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IOT based Secured Railway Passengers Service Systems with QR Code and Unmanned Railway Crossing Alarm

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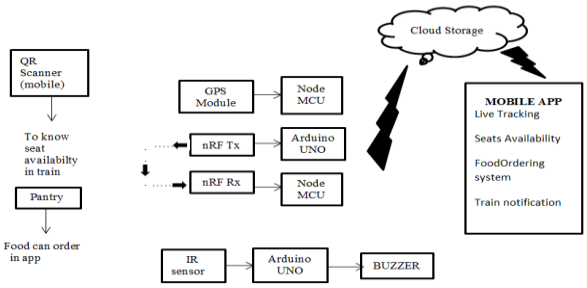
Abstract*: Railway is the most commonly used transportation vehicle. Most of the people choose this transportation mainly for the low cost and it gives comfort ability. To make more comfortable to the users our system gives many solutions and provide the greater facilitations to the users. Mainly our system creates an mobile app where the users can know the which seats are available or empty to reserve with the help of QR scanner. The passengers can order the food within the train and users can know the live tracking of a train using GPS. Our system also provides one alert system near unmanned gate to avoid accidents at the same time which train has come near to which station is also shown with the help of nRF in mobile app

Keywords: IOT, QR (Quick Response) scanner, Pantry System, GPS (Global Positioning System), Accident monitoring.

I. INTRODUCTION

This is developed to make passengers to travel in train very comfortably without any risk. The passengers to travel in train to book seat at an urgency time they are unable to book they should go near railway stations and spend much time to book the seat so to avoid that here an mobile app is created so at any place they were they can easily book the seat with their handled device at the same time when they are travelling they need not to worry about their food in the same app they can order the food. The passengers can know the exact location of train by using the app so they will not miss the train. The other solution in railway is also developed i.e. To avoid accidents near unmanned railway crossings. And which train has come near which station is also known with the help of nRF.

II. BLOCK DIAGRAM



III. SYSTEM IMPLEMENTATION

In the above figure the GPS module is used to track the location of a train [8] where it is useful for the users or passengers that they can come in time to station without missing train by knowing the location of train through GPS. The GPS module is connected to Node MCU and placed in train based on the latitude and longitude values exact location of train can be traced and the data will be stored in cloud and shown in app. The nRF TX and nRF RX is connected to arduino and Node MCU. The nTX is placed in train through arduino when the train has come near to station it transmits which train has come to which station then receiver will receive and data will be stored in cloud and will be shown in app.IR sensor is placed at some distance of near railway crossing [11] when the train comes it detects gives the buzzer to avoid accidents near unmanned railway crossings. The passengers can book the seat through app, In the app the seats which are available can be known through QR [7] scanner which person has book they are given unique QR code. The QR scanner(mobile) is placed at the entrance of train when the passenger is entering into train they need to scan and enter then the passengers who are entered and who are not entered will be known in app, then the other persons who are required they can book the seat.

The passengers who are travelling they need some food so without any risk the passengers can order the food [4] within a train because the pantry system is developed in train itself they can order through app. In the app all the menu will displayed the passenger can order by placing their berth numbers then through the notification the pantry member will receive the person who ordered the food so that they can easily deliver the food.

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IV. SOFTWARE DESCRIPTION

a. Arduino IDE

b. Embedded C

c. Android studio

d. Firebase Cloud storage

e. Java.

a. Arduino IDE: The Arduino IDE is used for arduino controller and Node MCU. In Arduino IDE we can write different languages like C, C++, Embedded C. In this IDE we can write, execute and upload. It can be installed in any PC's like windows, linux etc.

b. Embedded C: The Embedded C is preferred language compare to other because it is an efficient code used for microcontroller based applications. The Embedded C programs were small and efficient they must be optimized for size and speed.

c. Android studio: Android studio is used to develop an app. It is a software development tool for an mobile app. We can use other tool but this android studio has inbulit cloud i.e. Firebase. In the android studio we can design our app as we want by using the Javascript and .xml languages. It is not tough to write the code in android studio we have many functions hints to write the code. Based on the hints we can write the code and design our app.

d. Firebase cloud storage: In the firebase we have inbuilt Google cloud we can directly send the data to cloud. It is a real time data base. In this we have NOSQL cloud database which has ability to save, retrieve, and sync our data. The data is stored as JSON. When our client makes any changes to an saved data then all the clients who are connected will receive the updated data. when our app goes offline also the data remains available. Firebase is mainly a backend system for app or website where we can store images, messages of users. The Firebase system of Google is best compare to other backend systems. If we are not satisfied with our App after developing we can delete through firebase backend. The Firebase supports for IUS, Android App and Web App.

e. Java: Java is a language. Java has its own standard libraries. It is not only useful for developing mobile app but also for desktop applications. It is very easy to implement because it is integrated with HTML. It is a open source platform.

