

## Chapter 1

### Abstract

There will be a huge pile of vehicles waiting to pass through the main gate of any organization on working days for security check as it is mostly done manually the process becomes very time consuming. Moreover, there is no existing automated system which can check whether the person is wearing a helmet or not. The main aim of our project is a gate system that uses the RFID system along with IOT which is the future of electronic communication. Here we use a dedicated desktop as a controller as well as a server. The vehicle that needs to be authorised is given a RFID tag with a unique number. Now when the vehicle reaches near the gate RFID reader reads the code, and sends a signal to the system which checks for the corresponding details of the unique number and if it matches with the saved data in the database then it again sends a message to the servo motor which opens the gate. The servo motor is programmed such that it opens the gate for a particular time and then closes, but when the vehicle pauses in between the gate for more than the required time then the IR sensor acts immediately which detects a block in its way and keeps the gate open until the vehicle crosses. The IN and OUT time of every vehicle that enters the are saved in a database and also a webserver which helps us to access those details wherever we are using IOT.

Our project deals with a secure RFID gate system that uses IoT technology for better protection .IoT enables the use of internet in connecting different devices that are helpful in our day to day life.. By Implementing this technology in a gateway it enhances the system by providing more security . This type of a gate can be used in large organizations like Industries, Military or Defense area ,Apartments, etc. The system consists of RFID reader and tag, Raspberry pi (Processor & server),Motor (230V AC) , IR Sensor and a gate. The system also uses Python as it is fast and more efficient.A connection is used so that large gates that need high voltage can be operated.When an unauthorised vehicle approaches the gate he/she needs to inform the person they want to meet so that the person inside can login to the website and click the OPEN button to open the gate.An IR sensor is also placed near the gate so that it prevents accident due to collision of the gate.

## Chapter 2

### Introduction and Overview of Project:

Every large organizations like apartments ,industries, military area etc are continuously accessed by the members of the organisation or other people in need of them. These large buildings are also a storehouse of various data that are confidential that can be controlled and given access to only authorised members of the respective authority ,hence they must be well secured. Safety of an organisation mainly depends on its Gate security system because anyone who enters the industry or apartment need to pass through these gates .So they must be monitored. For this reason the entry and exit of all the vehicles to the area are to be watched by the concerned person. In the present system for example in an apartment a watch man is kept all day long ,he/she needs to verify every single vehicle entering the premises. Our project focuses on an unmanned gate security system that uses an RFID .RFID automated gates are not a common thing that we see around especially in apartments etc. Here in this project we bring to you a gate that is fully automated and can be controlled and accesses by the owner from anywhere around the globe.

The vehicle of every authorised personnel of an organization is equipped with RFID tags .When these vehicles come near the gate the RFID tag is recognised by the reader and proccessed by a Raspberry pi, which sends a signal to the motor and the gate is automatically opened. An IR sensor is also used in the circuit to prevent accidents. When an unauthorised person wants to enter the place he must intimate it to the person he wants to meet inside in this way he sends an OTP to the person outside which he uses as a password to open the gate The main purpose of this system is to provide a gate that can be controlled by the owner from anywhere around the world using IOT (Internet of things).The raspberry pi is itself a server that is used for this purpose. A webpage is created and then the owner can have access to all the in and out vehicles. Similarly , in industries the manager or headperson will be able to know if anyone comes or goes out of the area.

There will be a huge pile of vehicles waiting to pass through the main gate of any organization on working days for security check as it is mostly done manually the process

becomes very time consuming. Moreover, there is no existing automated system which can check whether the person is wearing a helmet or not. The main aim of our project is a gate system that uses the RFID system along with IOT which is the future of electronic communication.

## **2.1 Problem:**

In Traditional Gate System , there are no process for auto closing and auto opening gate , so it take time and it is hard for a security guard to always open and close gate in few interval of time and it is basically make slow process in large industry or Organisation.

There are another problem occur in tradition system that if any person comes to enter using their Four Wheeler Vehicle or two wheeler Vehicle , the it is two difficult to identify , if the person is Employees/Student or guest, which is take time to register or to maintain a record manually.

The another issue is the two wheeler person comes with without helmet, then there is no process to identify and check for helmet and to make warn for it. It is always follows manually process.

## **2.2 Purpose:**

### **Gate Automation Process:**

The main aim of this type of a gate system is that it uses the RFID system along with IOT which is the future of electronic communication. Here we also replace the microcontrollers earlier used with a raspberry pi 2 which is a mini processor that is both a microcontroller as well as a server. The vehicle that needs to be authorised is given a RFID tag with a unique number. Now when the vehicle reaches near the gate RFID reader reads the code ,and send a signal to raspberry pi which checks for the corresponding details of the unique number and if it matches with the saved data in the database then it

again sends a message to motor which opens the gate. The 230V AC motor is programmed such that it opens the gate for a particular time and then closes, but when the vehicle pauses in between the gate for more than the required time then the IR sensor acts immediately which detects a block in its way and keeps the gate open until the vehicle crosses. The IN and OUT time of every vehicle that enters the area is saved in a database and also a webserver which helps us to access those details wherever we are using IOT. there is no existing automated system which can check whether the person is wearing a helmet or not.

### **Helmet Detection Process by using image processing:**

The main aim of this process is to check helmet using image processing and take a photo using camera for two wheeler vehicle and process the data to store in database which can help to follow a rule in organization and can warn to the person if he/she are not using helmet and can add some fine for it if the rule is not obeyed.

### **2.3 Aims and Objectives:**

We are making Artificial Intelligence based Smart Gate Automation System Which helps for all places like Education Organisation, Companies, Every large organizations like apartments, industries, military area etc are continuously accessed by the members of the organisation or other people in need of them. This is also Detect By image processing which can check whether the person is wearing a helmet or not. We are using some IoT Devices for this project to detect vehicles and if the vehicle is a four wheeler and belongs to its employees vehicles it automatically open the gate because it is registered in our authorised database, and if not then it will alert as a guest Vehicles. Then If it is two wheeler, it is check whether Both as employees or guest and also check if the rider is wearing helmet or not, if not then it will alert to stop the gate.

## 2.4 Scope:

Internet of Things is not something new and its been there in the industry for a long time. Like Airforce, Army, Navy, Space research etc.

Anything that touches consumer industry became a buzz word. So now Internet of Things is one among. What it is - the end goals is to bring all things we use in day to day life over network and can be accessed across the world over internet. That means every objects/gadgets we use in a day to day life will have a identify over network and its information can be consumes via Laptop, Tablet and mobile and including wearable like smart watches.

Why we should do it - the first and foremost thing is automation. In a typical day, we all have a 24 hours - 1/3 of time goes in bed, 1/3 of time goes in office/school and 1/3 third of time we have to spend for ourselves. How effectively are we spending this time will have a ripple effect on throughout the life.

So here we are doing this project gate automation system and helmet check to do more efficient for secure a organization and to identify vehicle details and to check whether the person is using helmet or not during two wheelers riding and we are using iot device like raspberrypi3,Arduino and some other devices to manipulate the data flow and data storage of an organization.

