TRAIN MONITORING SYSTEM AND AUTOMATIC RAIL GATE CONTROL SYSTEMS

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UNIFIED PROJECT

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ABSTRACT

This study develops a train monitoring and automatic rail gate system which helps to avoid many problems in current railway system. Such as accident, time delay, collisions and etc..This system will be basically used in railway system. The proposed system has an embedded GPS connected central server and IR signal is an input and display as an output. Each GPS module in the train is connected to a central server installed at the main monitoring location in the railway station through a wireless network. This system immediately show updates to railway station about train locations and others…The following aspects will be addressed by the system mainly.

- Easy to use(Automatic)
- User friendly
- Speedy operation
- High accuracy
- Efficient method compare to manual system

CONTENTS

BACKGROUND OF THE PROJECT

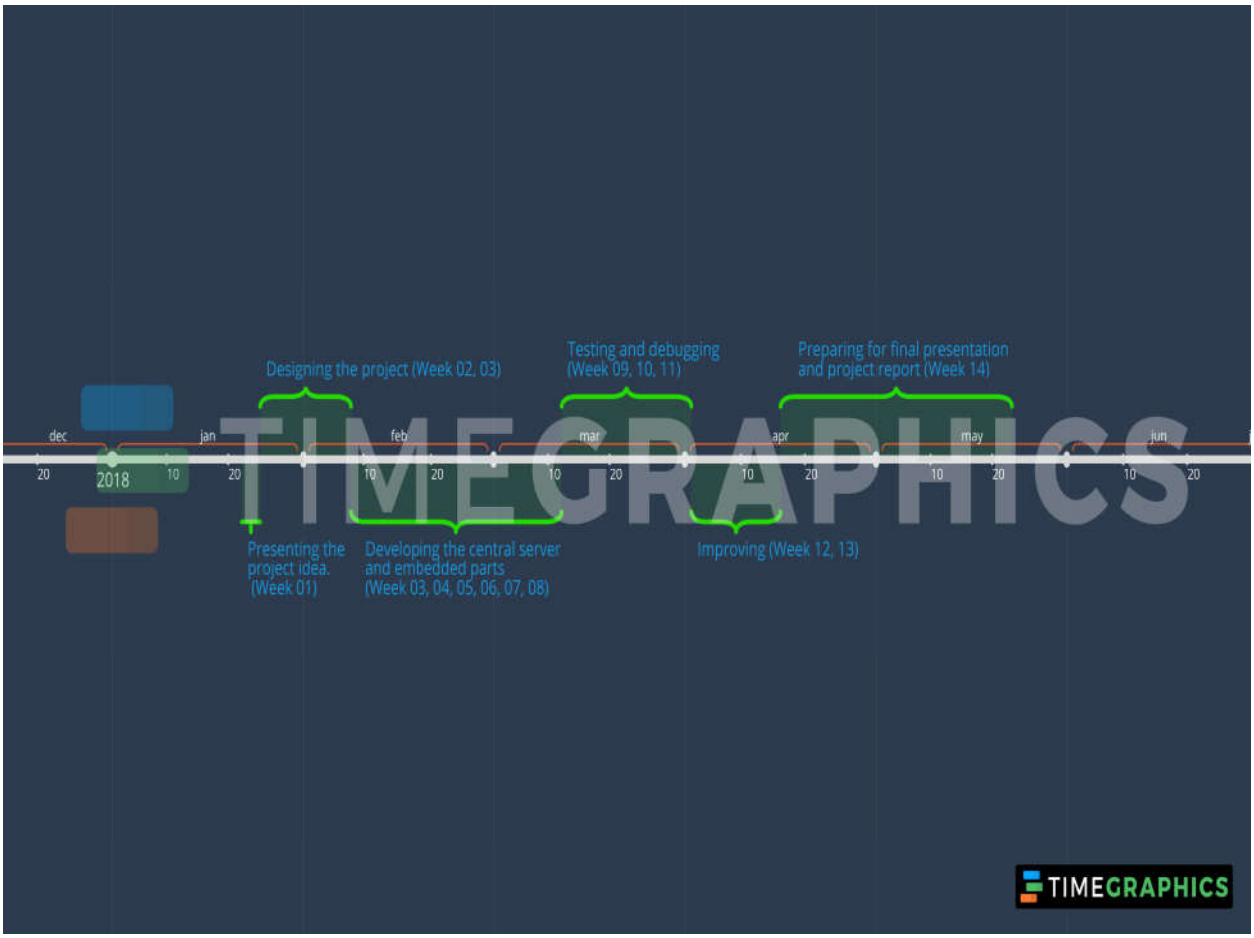
Why we selected this idea?

In a traditional train system does not have automatic train monitoring and automatic rail gate systems. In that situation they detect the train location and control of gate manually. Therefore, there was no accuracy and efficiency of that manual system approach. So that, we implement our project to train monitoring and automatic control of rail gate system in automatic manner through use of some technologies and other developments.

What is our solution for this?

We use GPS and GSM module to develop our project. This system is automatically. GPS modules are inside the train then, that GPS module sends the signal to the central server of the train monitoring station. Central server and GPS modules are connected via wireless network. If the signal arrive to the central server then, server find the exact location of the train and control the gate from 300m within train current location to gate.

TIME LINE


Designing the project (Week 02, 03)
Testing and debugging (Week 09, 10, 11)
Preparing for final presentation and project report (Week 14)
dec
jan
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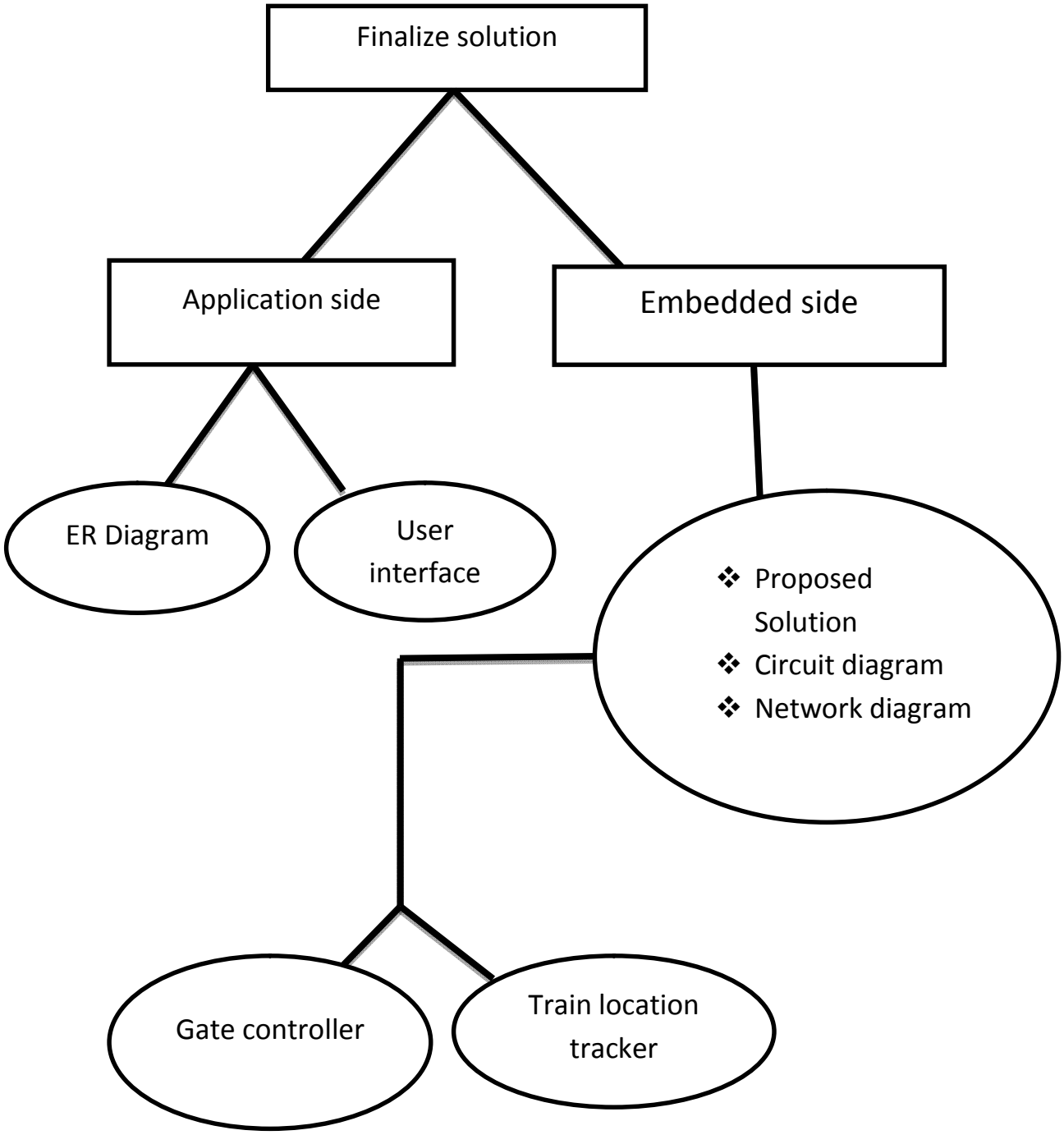
Presenting the project idea. (Week 01)
Developing the central server and embedded parts (Week 03, 04, 05, 06, 07, 08)
Improving (Week 12, 13)
TIMEGRAPHICS
TIMEGRAPHICS