V.HARDWARE DESCRIPTION:

a. Node MCU(ESP8266)

b. Arduino

c. GPS Module

d. IR Sensor & BUZZER

e. nRF TX & RX

a. Node MCU (ESP8266): It is controller in which inbuilt wifi is available. In this controller the pin assignments will be in the form of D0, D1, D2…….. and the frequency band is 2.4GHz. The operating voltage is 3.3V. Integrated with 32bit MCU, 10bit ADC, TCP/IP protocol. The baud rate is 115200. It is programmable with Arduino IDE.

b. Arduino: Arduino is a basic controller. This controller has 14 digital I/O pins and 6 Analog I/O pins. It is programmable with Arduino IDE.

c. GPS Module: The GPS(Global positioning system) is used to navigate the device by receiving the information from satellites and calculate the position of a device. In the project the NEO-6M GPS module is used it has 4 pins they are VCC, GND, TX & RX. The VCC pin of GPS is connected to VCC of Node MCU. The GND pin of GPS is connected to GND of Node MCU. The TX pin of GPS is connected to RX of Node MCU. The RX pin of GPS is connected to TX of Node MCU.

d. IR Sensor & BUZZER: IR sensor is used to sense the object. If the object presents reflected IR light is detected by sensor. If no object presents no IR light is detected by sensor. IR sensor is connected to arduino. It has 3 pins they are OUT, GND, VCC. The OUT pin is connected to 2nd pin of arduino. The GND is connected to GND of arduino. The VCC is connected to VCC of arduino. The 4th pin of arduino is connected to Buzzer.

e. nRF TX & RX: Nordioc radio frequency module which is used to transmit or receive the information between two devices. nRF24L01 is a single chip transceiver. It has 8 pins they are VCC, GND, CSN, CE, SCK, MOSI, MISO, IRQ. Where IRQ is not used, remaining all the other pins are used. nRF TX is connected to Arduino. The 9th pin of arduino is connected to CE of nRF TX. The 10th pin of arduino is connected to CSN of nRF TX. The 11th pin of arduino is connected to MOSI of nRF TX. The 12th pin of arduino is connected to MISO of nRF TX. The 13th pin of arduino is connected to CSK of nRF TX. nRF RX is connected to Node MCU. D2 is connected to CE of nRF RX. D5 is connected to SCK of nRF RX.D6 is connected to MISO of nRF RX.D7 is connected to MOSI of nRF RX.D8 is connected to CSN of nRF RX.

VI. RESULTS

The results of the developed android application and hardware modules are shown below.

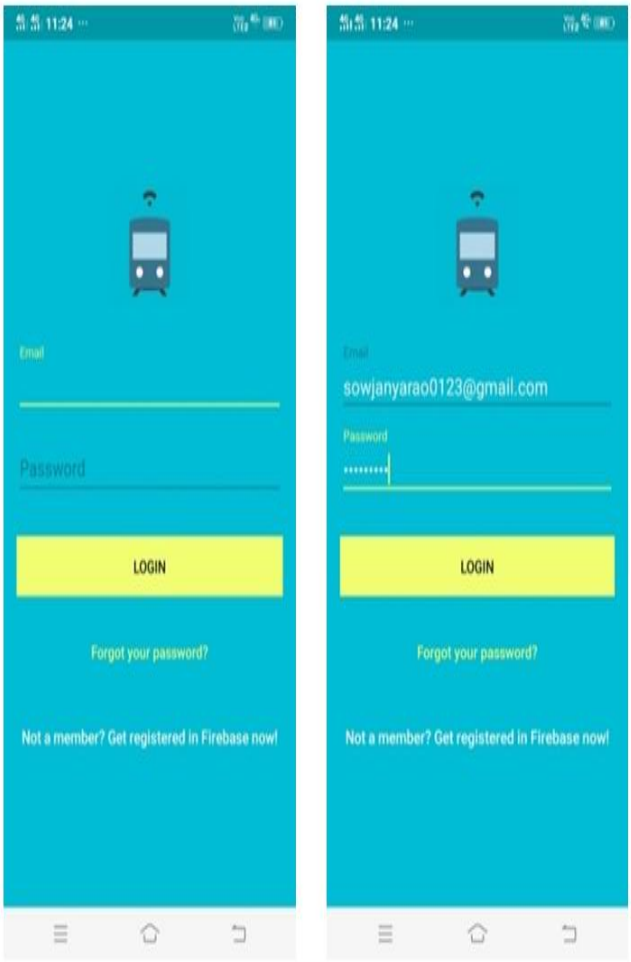

Fig1: To use the app user need to register and login.