## Chapter 3

### Overall Description

There are various kinds of existing gates slide gates, swing gates, barrier gates etc. These are the commonly used types apart from these there are hydraulic gates etc. They are controlled mostly manually . Later came the automated systems that use microcontrollers and RFID and opens when a vehicle with a known tag enters. But this system consists of a microcontroller a pc with server. Which is indeed a costly circuit for a gate. Due to this reason they are not very affordable and are not used commonly.

#### 3.1 Product Perspective:

The main aim of this type of a gate system is that it uses the RFID system along with IOT which is the future of electronic communication. Here we also replace the microcontrollers earlier used with a raspberry pi 3 which is a mini processor that is both a microcontroller as well as a server and also we are using Arduino for data collection purpose. The vehicle that needs to be authorised is given a RFID tag with a unique number. Now when the vehicle reaches near the gate RFID reader reads the code ,and send a signal to raspberry pi which checks for the corresponding details of the unique number and if it matches with the saved data in the database then it again sends a message to motor which opens the gate. The 230V AC motor is programmed such that it opens the gate for a particular time and then closes, but when the vehicle pauses in between the gate for more than the required time then the IR sensor acts immediately which detects a block in its way and keeps the gate open until the vehicle crosses. The IN and OUT time of every vehicle that enters the are is saved in a database and also a webserver which helps us to access those details wherever we are using IOT. The main aim of this study is to propose and develop a system for automatic detection of helmets on public roads. The motto of this project is accident prevention by using the methods of alcohol detection, helmet authentication, fall detection etc.

### 3.2 Product Features

Using of IOT device in this Project we are changing the old traditional method and it will help for time efficient to identify the person enter into the gate and it will help to open and close gate after person identification. As per product prospective of this project help to gate automation and helmet detection to know the enter person details in to the gate and also to make a organization more secure by using this product.

## Chapter 4

### Requirement Analysis

#### 4.1 Personnel and Tasks

1. Arduino To RFID configuration and some hardware configuration done By Lalit
2. Raspberrypi3 to database Server connection and data fetch using mqtt and Image processing using TensorFlow Done By Jitu
3. Website designing and database designing and data fetch from raspberry pi3 to MySQL database done by Ashish.

#### 4.2 Technical Feasibility:

- a. It can detect vehicles having RFID tags only.
- b. For helmet checking biker needs to slow down his/her bike.
- c. RFID tags has a limited range to operate.
- d. Continuous power supply to the system



### **4.3Economic Feasibility**

Economical view This project module is low cost for maintained. There are some hardware which is used in this project like camera module and rfid tag, raspberry pi3, and Arduino, some led, jumper wire are very low cost and easily available in market.

### **4.4Operational Feasibility**

- In operation view this project is working fine and do not have any debug issue
- The functional and data transfer working and providing real time system interface.

## Chapter 5

### Selection of Software Development Lifecycle

#### 5.1 Requirements

1. Internet Connection
2. Always On Current Supply for working the module
3. Adding with Software requirement and hardware requirement.
4. Always maintenance should be provide

#### 5.2 Status of Development Team

Here The development team add some device and the Connectivity of all the device with appropriate model work for smart Gate automation system and helmet detection.

Here the Process is Start From Admin for registration of vehicle by the use of RFID tag. RFID is connected to Arduino for Communication to server.

Again Arduino Connected to Raspberry Pi3 with Same network.

The process from Raspberry Pi3 to Database Connection Through MQTT server.

Some Module connected to the Raspberry Pi3 like Camera And Motor Driver Which connected to the Motor For gate Opening and Closing

Here Sliding gate are made for easy and time efficient work purpose.

After The database update the data will show in a Web application which is made by Electron JS.

## **Working :**

When a User show their RFID tag in front of RFID It will verify from the database which is Register or not.

If it is not Register the gate can not open till the user registration not completed.

Basically it is help to identify between guest and User entering to an organization .

If the User the Register then it check for 2 wheeler or 4 wheeler registration.

After verify the gate automatically open to pass the vehicle. But if the Vehicle is two wheeler , the camera work to check for the user with helmet or without helmet. and it record a logbook if the user is not wear helmet it add some fine in the logbook.

## **5.3 Involvement of Users**

The users can easily use this model working as real time basis.

The user need to only Register from admin as he/she below to an organization By the help of getting a RFID tag for a prospective Vehicle.

For Verification of user and user need to show their RFID tag in front of RFID and if the User Comes with 2 wheeler then need wear helmet.

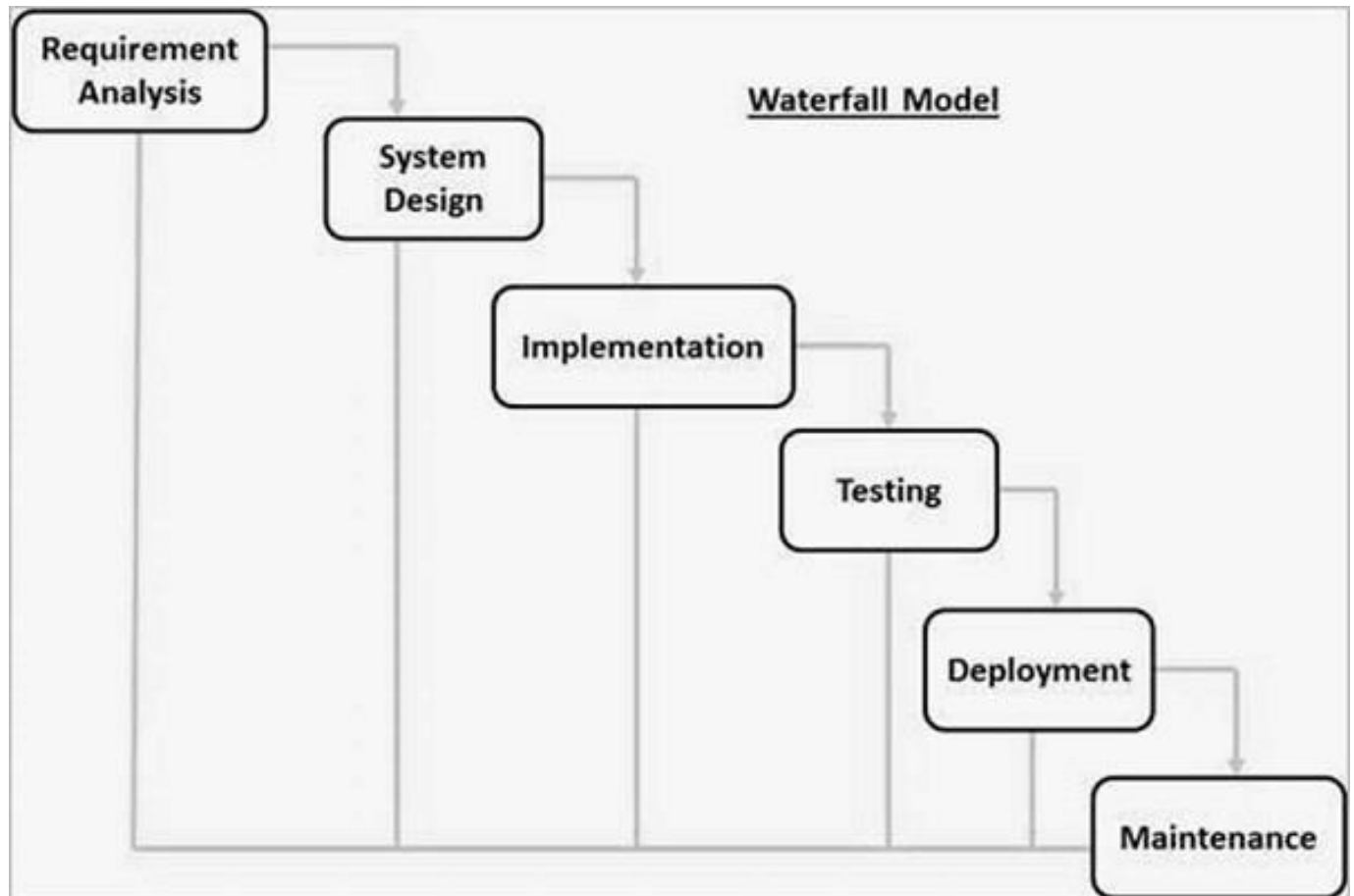
## **5.4 Type of Project and Associated Risk**

