOR
DRIVER

8051
MC

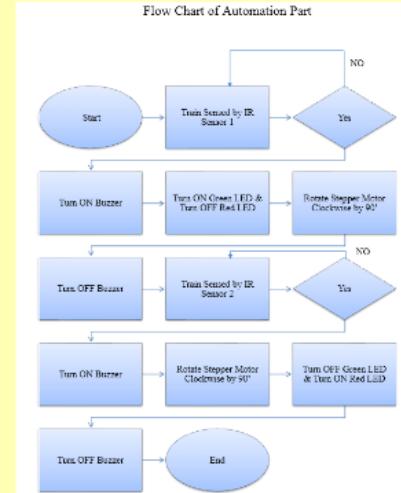
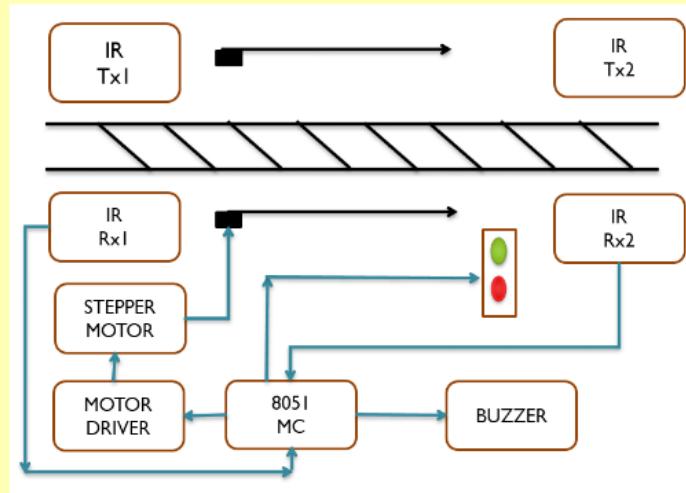