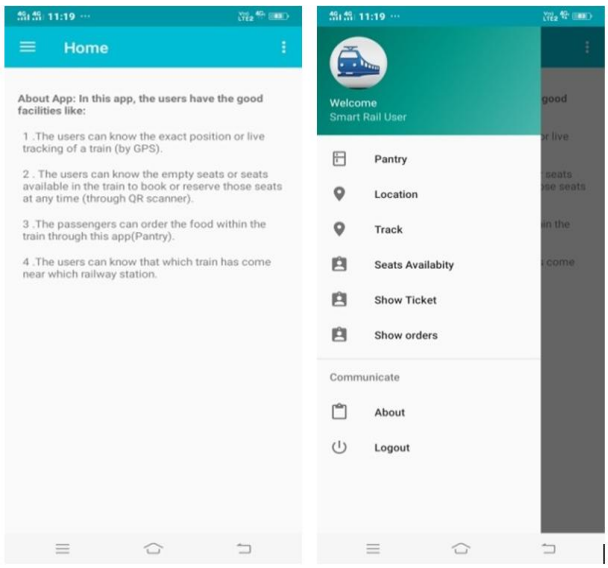

Fig2: when user logged in about app will be displayed in home page and what facilities available in app can be seen.

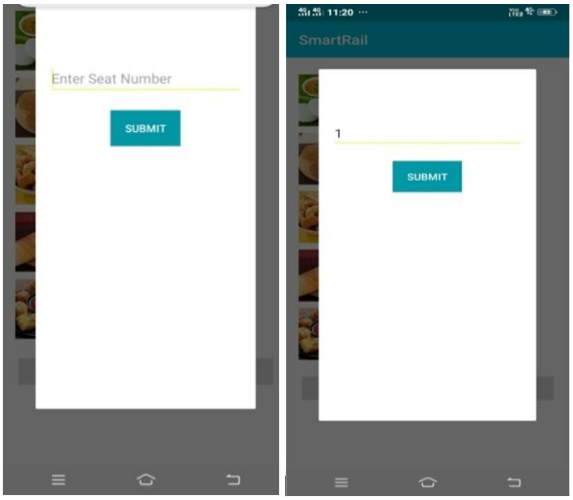

Fig3: The user want to order the food click on the pantry and give the berth or seat number and submit.

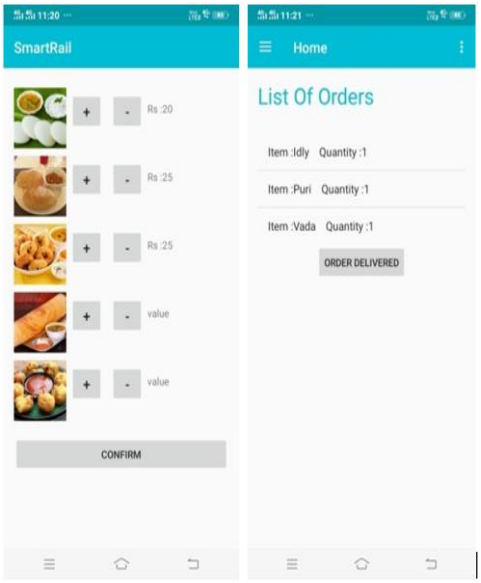

Fig4: Click on + to place the order and – to delete the order there itself user can see the price. After placing the order make it conform and can see the orders in show order list which food you have ordered.

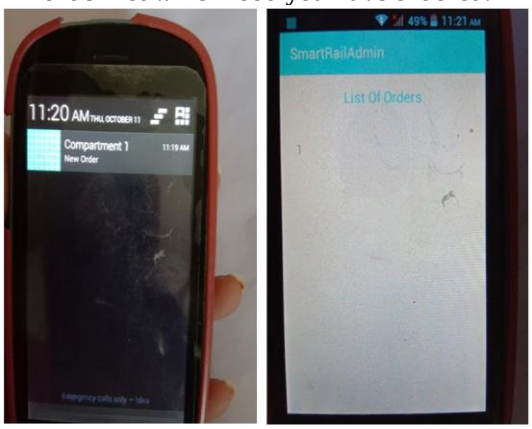

Fig5: When user order the food in the admin app the notification comes then the pantry member will check the order.