ESTIMATED BUDGETS

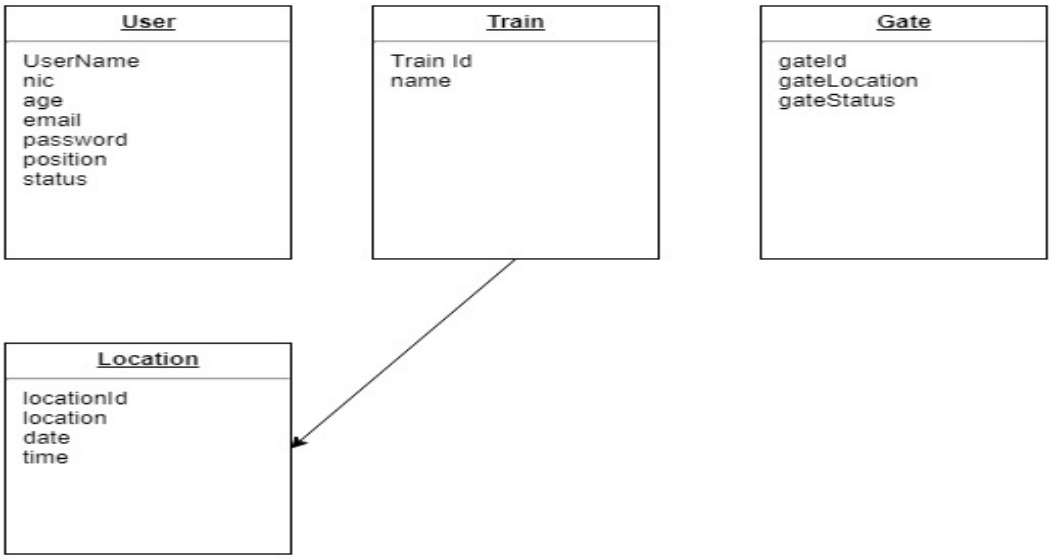
Part	*Qty*	*Price*	*Total Price*
Arduino Mega	2	1500/=	3000/=
Ethernet Shield	1	1450/=	1450/=
Power regulators (Step down)	2	350/=	700/=
Gprs module	1	1950/=	1950/=
Servo motor	1	1150/=	1150/=
Plastic Box	2	500/=	1000/=
Buzzer LEDs and resistors	5	38/=	38/=
Long distance Bluetooth transmitter	2	750/=	1500/=
		Total	***10788/=***

FINALIZE SOLUTION



APPLICATION SIDE

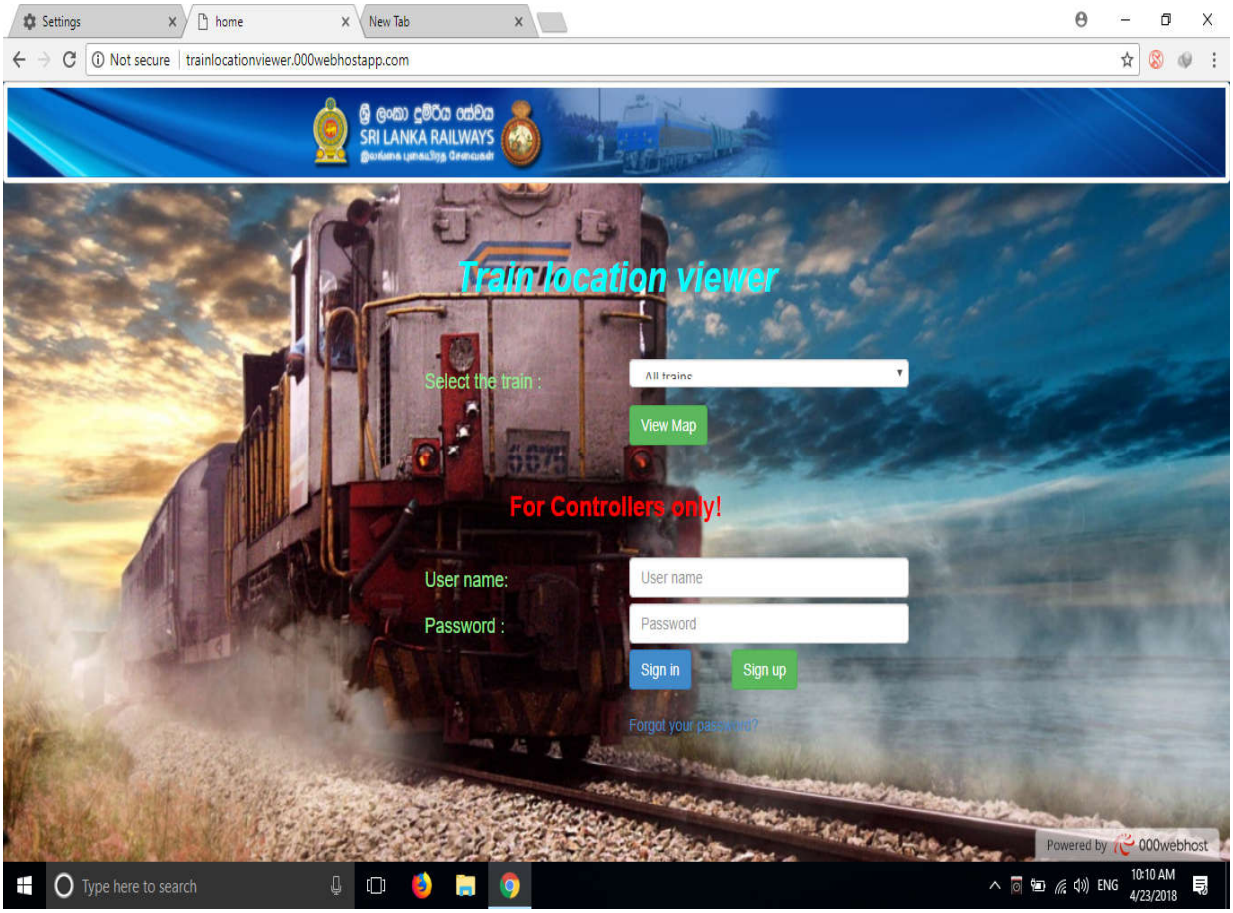
ER DIAGRAM



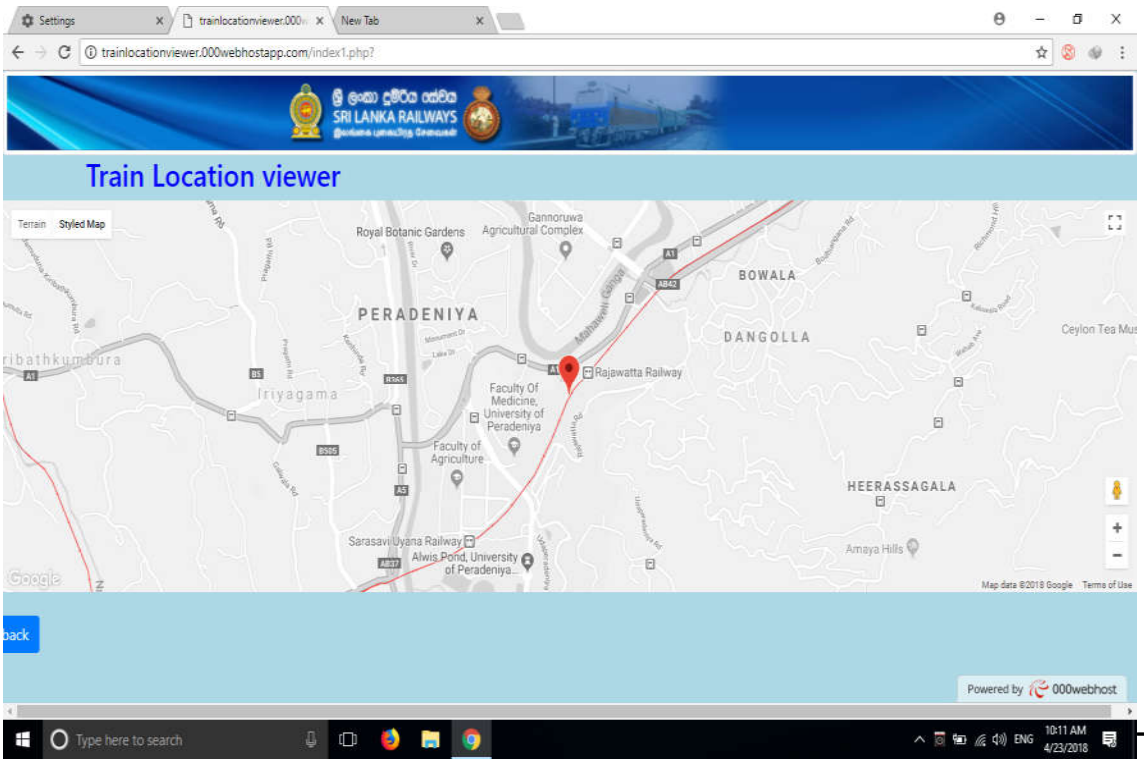
Above diagram indicate the ER diagram of our project. This is very simply understanding diagram. This diagram has four entities those are user, train, gate, and location. Those entities have many attributes. If we simply take the user entity then, it has username, nic, age, email and etc… attributes. If we want to control the gate of train of Gampola train then, we simply said train id=20,name="Gampola",gateid=15,gatelocation and so on..