BUZZER

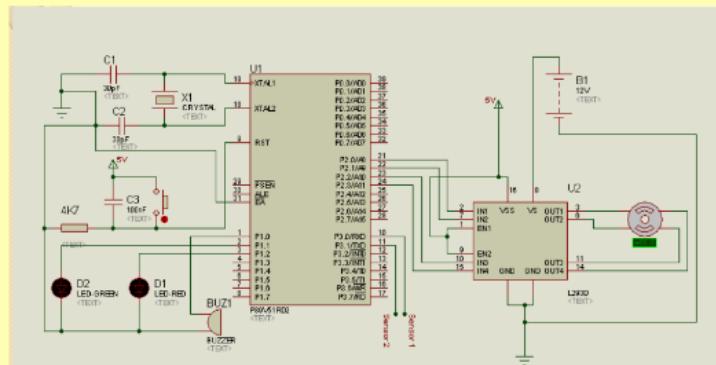
Flow Chart of Automation Part

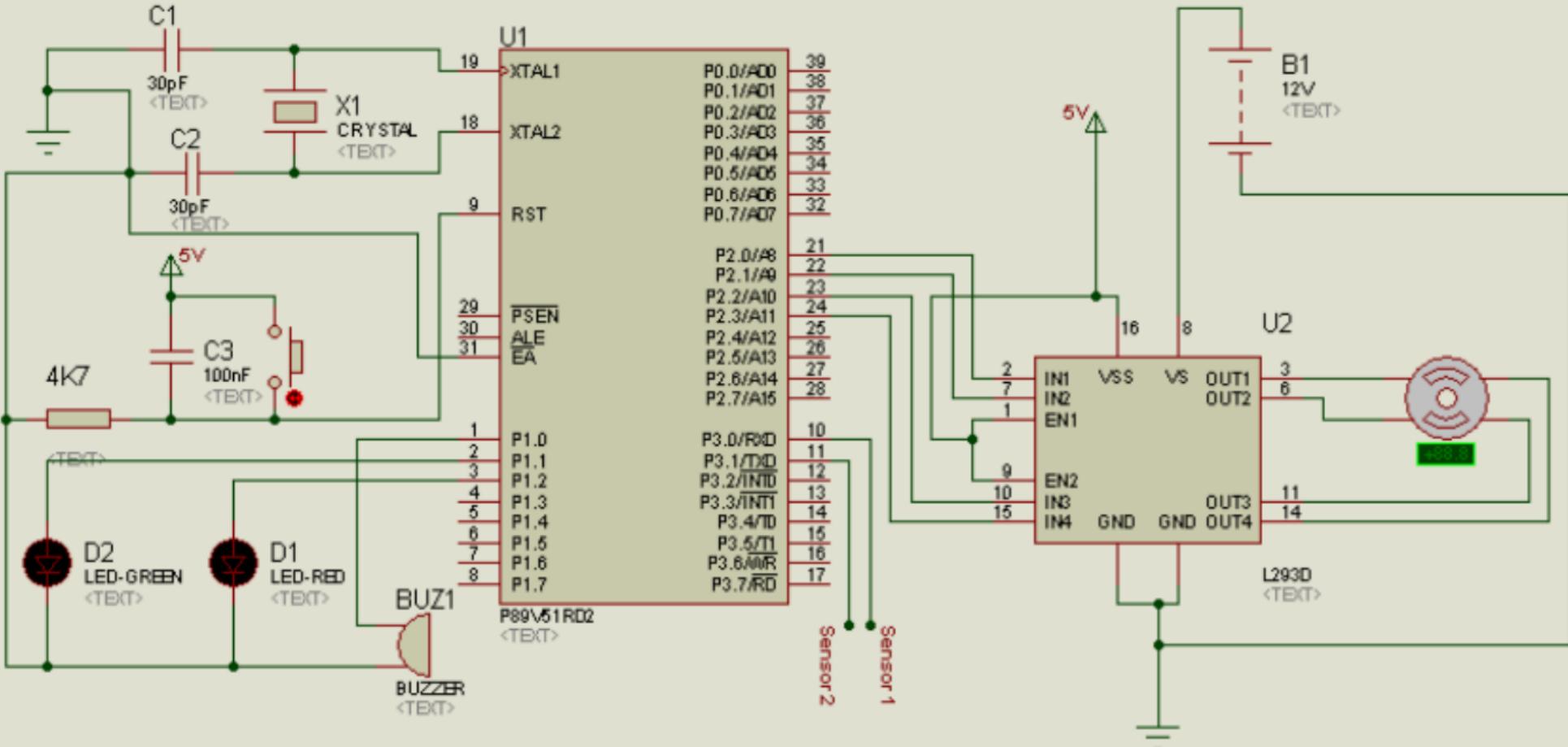


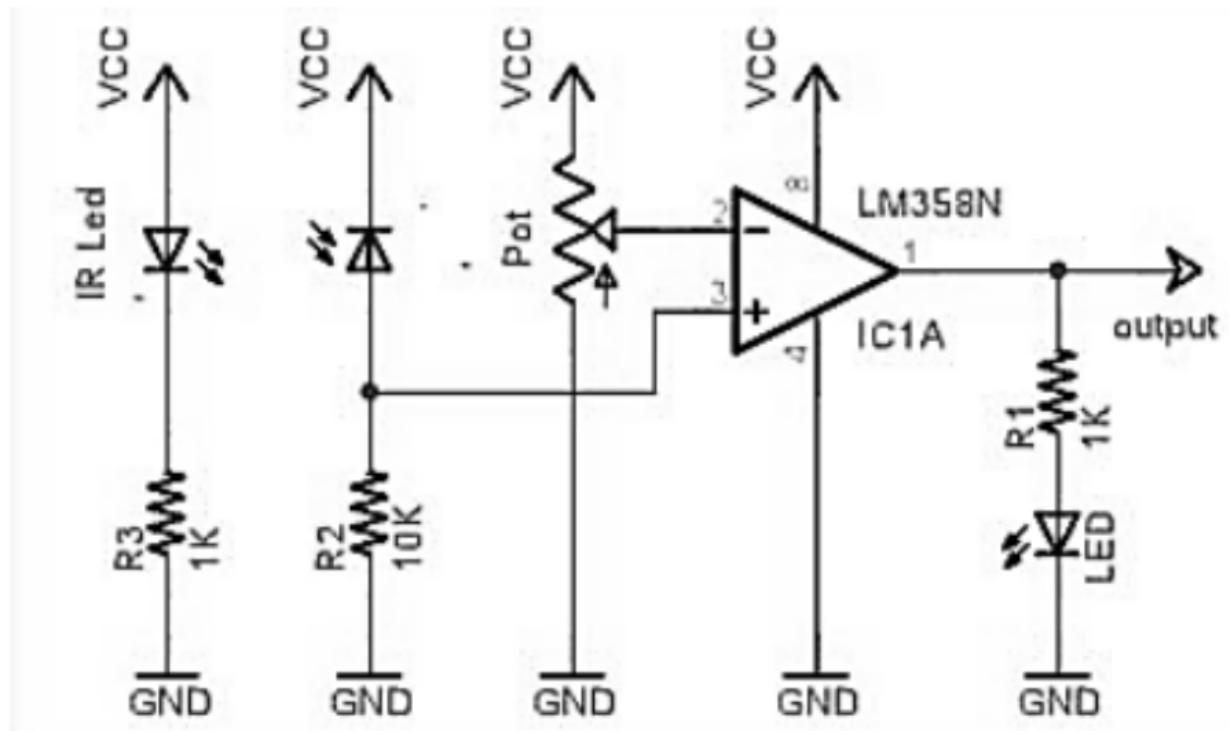
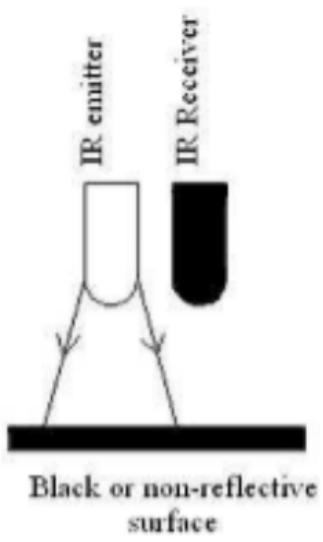
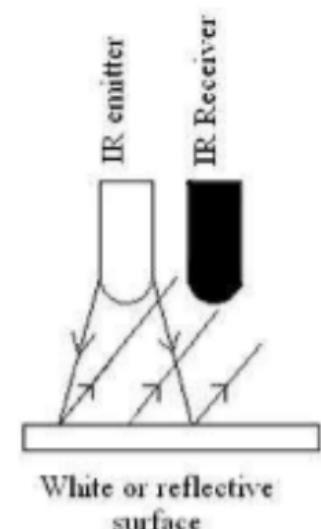