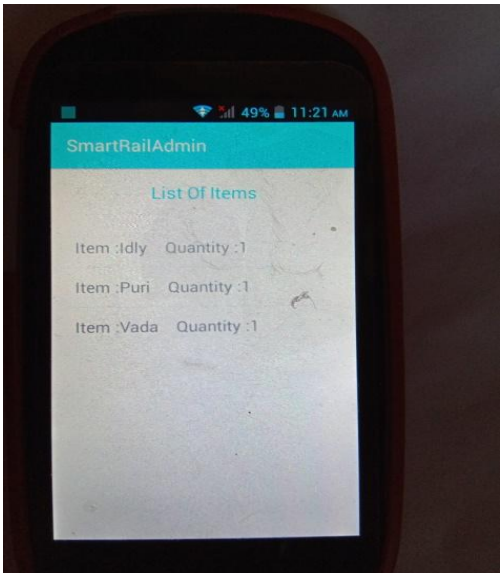

Fig6: The admin can see these list and delivers to that particular user.

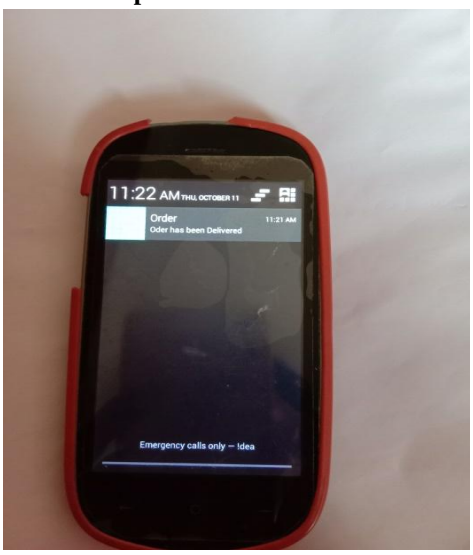

Fig7: The admin can see these list and delivers to that particular user. When user receives the food they can say order delivered then admin will receive the order has been delivered as shown in figure.

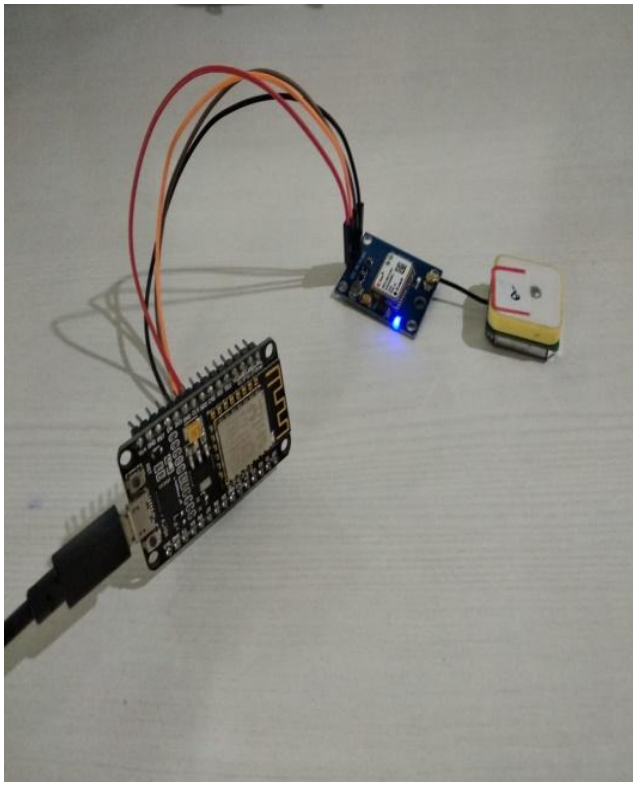

Fig8: To see the exact location of train GPS module is connected Nodemcu with proper connections