USER INTERFACE

This is the user interface for the controllers. For all train location to find then, select the train=”All trains”

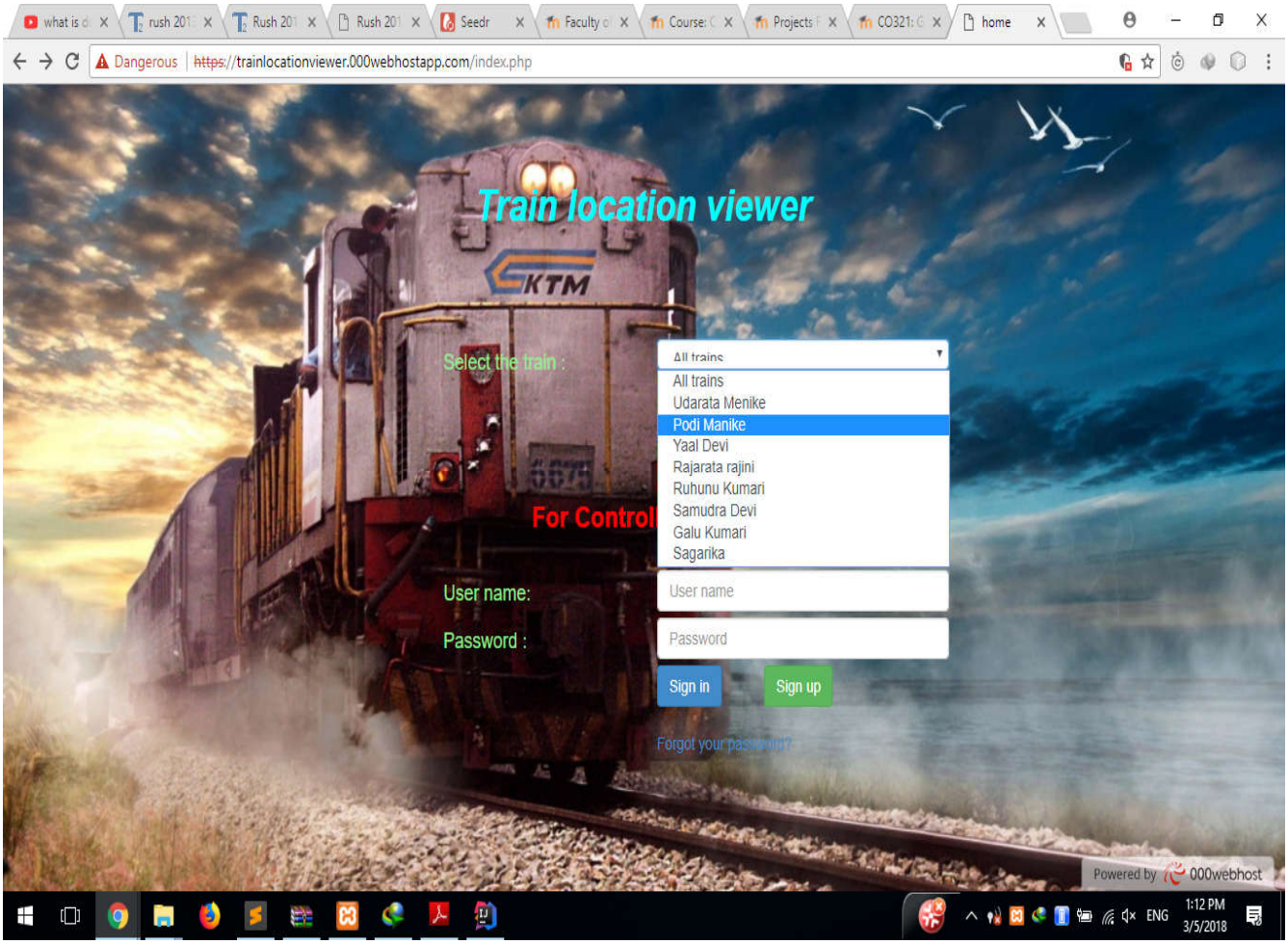


Then, we will get below view map.

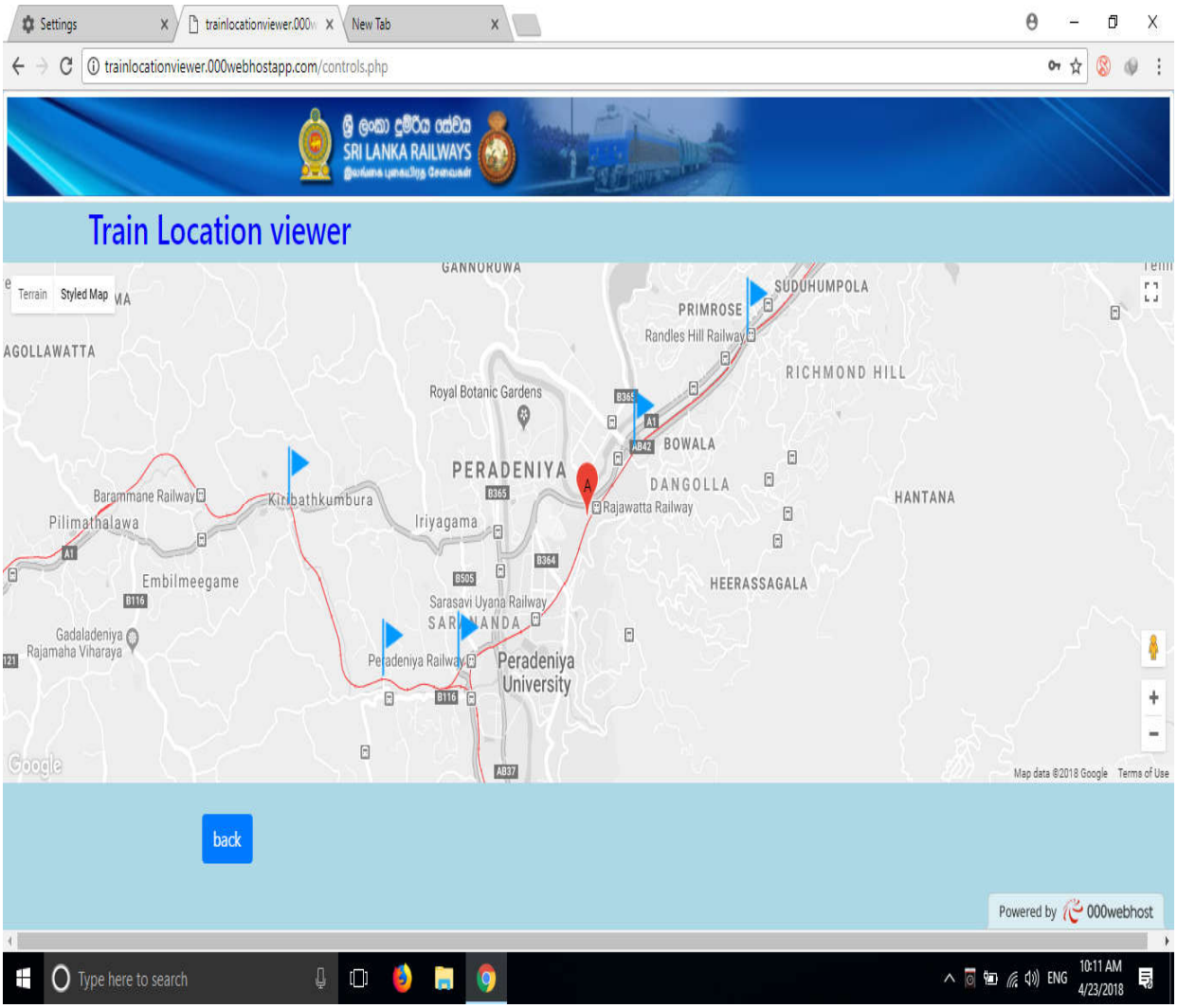


This is the user interface. For controllers if controllers want to map the train location of the PodiManike then, set the Select the train=”PodiManike”