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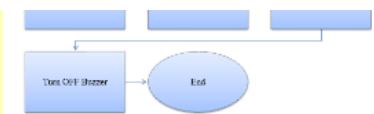


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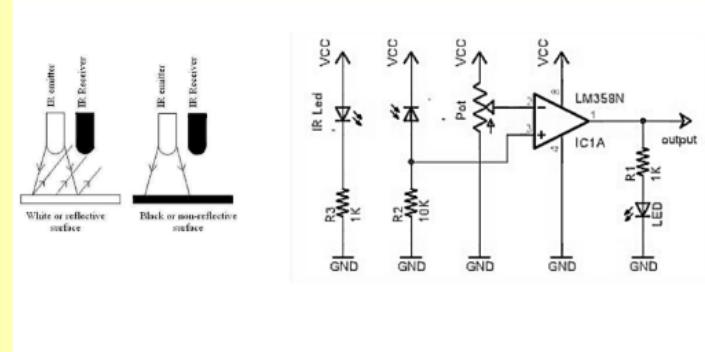
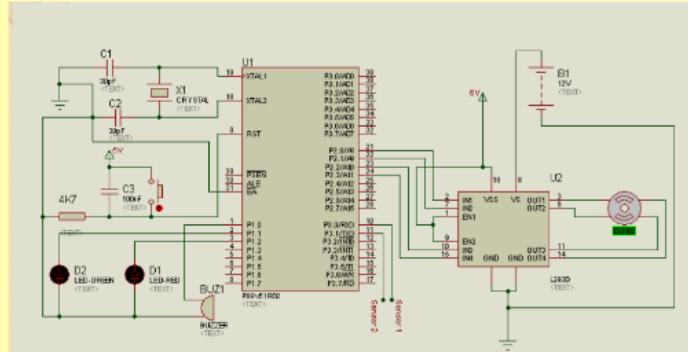