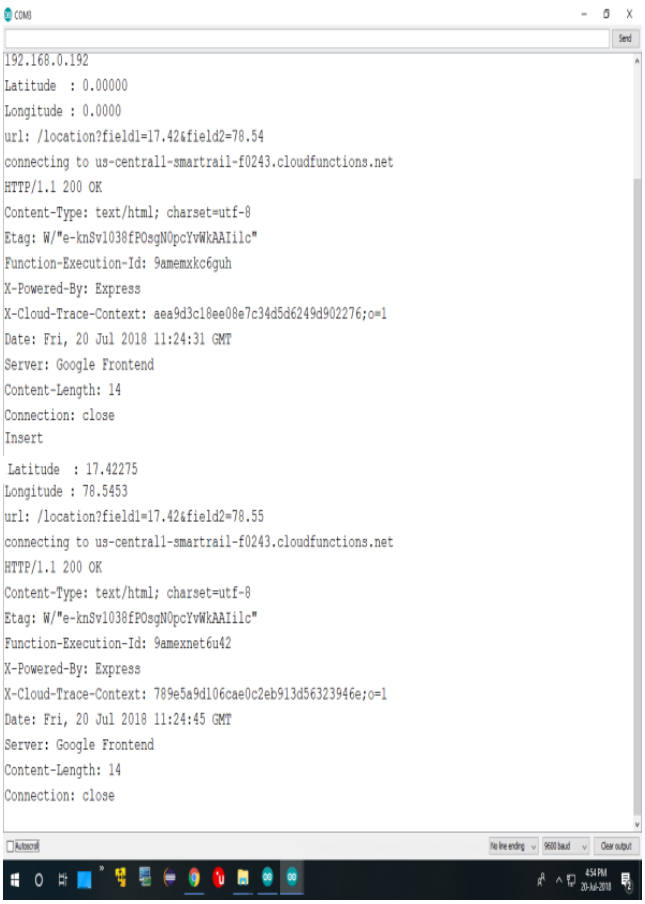

Fig9: when it receives the signal the info shown in arduino IDE as shown in figure.

Fig10: When signals has received through GPS points the location and through the help of cloud the location is shown in App as shown in figure. when the latitude and longitude values changes when train in running position then the location also changes and updated in cloud.

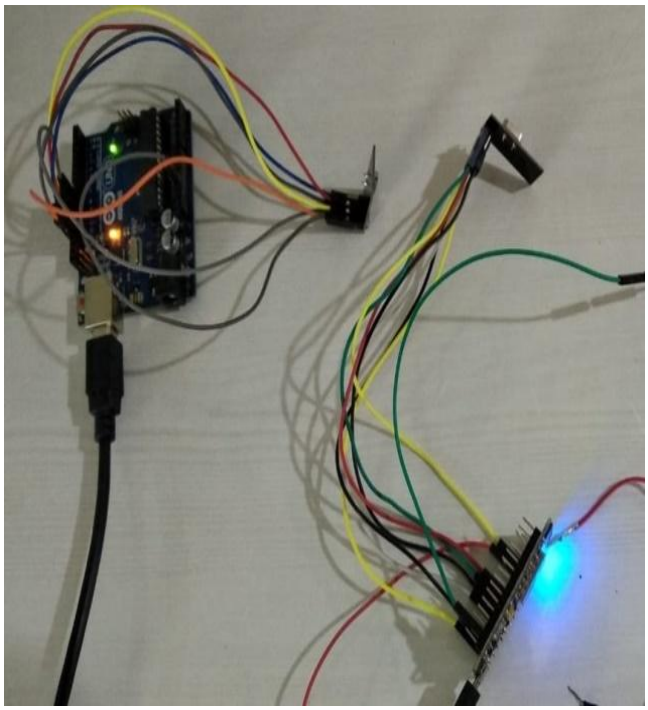

Fig11: The nRF TX and RX is connected to arduino and nodemcu.