The Project is IOT based and it is Smart automation system for Gate and Helmet detection.

This project is base on totally on waterfall Model

The following illustration is a representation of the different phases of our Project

## Waterfall Model:



### The sequential phases in Waterfall model are –

- Requirement Gathering and analysis – All possible requirements of the system to be developed are captured in this phase and documented in a requirement specification document.
- System Design – The requirement specifications from first phase are studied in this phase and the system design is prepared. This system design helps in specifying hardware and system requirements and helps in defining the overall system architecture.

- Implementation – With inputs from the system design, the system is first developed in small programs called units, which are integrated in the next phase. Each unit is developed and tested for its functionality, which is referred to as Unit Testing.
- Integration and Testing – All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.
- Deployment of system – Once the functional and non-functional testing is done; the product is deployed in the customer environment or released into the market.
- Maintenance – There are some issues which come up in the client environment. To fix those issues, patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment.

### **Waterfall Model – Application:**

Every software developed is different and requires a suitable SDLC approach to be followed based on the internal and external factors. Some situations where the use of Waterfall model is most appropriate are –

- Requirements are very well documented, clear and fixed.
- Product definition is stable.
- Technology is understood and is not dynamic.
- There are no ambiguous requirements.
- Ample resources with required expertise are available to support the product.
- The project is short.

### **Waterfall Model – Advantages:**

The advantages of waterfall development are that it allows for departmentalization and control. A schedule can be set with deadlines for each stage of development and a product can proceed through the development process model phases one by one.

Development moves from concept, through design, implementation, testing, installation, troubleshooting, and ends up at operation and maintenance. Each phase of development proceeds in strict order.

### **Some of the major advantages of the Waterfall Model are as follows –**

- Simple and easy to understand and use
- Easy to manage due to the rigidity of the model. Each phase has specific deliverables and a review process.
- Phases are processed and completed one at a time.
- Works well for smaller projects where requirements are very well understood.
- Clearly defined stages.
- Well understood milestones.
- Easy to arrange tasks.
- Process and results are well documented.

### **Waterfall Model – Disadvantages:**

The disadvantage of waterfall development is that it does not allow much reflection or revision. Once an application is in the testing stage, it is very difficult to go back and change something that was not well-documented or thought upon in the concept stage.

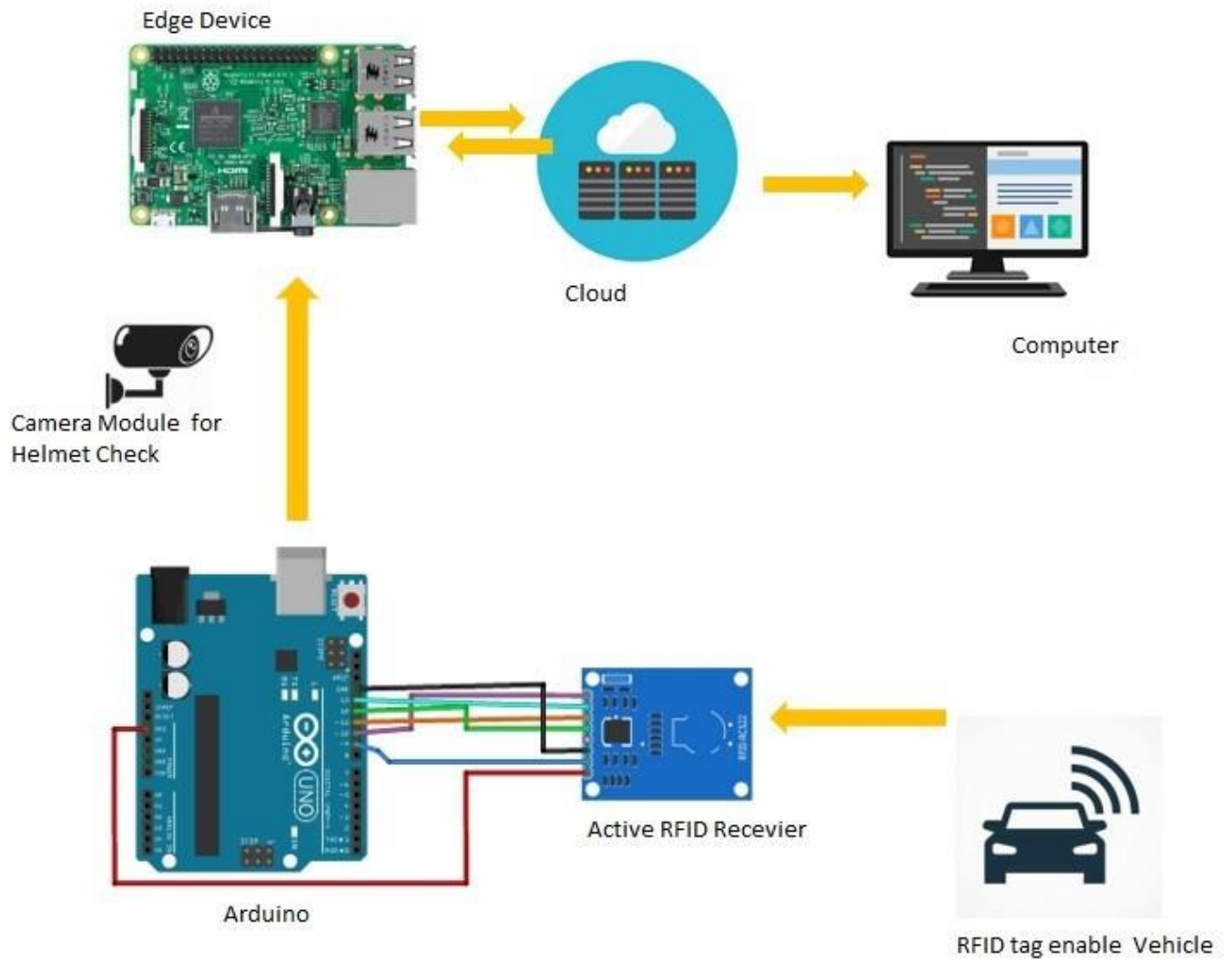
The major disadvantages of the Waterfall Model are as follows –