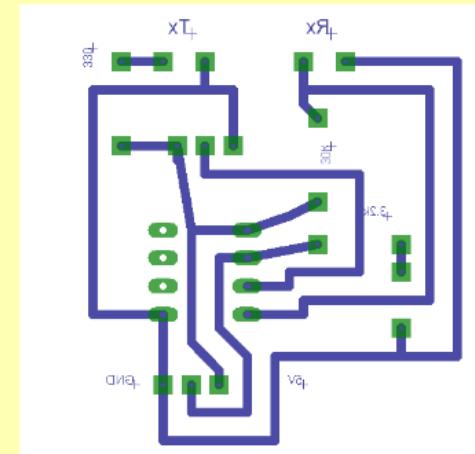
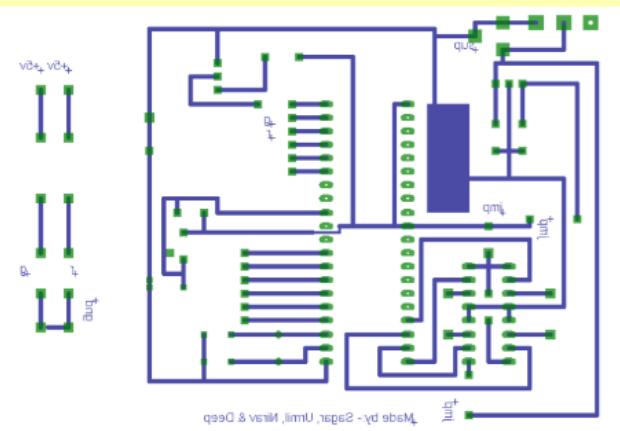