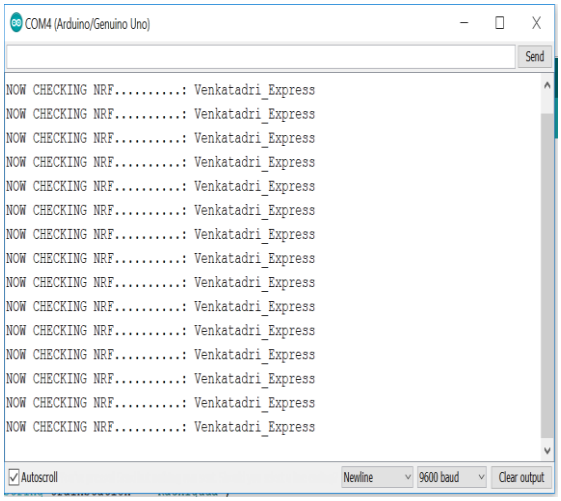

Fig12: nRF TX output is shown in arduino IDE.

```
in loop
Venkatadri_Express
nrf command:Venkatadri_Express
connecting to us-central1-smartrail-f0243.cloudfunctions.net
Requesting URL: /train?field1=Venkatadri_Express&field2=Kachiguda
HTTP/1.1 200 OK
Content-Type: text/html; charset=utf-8
Etag: W/"e-knSv1038fPOsgN0pcYvWkAAIilc"
Function-Execution-Id: 1hnshbdlsr6v
X-Powered-By: Express
X-Cloud-Trace-Context: 63abbceaf45bfba66aa5185bfb16b8e8
Date: Mon, 08 Oct 2018 12:03:53 GMT
Server: Google Frontend
Content-Length: 14
Connection: close

Insert
closing connection
in loop
```

Fig13: The figures are the outputs of nrf RX which will be shown in arduino IDE.

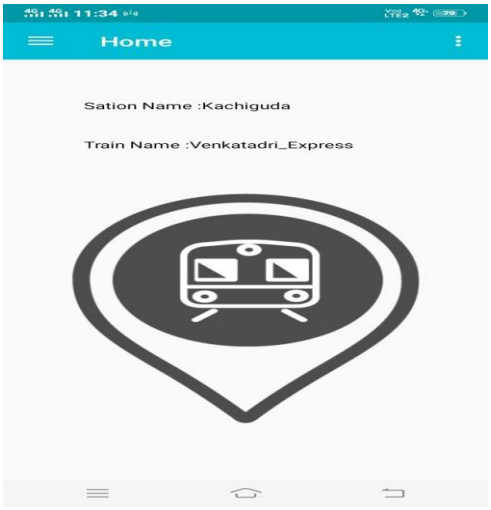

Fig14: Which train has come near to which station that will be shown in app in this way. When the station changes that will be uploaded in cloud in app also changes.

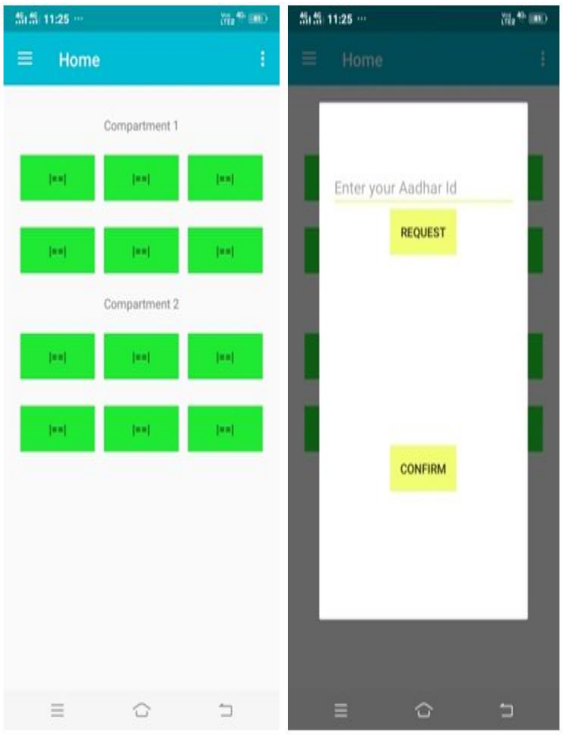

Fig15: For the user to book the seat in train they need to click on seat and enter their Aadhar number then their seat will book and they will get some QR code. When all seats are in green colour that means all seats are empty. Any user can book the seat.