- Cannot accommodate changing requirements.
- All resources are need for this complete this project and to get automated real time data we need all type requirement with look up on some limitation

## Chapter 6

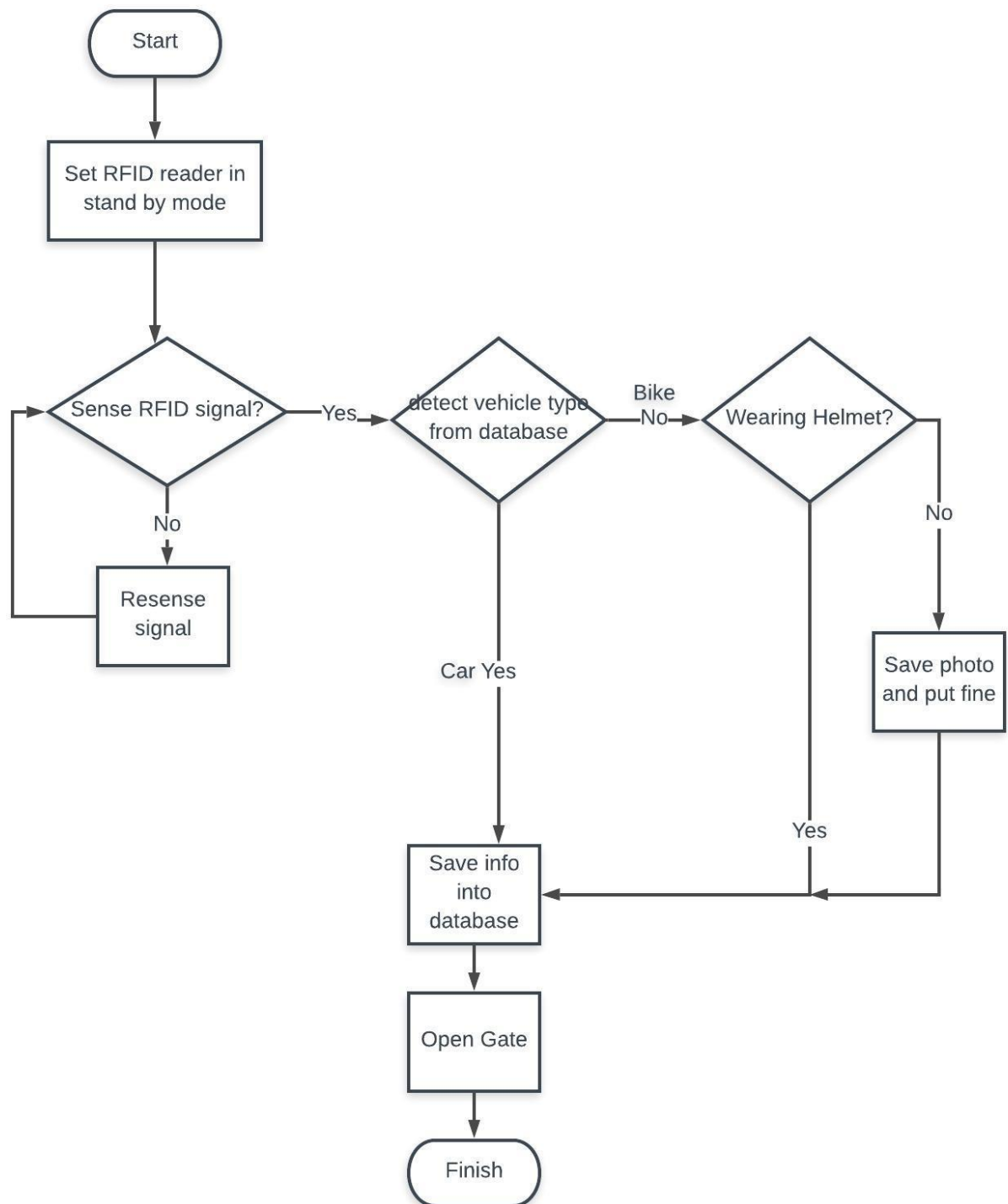
## Designing

### 6.1 Flow Diagram

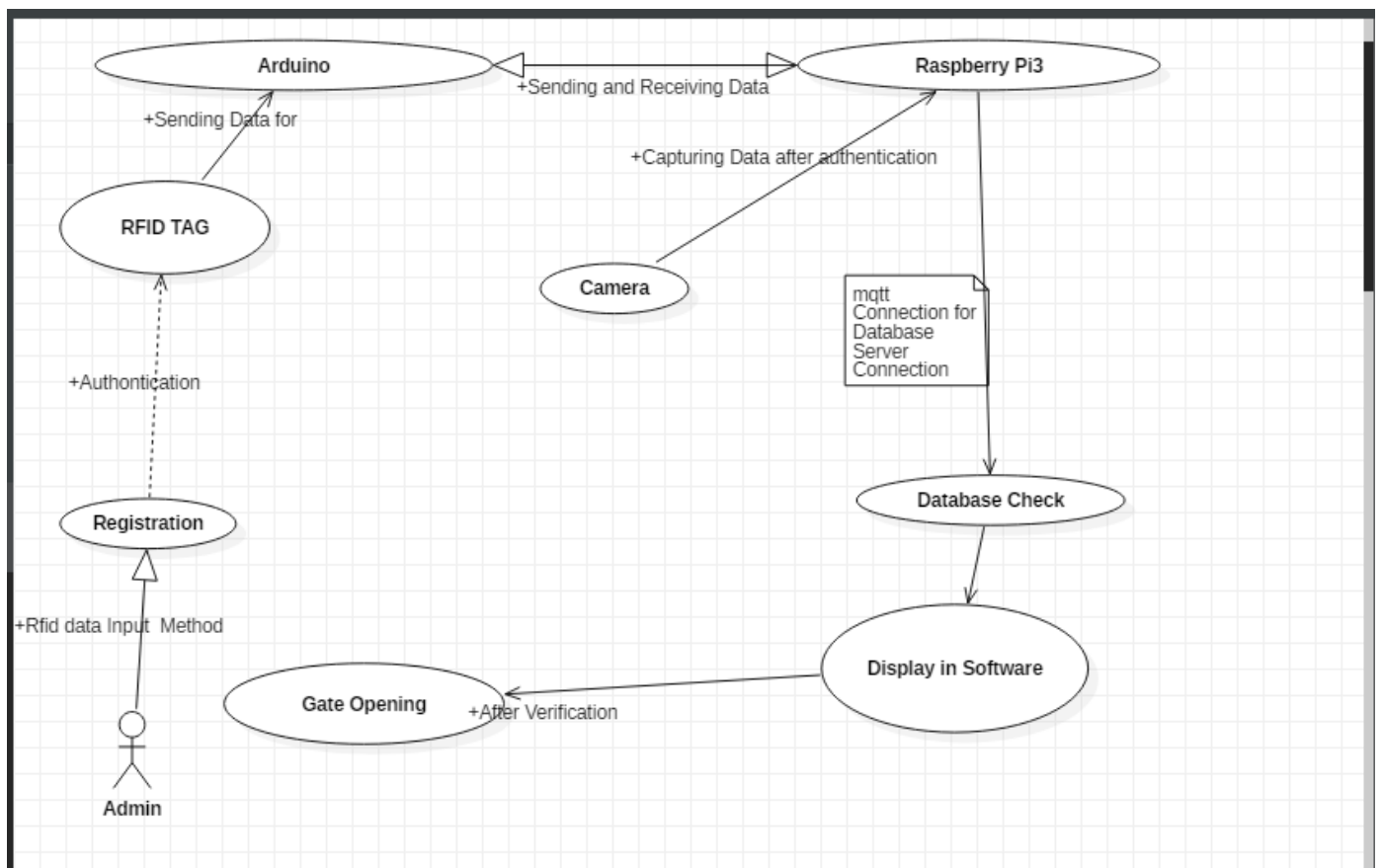




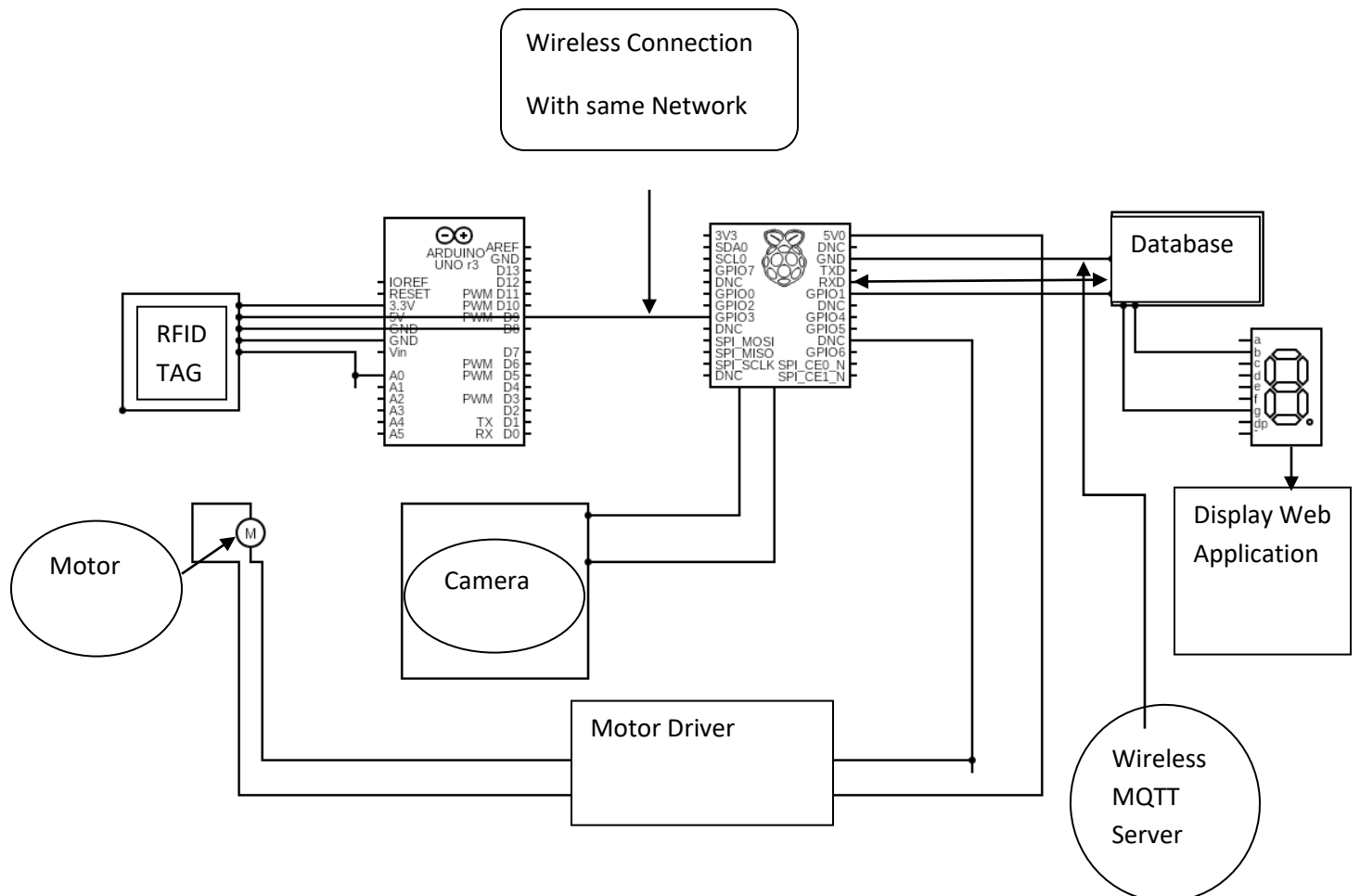
## 6.2DFD



### 6.3 Use Case Diagram



## 6.4 Circuit Diagram



## **Chapter 7**

### **System Requirements**

#### **7.1 Software Requirements**

- 7.1.1 Arduino IDE
- 7.1.2 Raspbesrrypi3 OS
- 7.1.3 Pycharm IDE
- 7.1.4 OpenCV
- 7.1.5 MYSQL Database
- 7.1.6 PhpStrome IDE
- 7.1.7 FSWebCam
- 7.1.8 Programming Language used:
  - 1. Python
  - 2. Php
  - 3. Html
  - 4. Css
  - 5. javascript
  - 6. MySQL
  - 7. Electronic JS