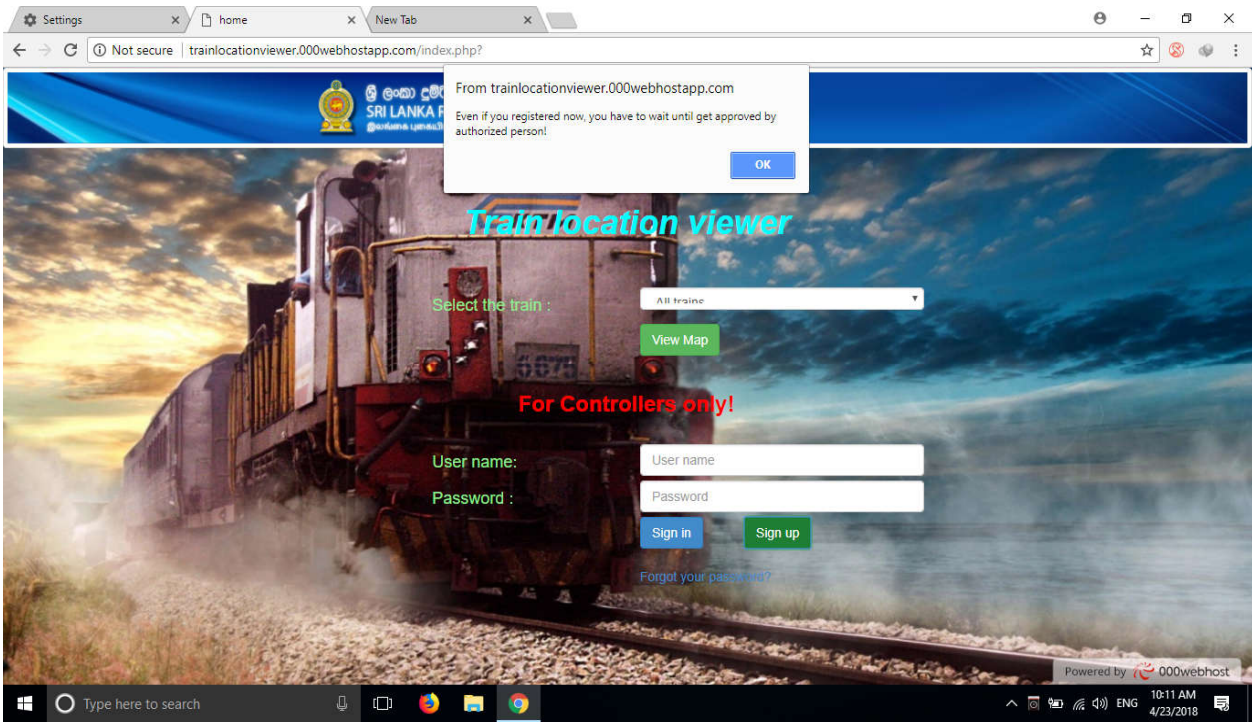
and view the map to find the location. So that,



Then, we will get this view map location

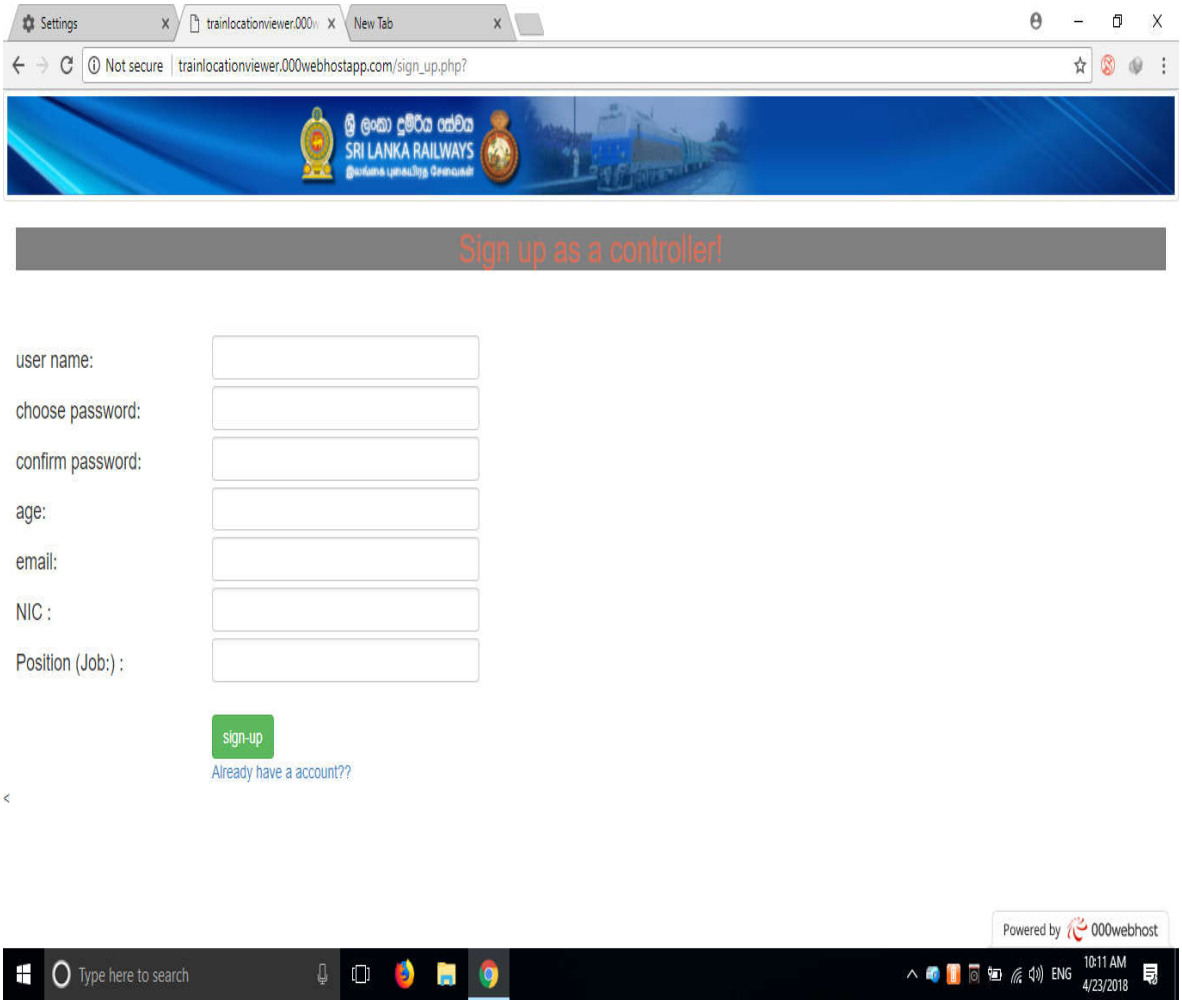


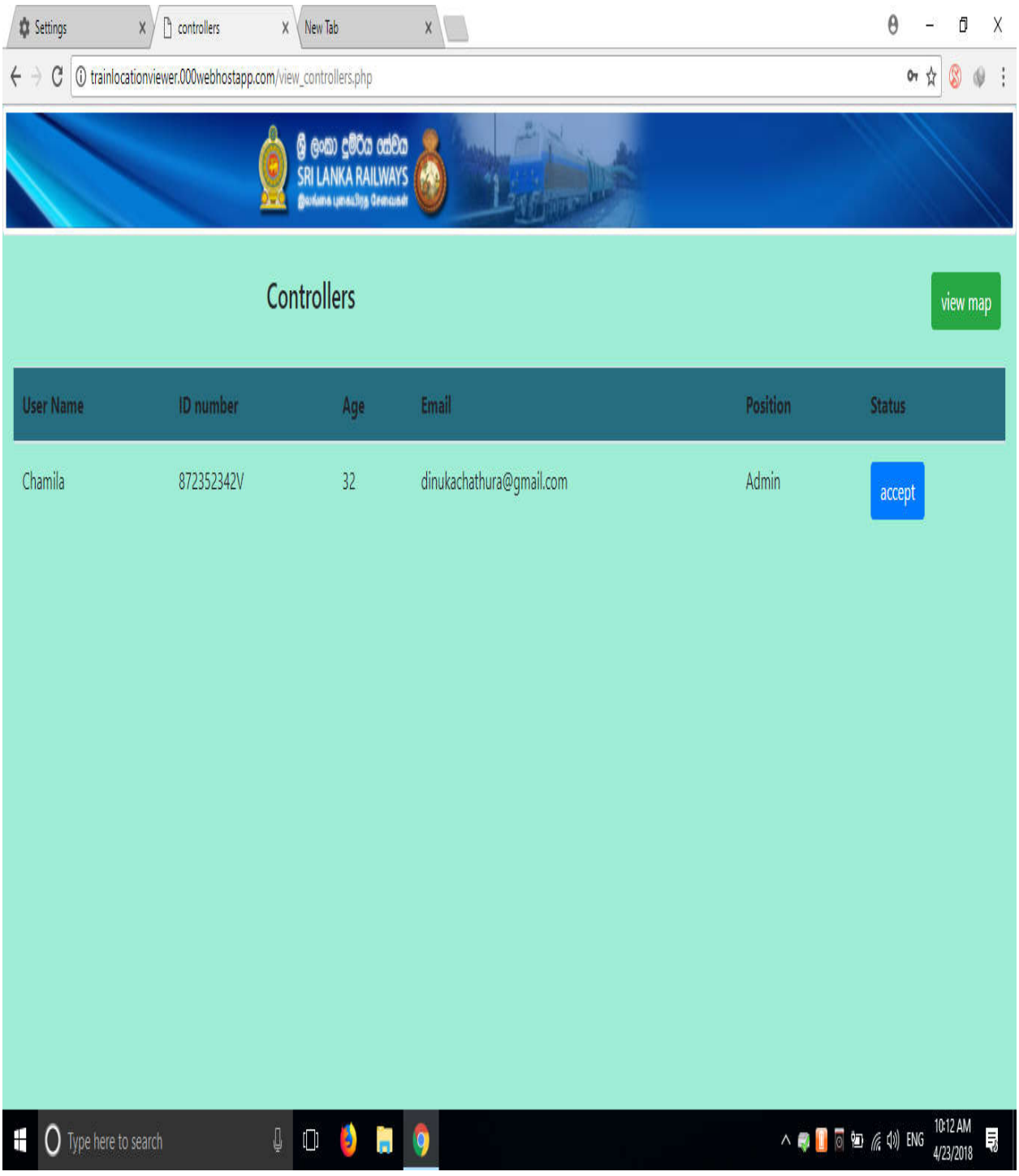
If somebody access this user interface and want to find the location of some train but he/she was not the controllers so then, that person wants to register the account for controllers.