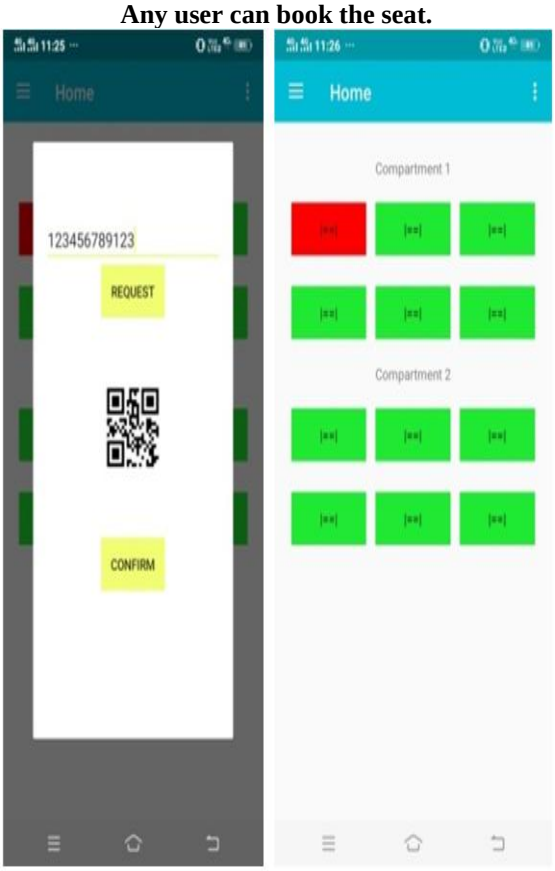

Fig16: As shown in figures QR code generated and first seat has booked. Green colour turns into red.

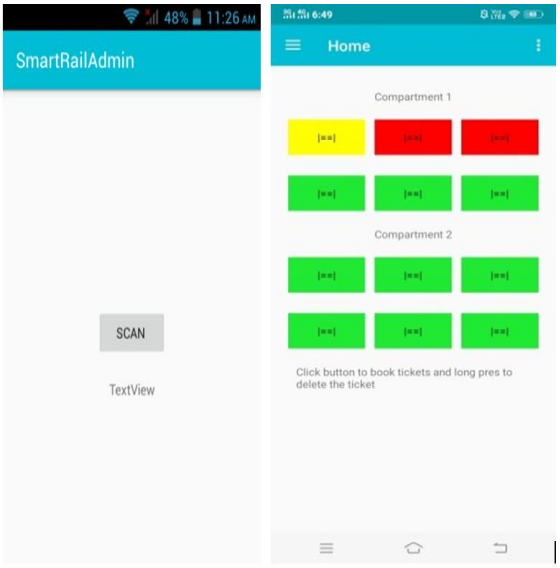

Fig17: when the person entering into train he need to scan his code and enter then it turns into yellow that means person has that seat cannot be cancelled or other person cannot book the seat.

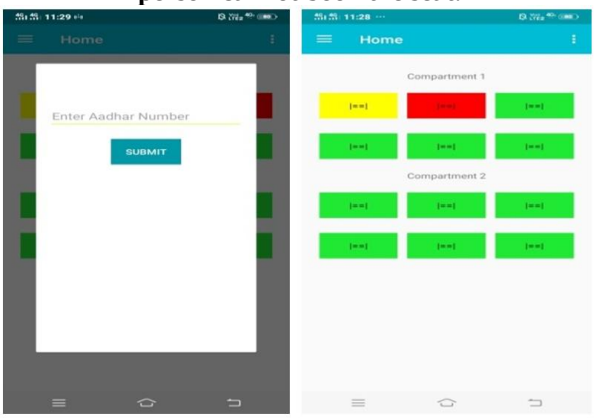

Fig18: As shown in figure the user has the facility to cancel the seat by giving their unique id which they have while booking with the same id they can cancel the seat here the third seat has cancelled where the red colour changes into green again so that other user can book. When the seats booked or cancelled or scanned how the user app shows the admin can also known with the help of admin app.

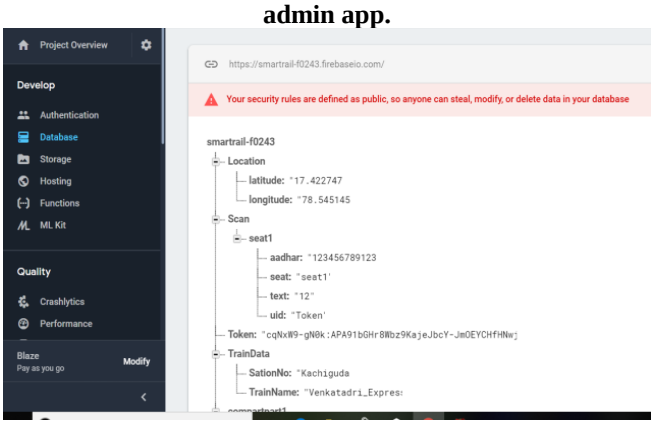

Fig19: Database outputs of GPS and Train/Station information.

Fig20: Seat booking data in database.