## **7.2 Hardware Requirements**

7.2.1 Arduino

7.2.2 Raspberry Pi3

7.2.3 Camera Module

7.2.4 Buzzer

7.2.5 Led

7.2.6 Jumper Wire

7.2.7 PC Monitor

7.2.8 RFID Active and Passive Tag

7.2.9 Raspberry Pi3 1.2-1.4 Giga Harz Processor

7.2.10 1 Gb Ram and Sd Card Supported as 32 gb

## Chapter 8

### Project Scheduling

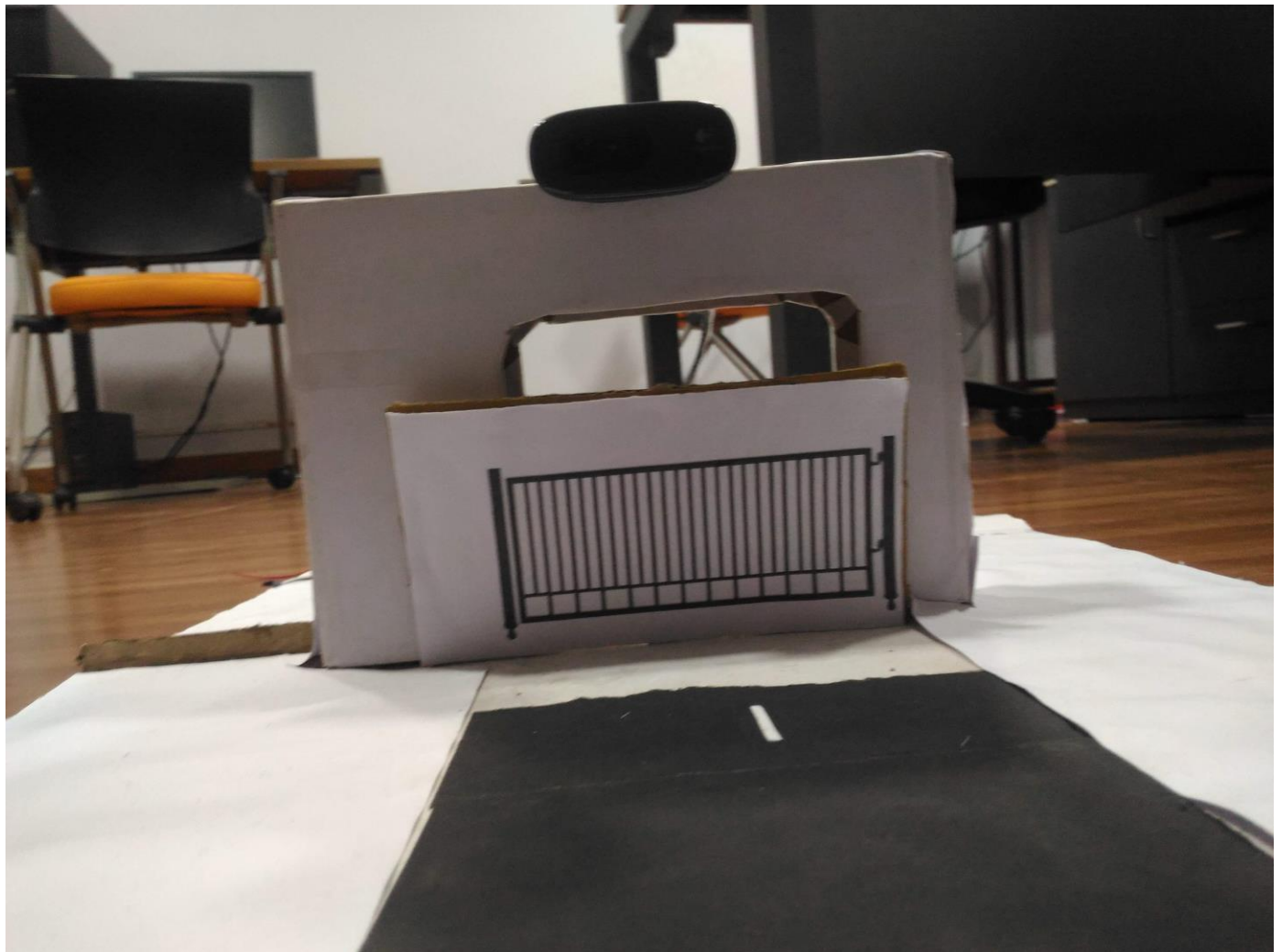
PROJECT NAME SCHEDULE	
Line Item	Delivery deadline
Arduino to RFID Connection with proper setup	24 January 2019
Arduino To raspberry pi3 Connectivity -I	2 February 2019
Raspberry pi3 MQTT configuration-I	07 February 2019
Demo Module Setup form Setup-I	12 February 2019
Database -I	18 February 2019
Web Application Design-I	22 February 2019
Arduino To raspberry pi3 Connectivity-II	23 February 2019
Testing working Module	25 February 2019
Demo Module Setup form Setup-II	27 February 2019

Database -II	4 March 2019
Web Application Design-II	05 March 2019
Web Application Design-III	07 March 2019
Testing Working Module	08 March 2019
Project Complete	09 March 2019