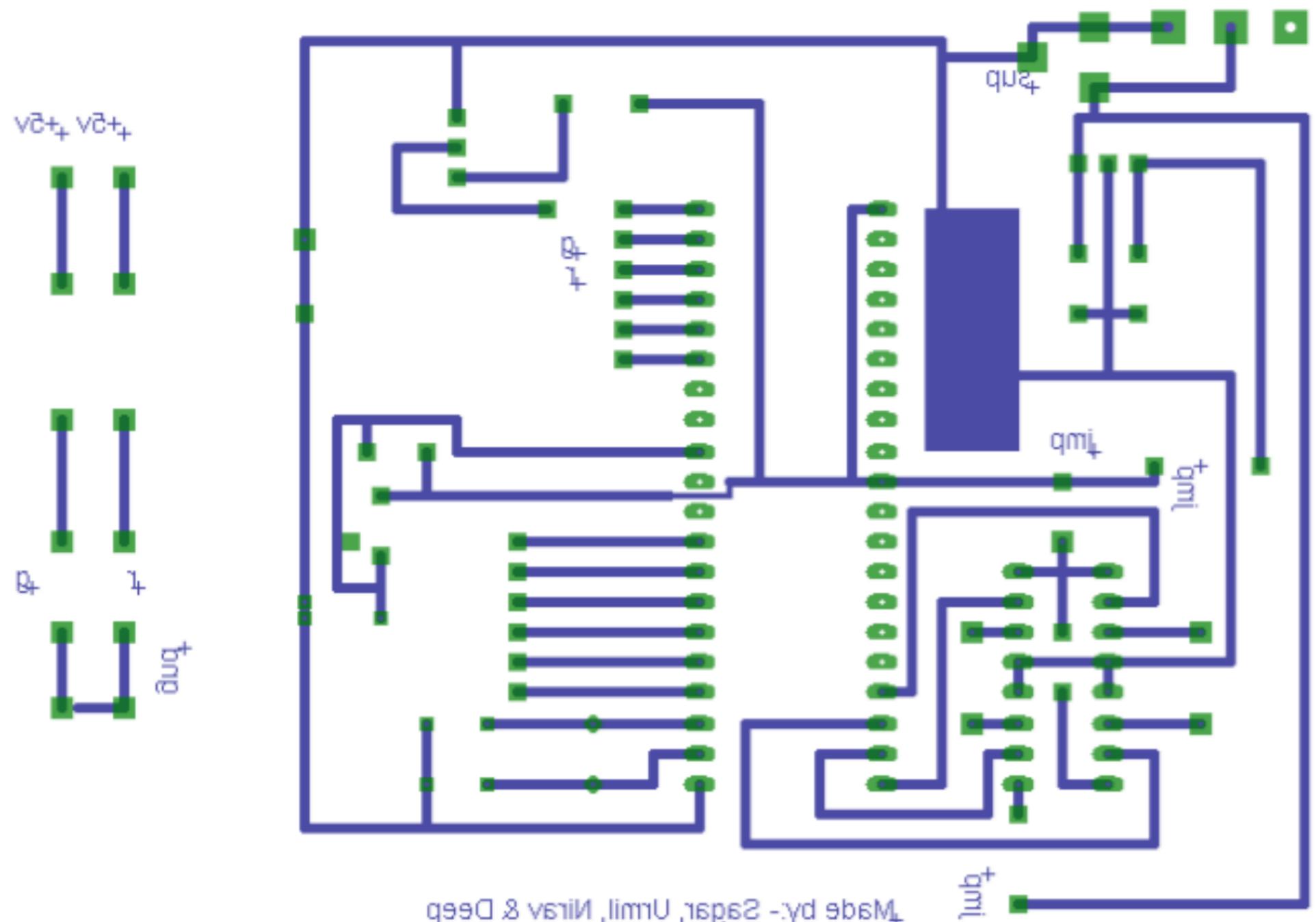


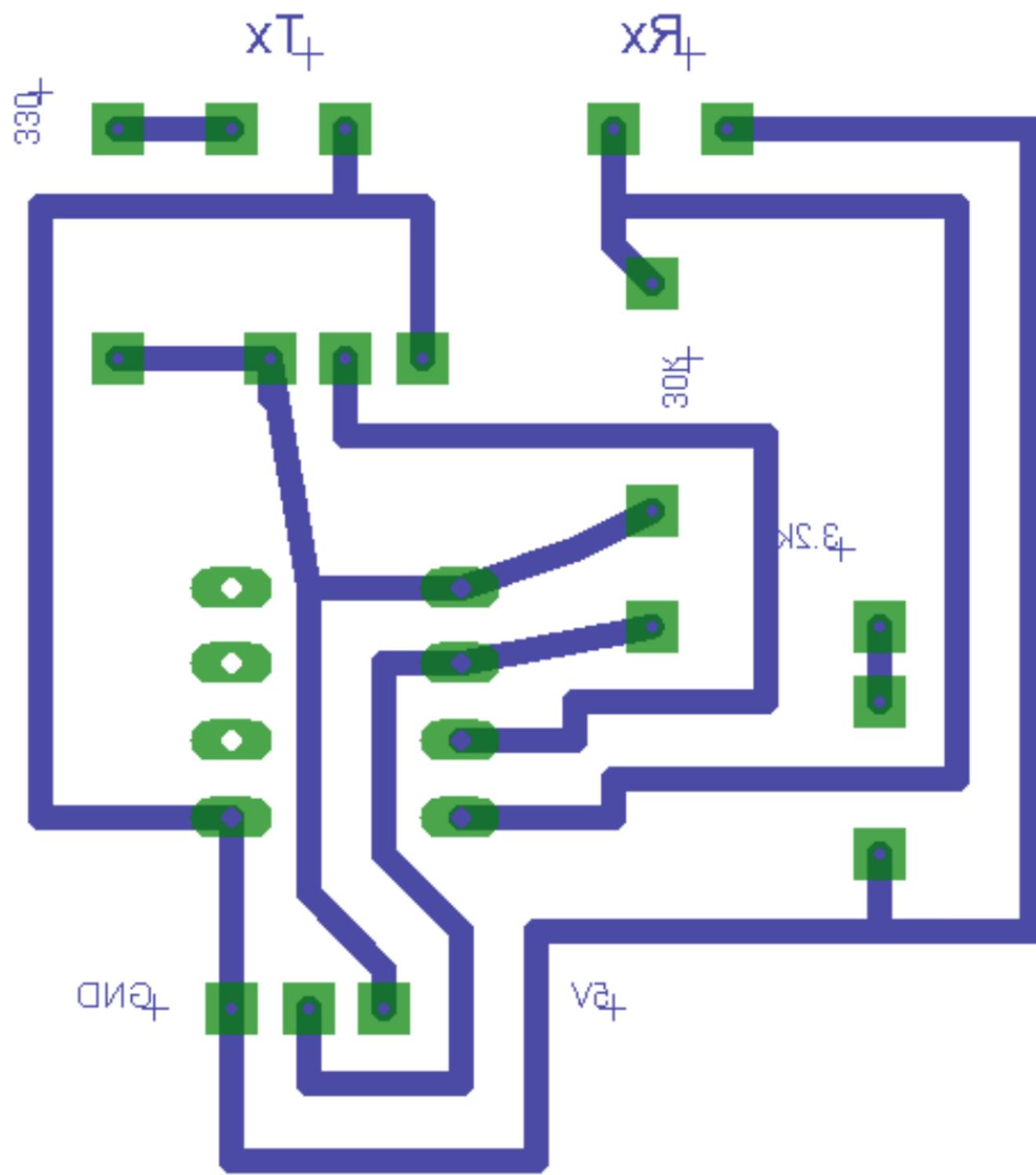
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PCB Layout of Gate Control and IR Sensor:





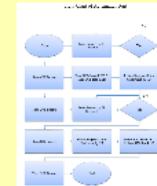
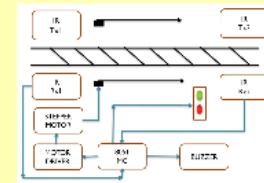


Automation Part

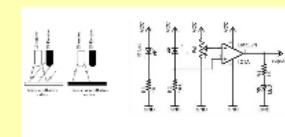
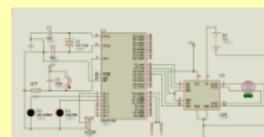
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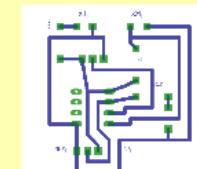
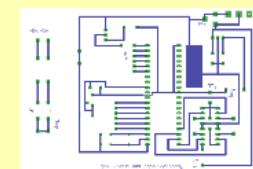
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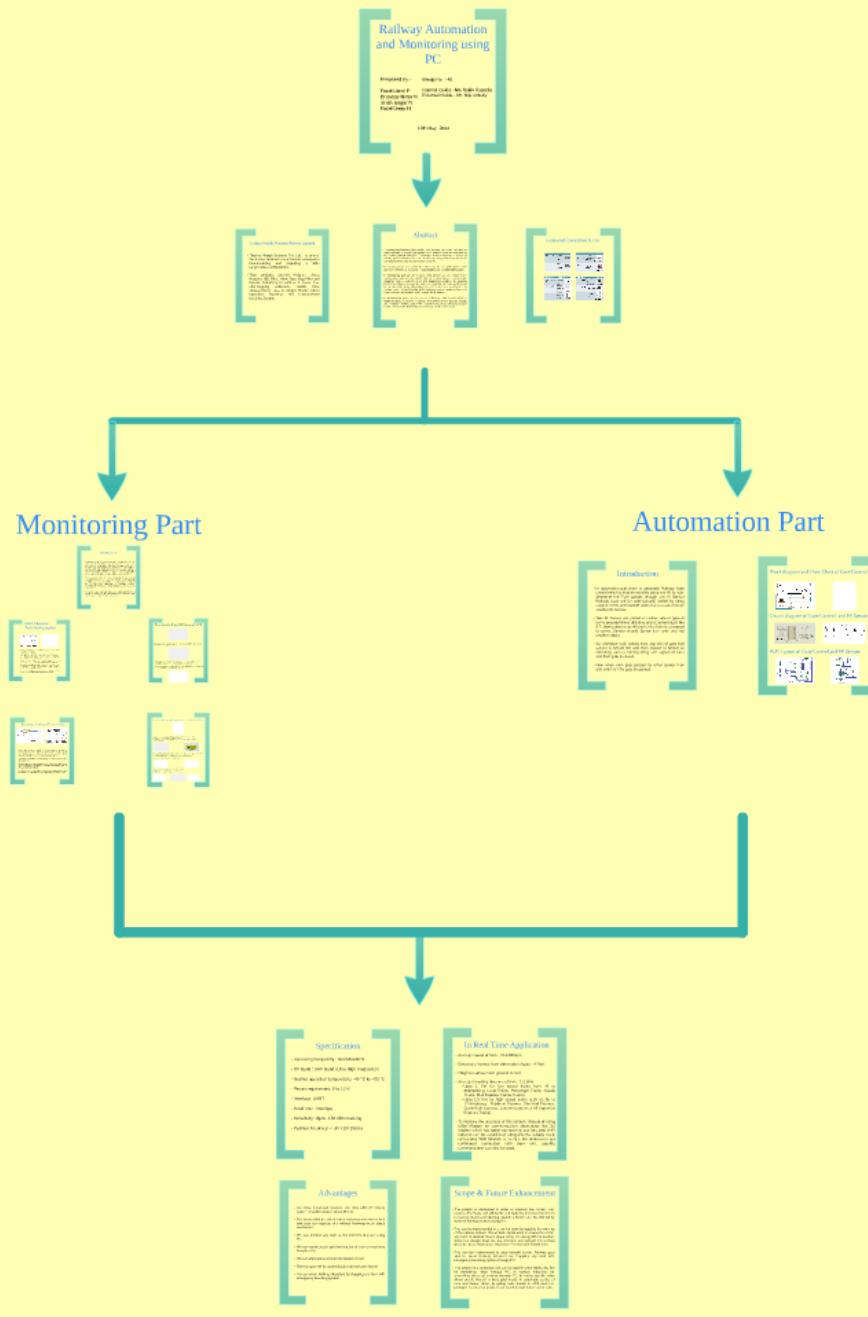
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Railway Automation and Monitoring using PC



Thank You...

Specification

- Operating Frequency : 900/1800MHz
- RF Band : UHF Band (Ultra High Frequency)
- Normal operation temperature: -40 °C to +85 °C
- Power requirement: 5 to 12 V
- Interface: UART
- Baud rate: 9600bps
- Sensitivity: Up to -158 dBm tracking
- Position Accuracy: < 3m CEP (50%)

In Real Time Application

- Average speed of train : 70-100kmph
- Distance of sensor from either side of gate : 4-7km
- Height of sensor from ground: 8-10 ft
- Average breaking distance of train : 1-1.5km
 - Upto 1 Km for low speed trains from 40 to 80kmph(e.g. Local Trains, Passenger Trains, Goods Trains, Mail Express, Menum Trains).
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- To improve the accuracy of this system, instead of using GSM Modem for communication alternatives like 3G Modem which has better connectivity can be used, WIFI network can be established alongside the railway track; by keeping WIFI Modem at every 1 Km distance to get continuous connection with train unit, Satellite communication can also be used.

Advantages

- We have developed wireless and time efficient railway system that will reduce human Efforts.
- GUI is provided to control train's various parameter so that end user can operate this without knowing much about electronics.
- We can Control any train at desired time & place using PC.
- We can continuously get the location of train on real time Google map
- We can estimate & control the Speed of train.
- Railway gate will be automatically opened and closed.
- We can avoid Railway disasters by stopping any train with emergency breaking system.

Scope & Future Enhancement

- This project is developed in order to improve the current train service effectively and efficiently and help the INDIAN RAILWAYS in making its present working system a better one, by eliminating some of the loopholes existing in it.
- This can be implemented in a control room to regulate the working of the railway system. Visual Basic Application is created to control any train at desired time & place using PC along with its location shown on Google map. So that end user can operate this without knowing about electronics, thus becomes the user friendliness.
- This can be implemented to automatically control Railway gate and to avoid Railway disasters by stopping any train with emergency breaking system through PC.
- This system is a prototype and can be used in other fields also like for controlling robot through PC, in various industries for controlling electrical devices through PC by using specific relay driver circuit, Aircraft in Auto pilot mode, in automatic control of cars and buses; where by giving route details in GPS and then putting it in auto pilot mode, it can reach to destination on its own.