Therefore, that person want to fill up some online data form and submit that form. Thereafter if the controllers authorized people accept his/her form then, he/she accesses the user interface and find the

location of the train by using the view map.

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SRI LANKA RAILWAYS
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dinukachathura@gmail.com
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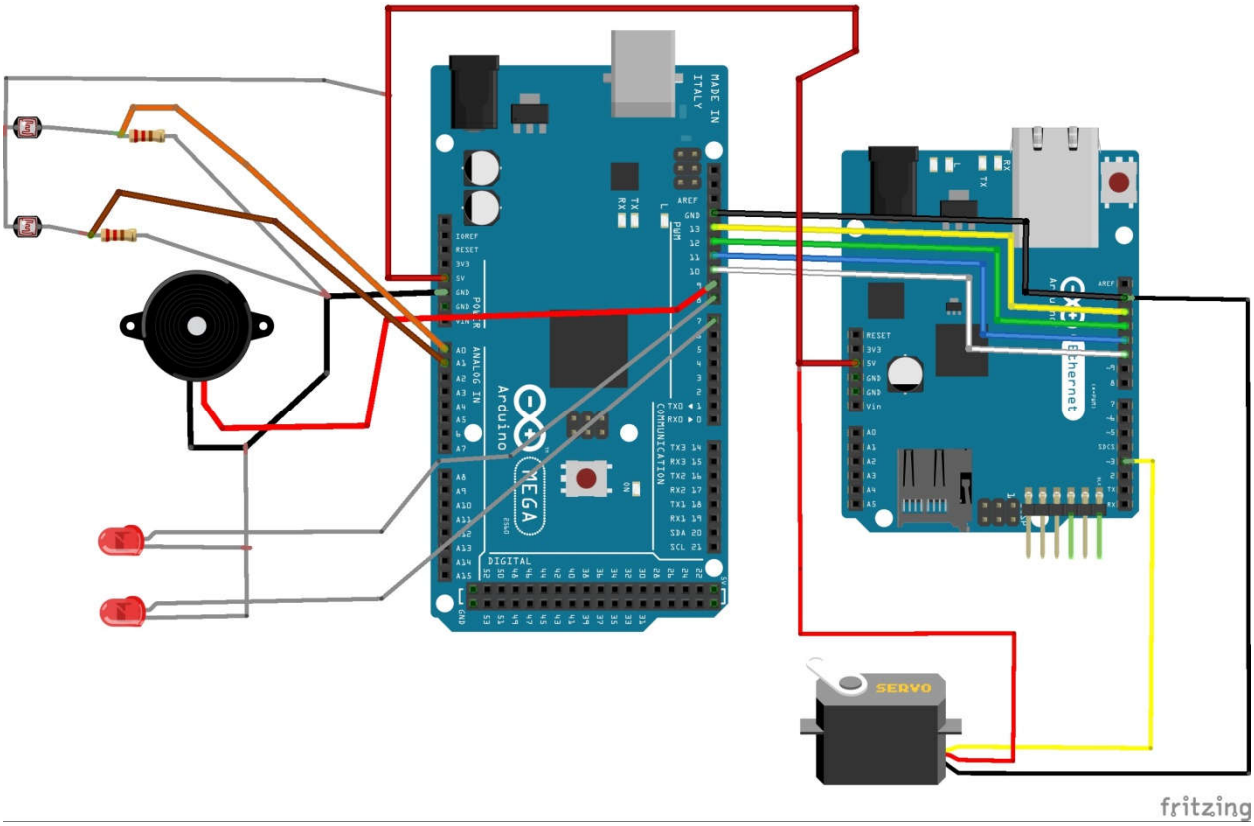
4/23/2018