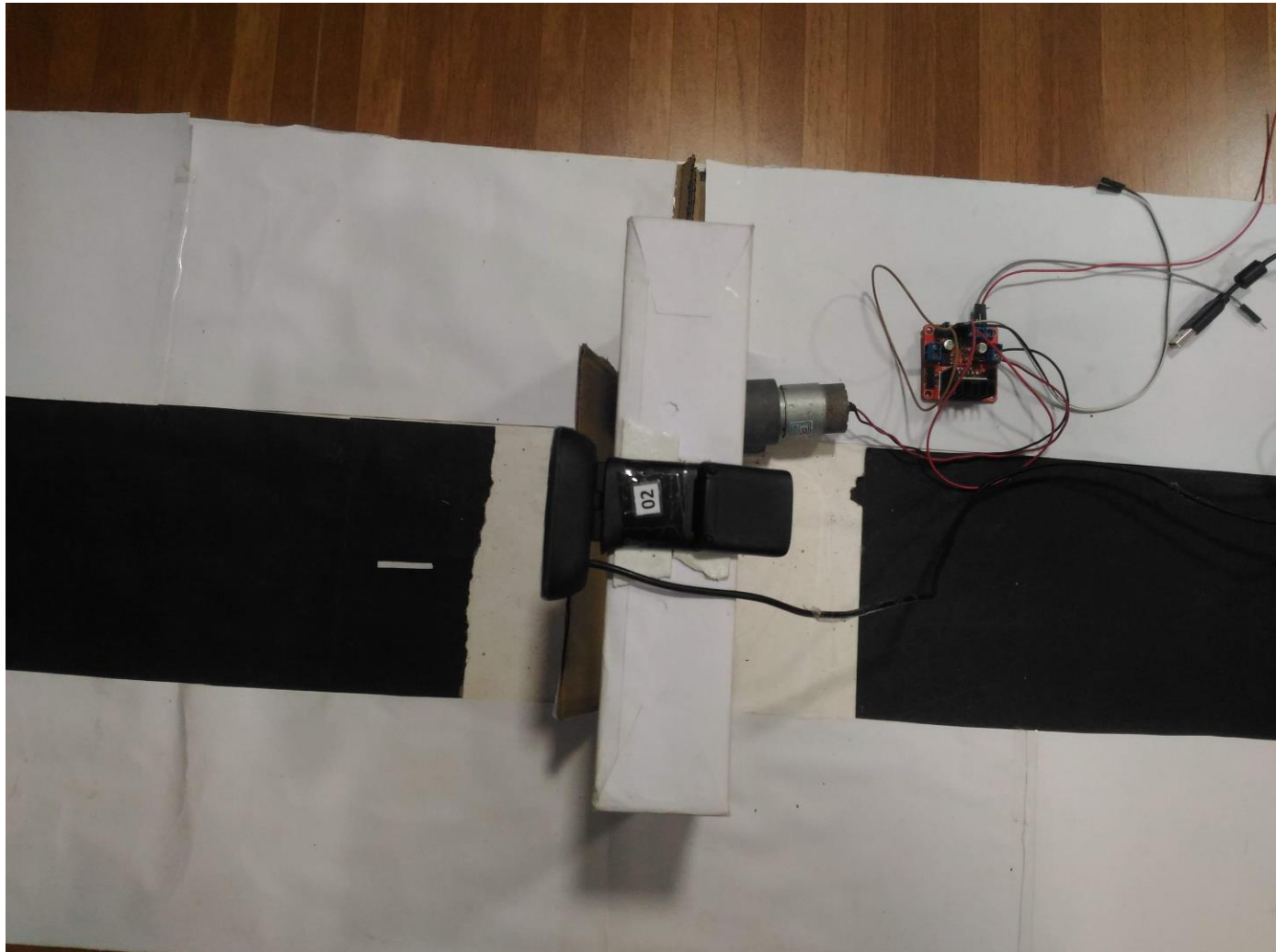
## Chapter 9

### Snapshots

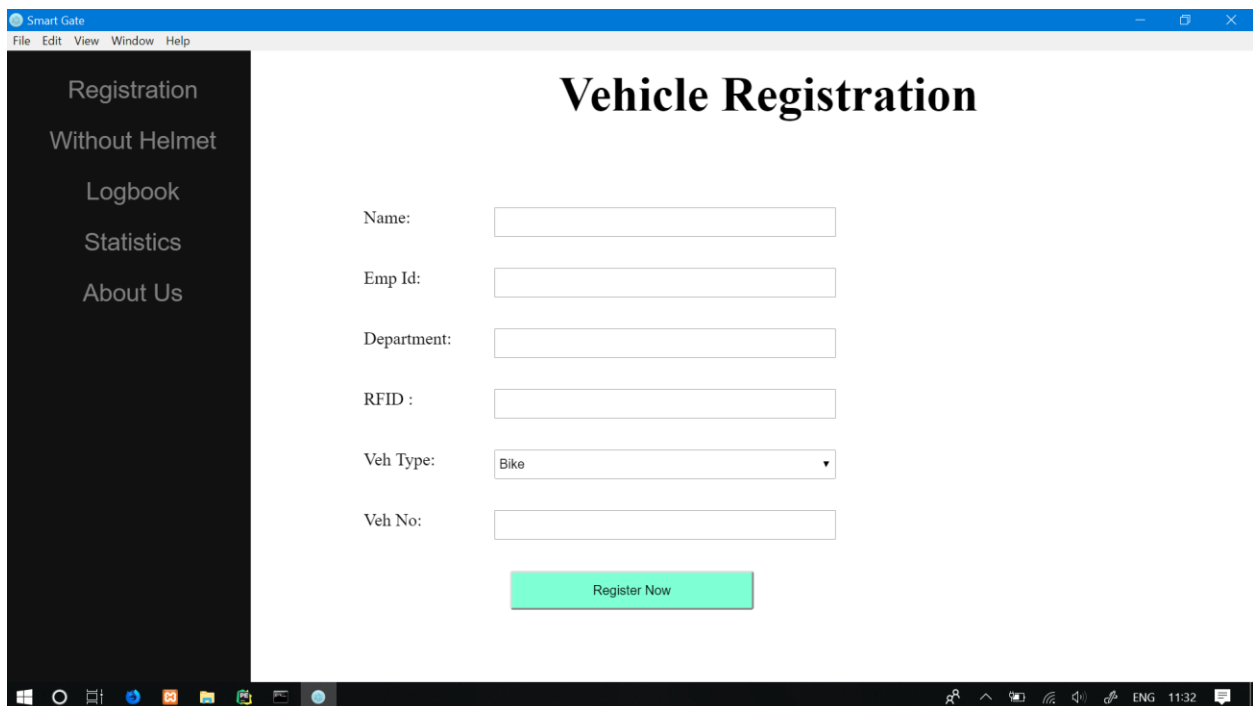
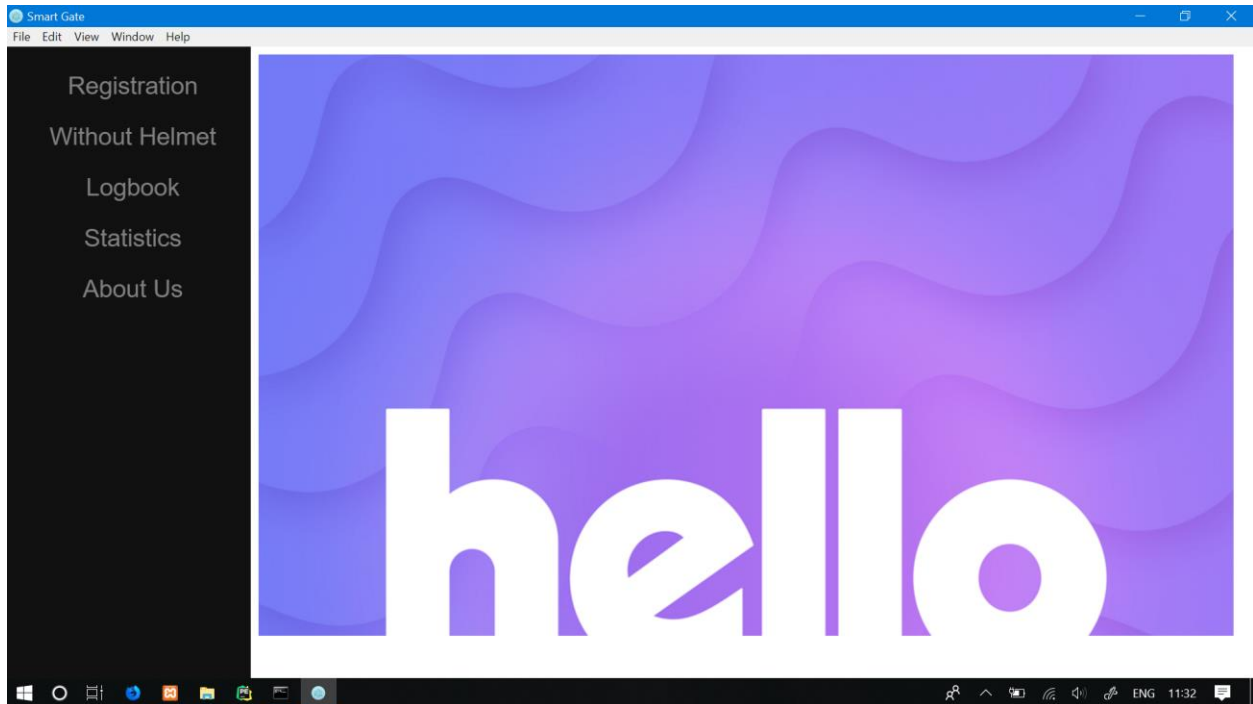
**Our Model:**








## Admin's Portal:

A screenshot of the 'Smart Gate' web application showing the 'Vehicle Registration' form. The browser window title is 'Smart Gate' with a menu bar of 'File', 'Edit', 'View', 'Window', and 'Help'. The left sidebar is identical to the previous screenshot. The main heading is 'Vehicle Registration'. The form contains the following fields: 'Name:' with a text input box; 'Emp Id:' with a text input box; 'Department:' with a text input box; 'RFID :' with a text input box; 'Veh Type:' with a dropdown menu currently showing 'Bike'; and 'Veh No:' with a text input box. Below these fields is a green button labeled 'Register Now'. The Windows taskbar at the bottom shows the system clock at 11:32.