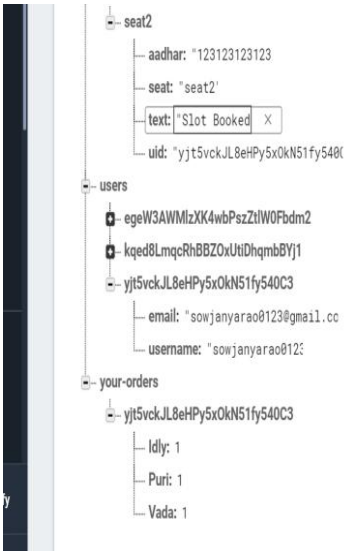

Fig21: Food ordering data in data base.

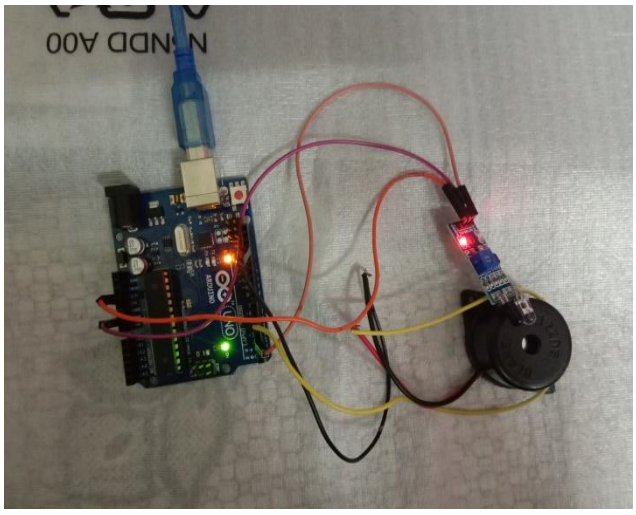

Fig22: IR sensor is connected to arduino to give the alarm near unmanned railway crossing when the train comes. The figure shows objected is not detected because there is no green colour light is blinked near IR sensor when object detects.

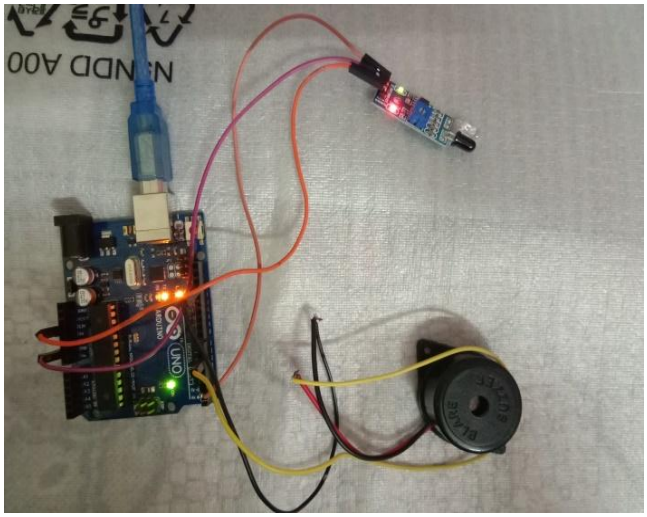

Fig23: The figure shows objected is detected because there green colour light is blinked near IR sensor when object detects and gives alarm through buzzer.

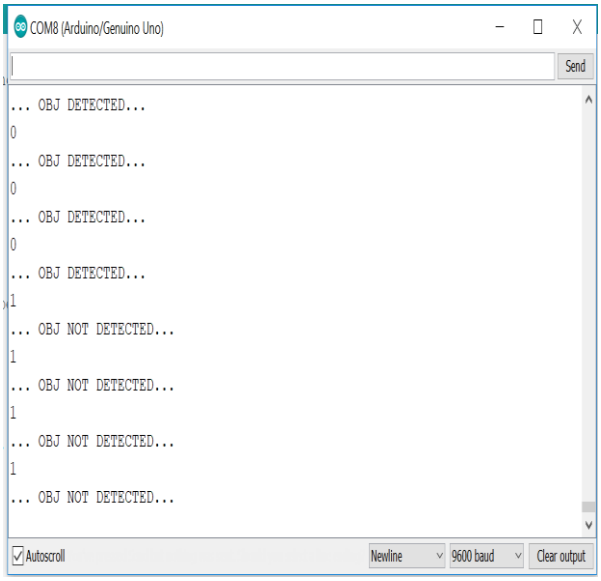

Fig24: when object detected and not detected is shown in arduino IDE output.

VII. CONCLUSION

The developed android application is very useful to the people who can easily travel without any risk as well as this system reduces the manpower and avoid accidents near unmanned railway crossing.

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