EMBEDDED SYSTEM SIDE

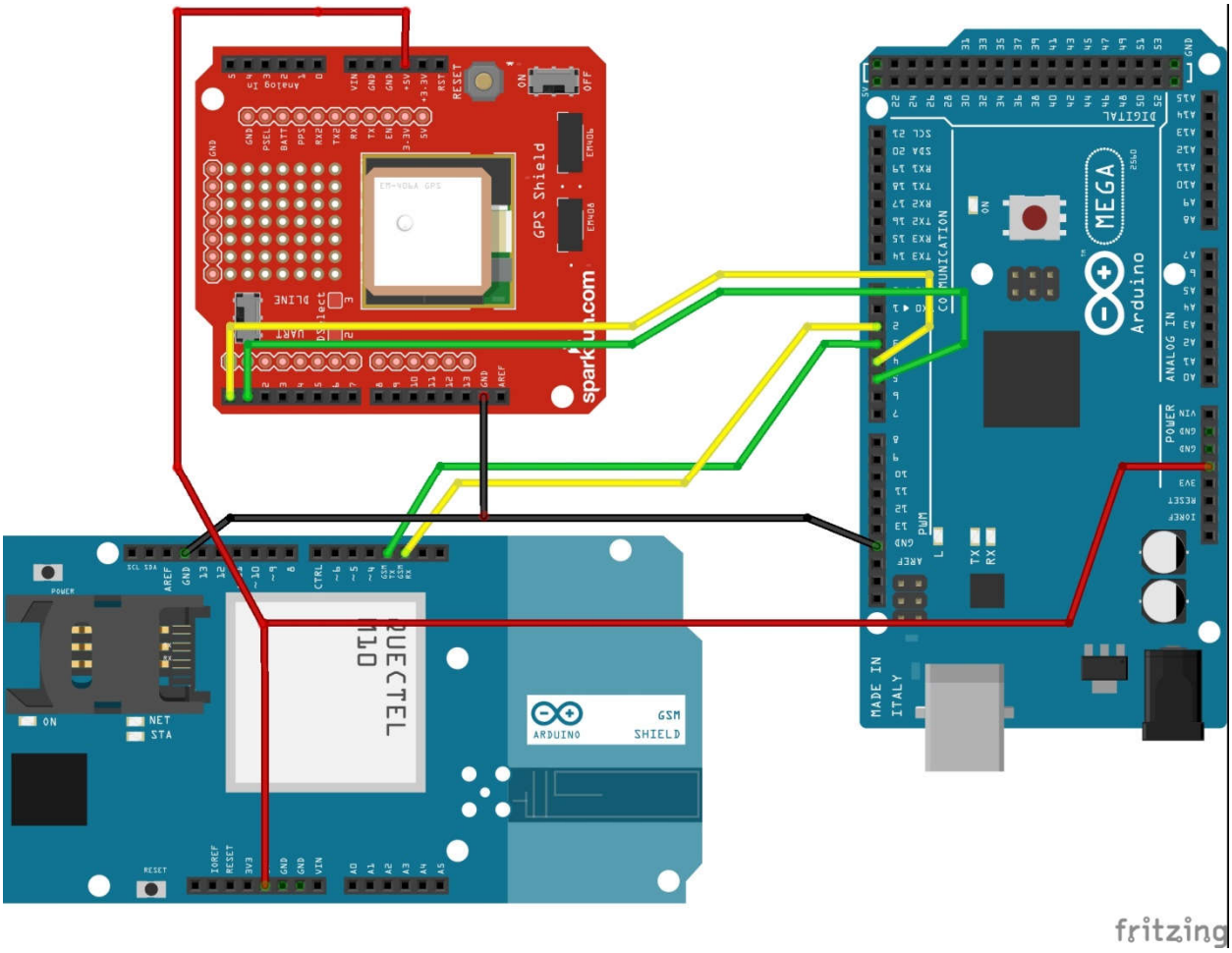
CIRCUIT DIAGRAM

GATE CONTROLLER

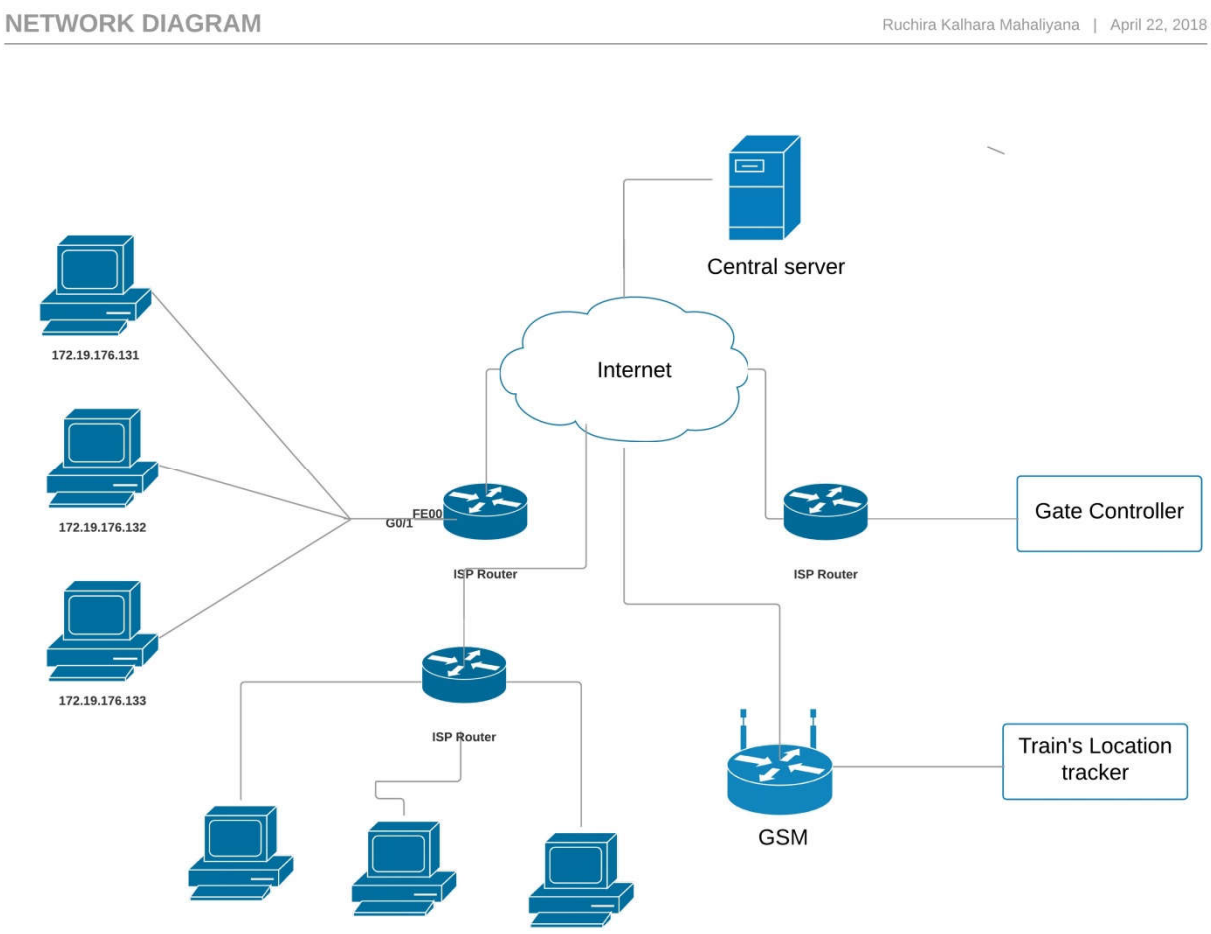


Above diagram is the gate controller of our project design. Gate controller has an arduino board, GPS module, some LDR, motor, some resistors and some wires.

TRAIN LOCATION TRACKER



NETWORK DIAGRAM



Above diagram implementation is the network diagram of our project. Our system has one central server that server is connected to all other communicate things in that network. In our system all hosts are connected to the central server by wireless network through routers, gate controller is also connected to central server via ISP router and GSM also so on….All our communication are done by internet. The GSM/GPS module is inside the train then, that module sends the IR rays to the central server to control the gate using internet. If the internet connection interrupt (when the train is under going through the tunnel) then, there is a failsafe mechanism for that. We know the exact

location of those some tunnels in our country and length of tunnel then, we calculate the time limit of passing tunnel by using the train speed and length of the tunnel.

OTHER DETAILS OF OUR PROJECT

- Power requirements
- bandwidth/speed requirements
- Solutions for power/network failure situations
- Data storage and backup

POWER REQUIREMENTS

Since our project has two embedded devices, we need to that power requirement fact separately.

In our train's location monitoring device, a gprs module is used. According to the data sheet, it consumes at least 1A current for it's proper function. The current consumption will be varying according to the signal strength which it has. So, our estimation is complete device will consume roughly 2.5A for its proper function.

In our gate controlling device, we use Ethernet shield and a servo motor. So, those parts consume most of the current which has supplied. So, our estimation is complete device will consume roughly 2.0A for its proper function.

BANDWIDTH/SPEED REQUIREMENTS

When it comes to the bandwidth, our Ethernet shield basically use 10Mb/s because it is using the Ethernet protocol.

GSM shield use 64kb/s because it is using the GSM network to communicate with the central server.

SOLUTIONS FOR POWER / NETWORK FAILURE SITUATIONS

Basically, if the internet connection is down, there are two things which can happen.

- Central server can't get the train's current location.
- Central server can't control the gates.

If the central server can't get the current location of the train, the central server can be able to predict the train's location using the previous speeds and the locations. This will be an over-estimation to prevent any collision.

If the central server couldn't send the commands to gate controller to close the gates, fail safe mechanism is coming into the picture. Even though gate controller didn't receive any commands from the central server if the fail safe detects that a train is coming, Gate will be close by force.

DATA STORAGE AND BACKUP

Basically, we use a mysql database to save our data. At the end of the day it will dump a backup database and it will be stored in a different cloud.

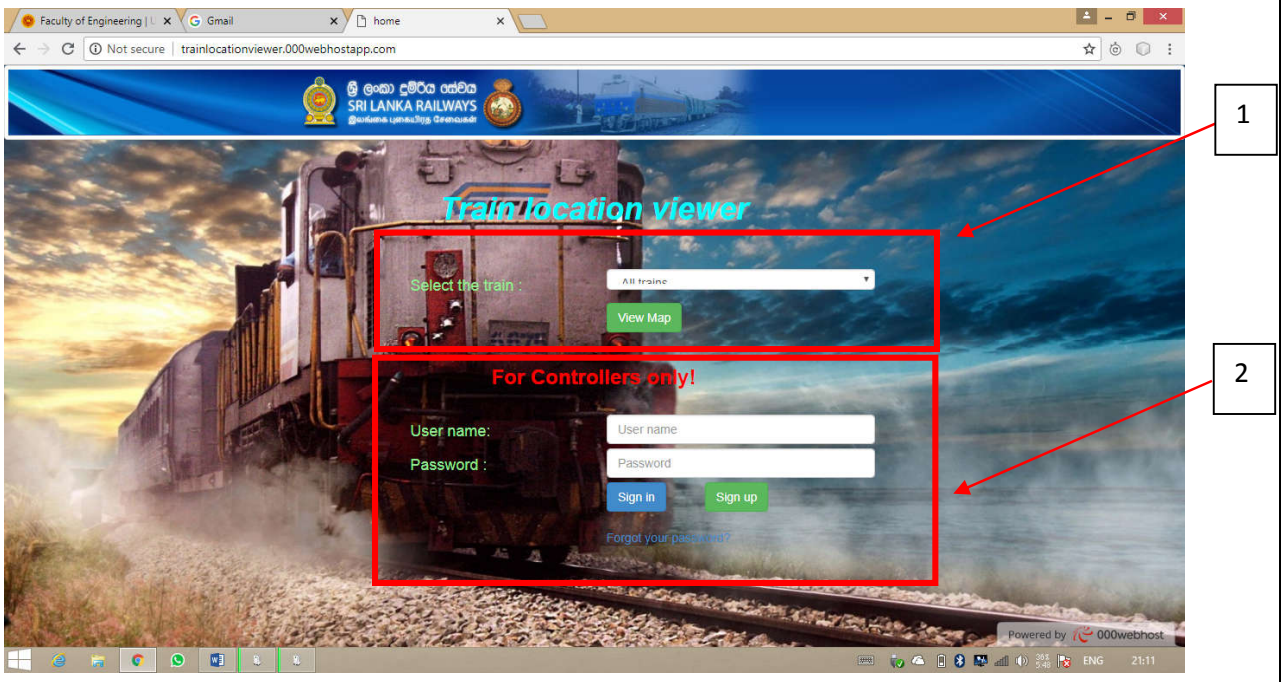
USER MANUAL

Introduction to Interface of Group 2

Train tracking and safety level crossing

The website is http://trainlocationviewer.000webhostapp.com

User manual



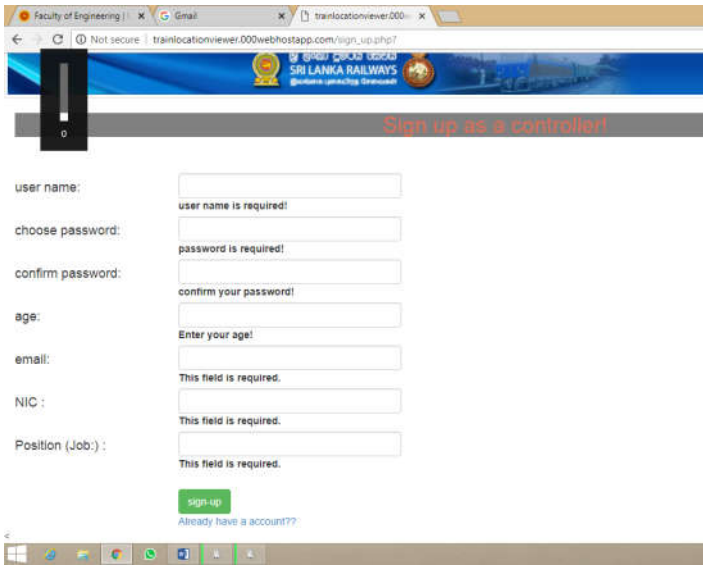
1) Viewers area

A viewer can log without create an account an they can view the train locations only. Using drop box they can select a particular train or all and view their locations.