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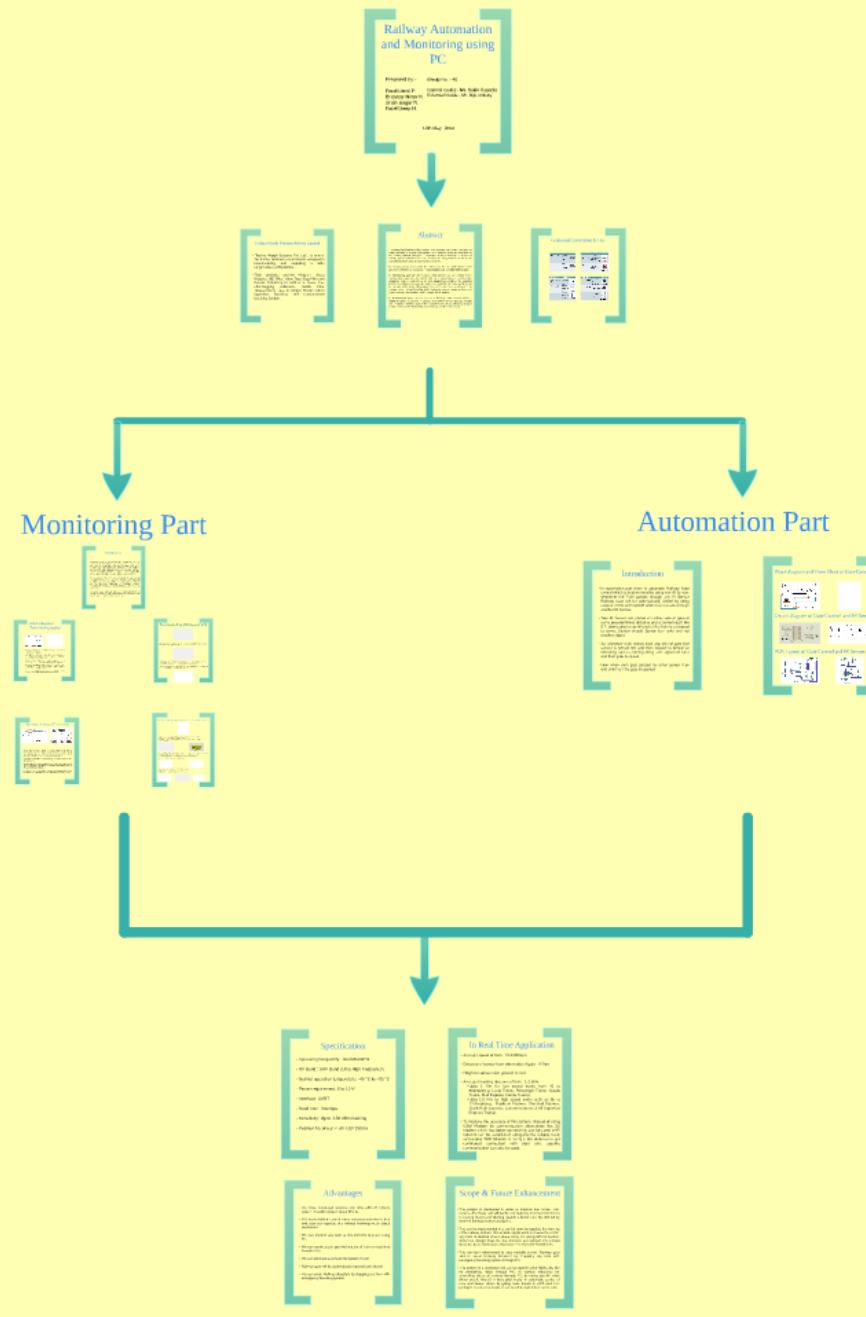
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