2) Controllers area

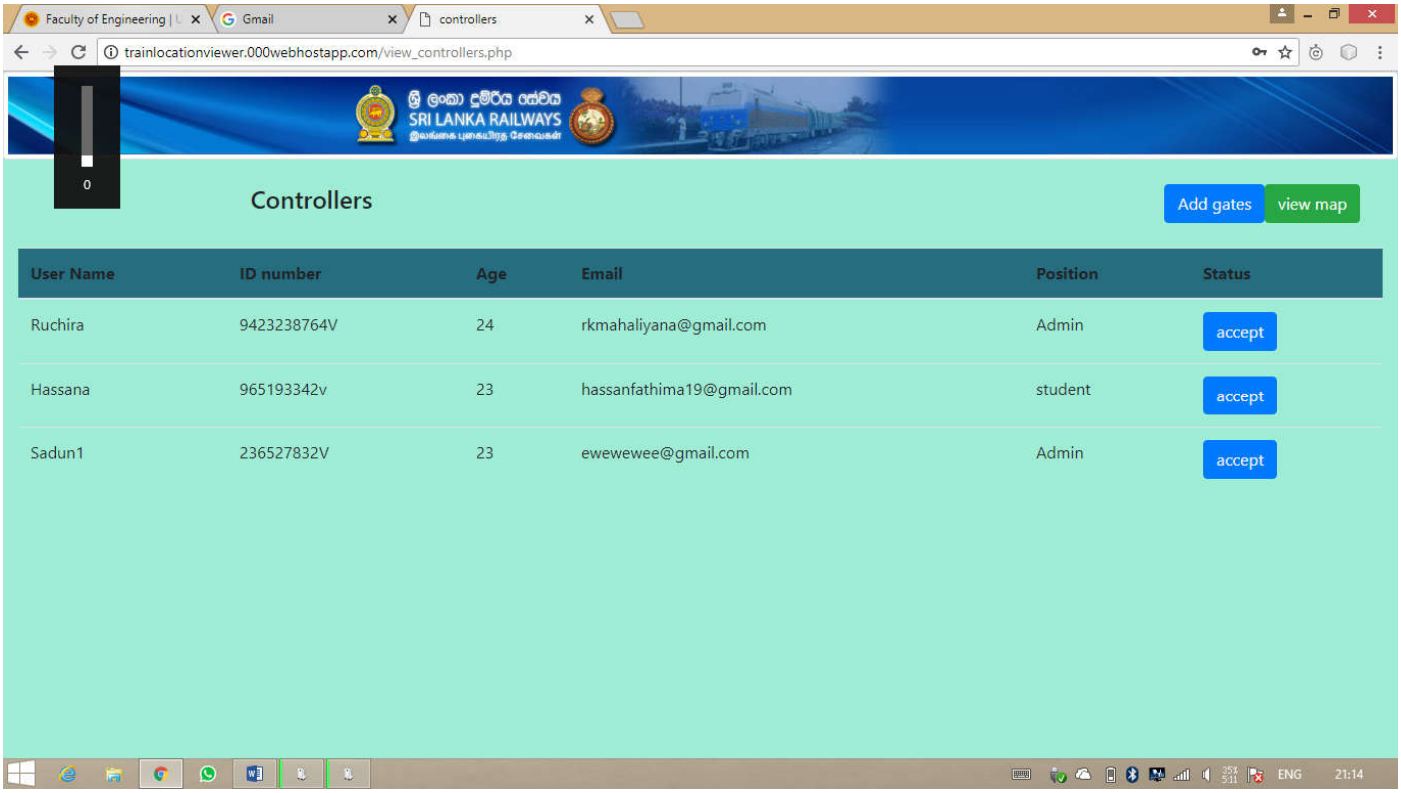
If someone a controller first he should sign up and wait until get approval by an admin. Controllers can view train locations as well as control the rail gates remotely as needed.

By click on sign up button controller scan before entering to the sign up page.



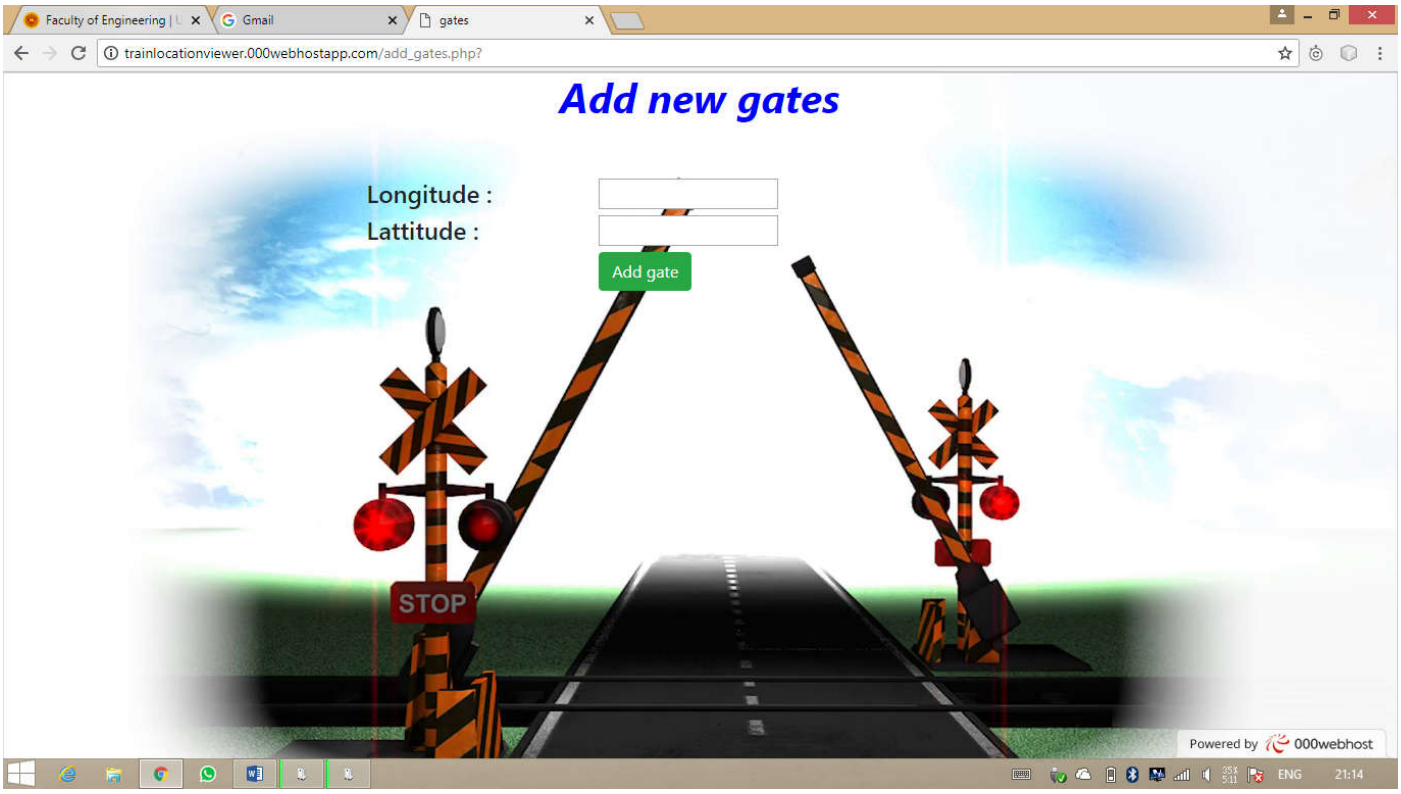
After sign up controllers have to wait for get approval by an Admin.

This is the view of an Admin.

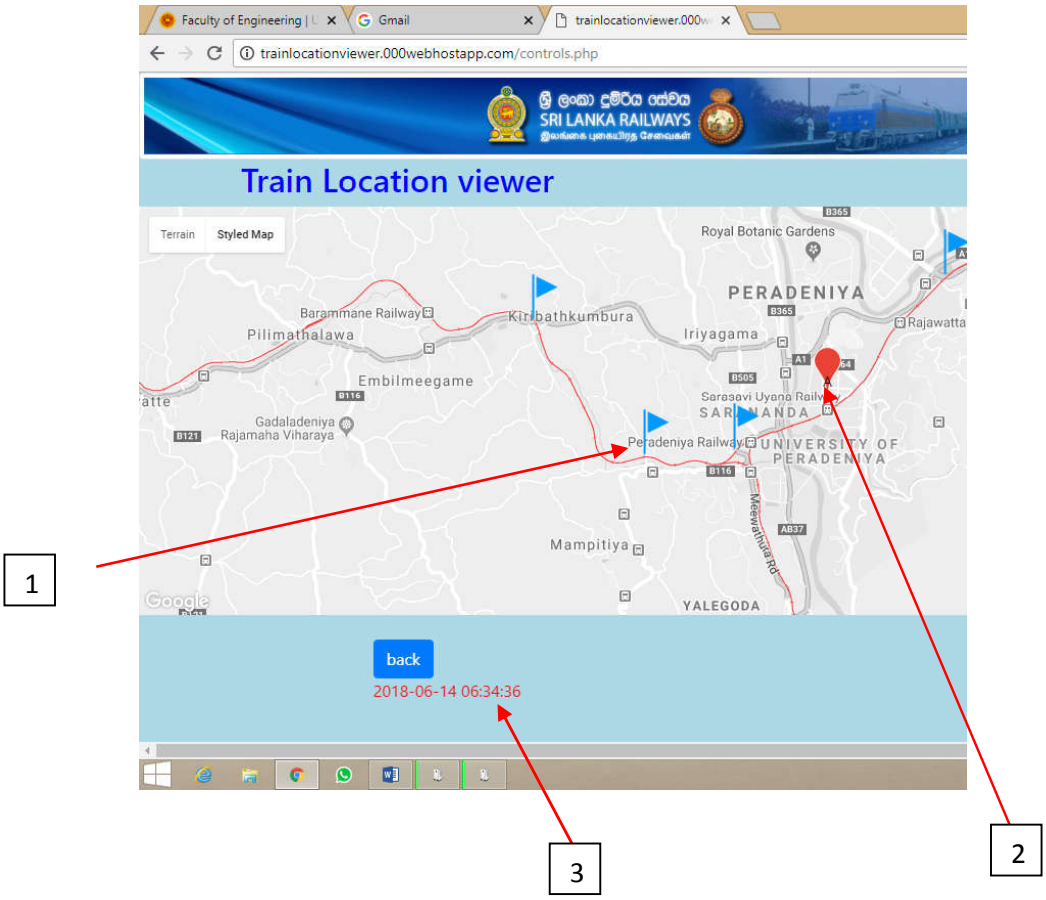


Admin should check the details that provided by controllers and if they are correct he can accept controllers by clicking on ‘accept’ button.

Admin can also add new gates to the system by click on add gates and entering the locations of the gates.



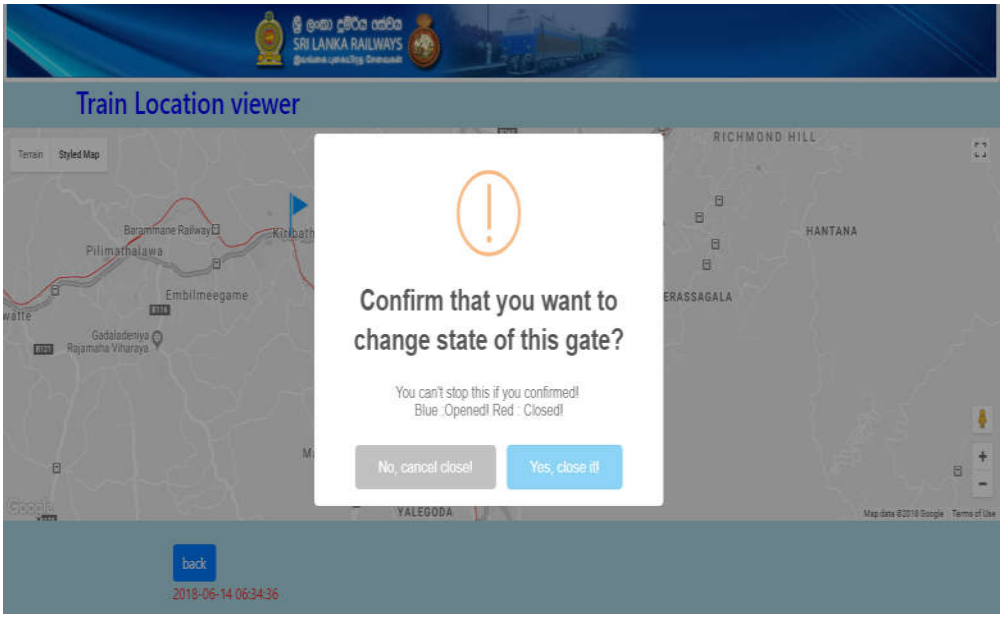
Let's see the controllers view.

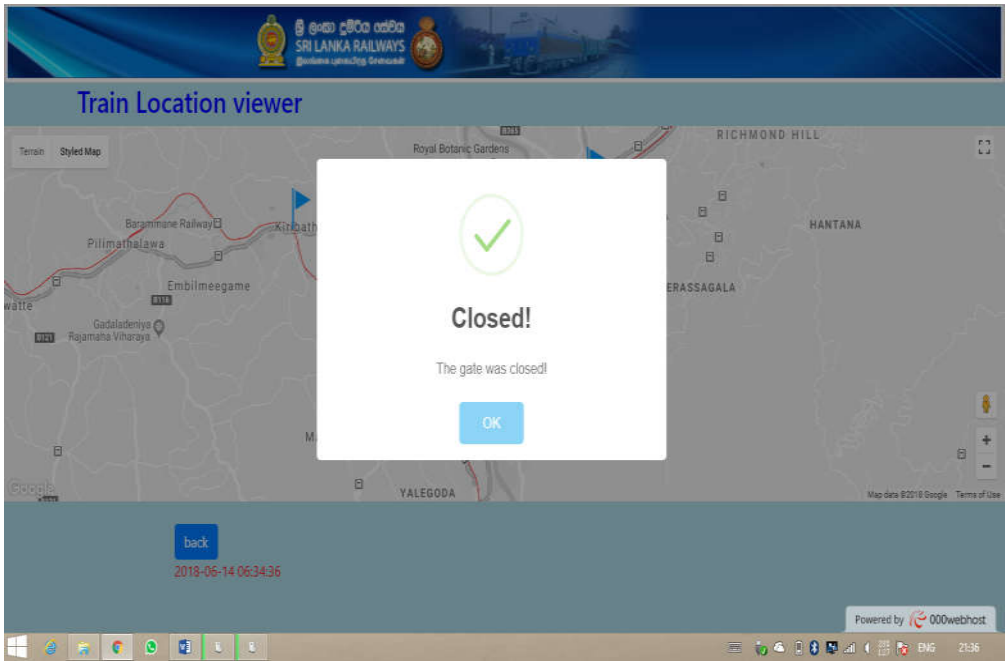


1 These blue flags indicate rail gates. If gate is open then it is blue and if gate is closed then it become red.

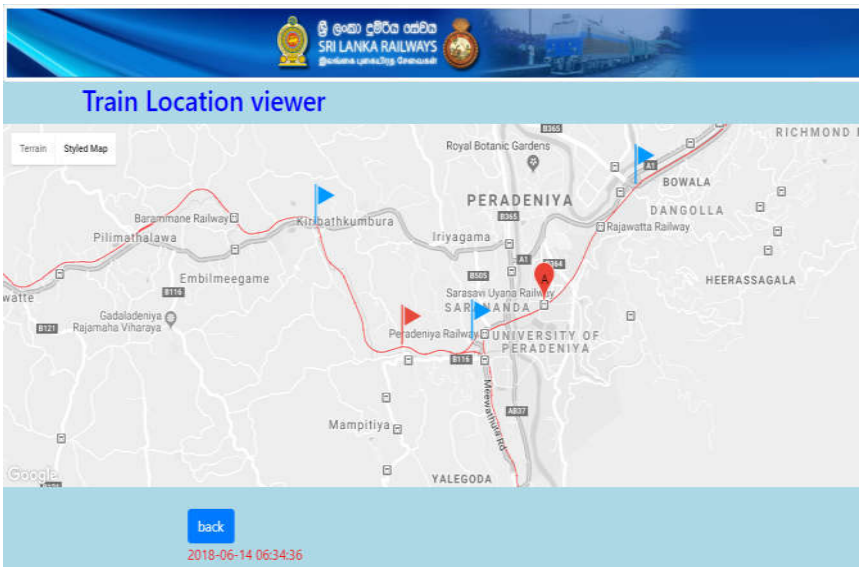
2 Location of the train.

3 The last time and date that update the location of the train and this can be used to identify if there's a signal failure or server failure because this time should be the current time. If it's not then there is a error. (This time is in GMT).





By double clicking on the gate it can be closed.



After close the gate the gate becomes red. After opening it again it becomes blue.

These are the details about the interface.

Embedded system user manual

Device which is for the train

- Mount the device inside of the train. Then power it up. It needs 12V 2A power supply for proper functionality.
- Then you will see LCD display turned on. First, on the LCD display you will see “Setup Complete”. It means device is ready to use.
- After that, you will see “GPRS ON” on the LCD screen. It means device is connected to the internet.
- Then you will see “Sending Data” and GPS co-ordinates on the LCD screen. That means device is sending the GPS co-ordinates of the train’s current location to the Central server.
- Finally, you will see “Sending complete” on the LCD screen. It means device has successfully sent the data to the server.

Device which is for the train

- Mount the device at the level crossing. Then power it up. It needs 12V 2A power supply for proper functionality.
- Connect the device to the internet via Ethernet.
- Then, you are good to go. When server close the gate, there is an LED and it will turn on. The motor will be working. When server open the gate, LED will turn off. The motor will be moving to the counter direction of when it was closed.

SUMMARY

In our project we intend to automate the gate closing by monitoring the train's moments in real time. The department of railways has a manual system to handle that. But through our project, gate closing will be faster and safe than ordinary system.

Our future plan is to expand our system to even control the railway paths and the signal system also.