Smart Gate

File Edit View Window Help

Registration  
Without Helmet  
Logbook  
Statistics  
About Us



2019-02-25 08:23 (GMT)

Windows taskbar: 11:32

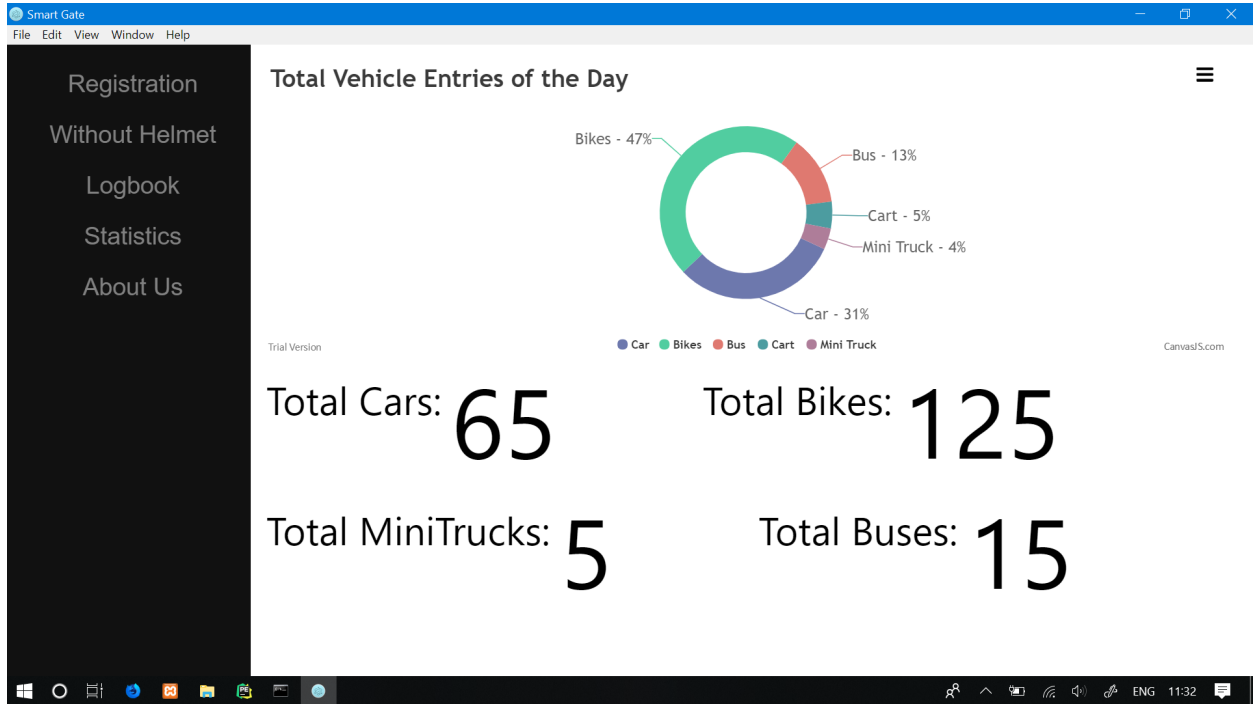
Smart Gate

File Edit View Window Help

Registration  
Without Helmet  
Logbook  
Statistics  
About Us

S No	Name	Time	Veh No
85	Lalit Kumar Mahabhoi	2019-02-25 16:16:10	OD 78 523712
84	Ashish	2019-02-25 16:15:41	OD 34 56R4
83	Lalit Kumar Mahabhoi	2019-02-25 16:15:10	OD 78 523712
82	Ashish	2019-02-25 16:14:33	OD 34 56R4
81	Lalit Kumar Mahabhoi	2019-02-25 16:13:23	OD 78 523712
80	Ashish	2019-02-25 16:11:18	OD 34 56R4
79	Lalit Kumar Mahabhoi	2019-02-25 16:10:16	OD 78 523712
78	Ashish	2019-02-25 16:09:36	OD 34 56R4
77	Lalit Kumar Mahabhoi	2019-02-25 16:05:25	OD 78 523712
76	Ashish	2019-02-25 16:04:12	OD 34 56R4
75	Lalit Kumar Mahabhoi	2019-02-25 15:56:11	OD 78 523712
74	Ashish	2019-02-25 15:54:41	OD 34 56R4
73	Lalit Kumar Mahabhoi	2019-02-25 15:52:40	OD 78 523712
72	Ashish	2019-02-25 15:52:10	OD 34 56R4
71	Lalit Kumar Mahabhoi	2019-02-25 15:48:37	OD 78 523712
70	Ashish	2019-02-25 15:48:08	OD 34 56R4

Windows taskbar: 11:32



Smart Gate

File Edit View Window Help

Registration  
Without Helmet  
Logbook  
Statistics  
About Us

## Hello World

This is our CDAC IoT Internship Project.

### Our Developers:

Ashish Kumar Senapati  
Jitu Nayak  
Lalit Kumar Mahabhoi

Windows Taskbar: 11:32

## Chapter 10

### Testing

#### 10.1 Introduction

##### **Sliding Gate Test Points:**

A typical sliding gate closing scenario test points required by this standard are indicated and must be carried out as follows :- Vertically testing points to be measured are 50mm from bottom, 300mm from top and then halfway up the gate (up to a height of 2.5M). Distances from closing position are also measured at 500mm, 300mm & 50mm. Each measurement point is tested 3 times and the average value is used, there are a total of 27 measurements to make using an EN12445 approved testing device. If the average test results exceed 400N in force an appropriate protective device (e.g. resistive Safety Edge) should be fitted to the gate and the tests carried out again.

The tests are repeated for the opening phase of the gate if an obstruction or opening post is in place (If the average test results exceed 400N in force an appropriate protective device (e.g. resistive Safety Edge) should be fitted to the gate and the tests carried out again.

##### **Gate Automation module:**

This module are working with great and providing real time result for opening and close the sliding gate .

The motor and and some device like raspberry pi3, Arduino and RFID tag working good and give accurate result after testing the device.

## **10.2 Testing of individual Modules:**

### **RFID data testing:**

User authentication passed if the RFID tag id register in data base then it will check and authenticate successfully

### **Arduino Data Testing:**

Arduino connecting with RFID tag and sending data to raspberry pi for ser authentication for using RFID.

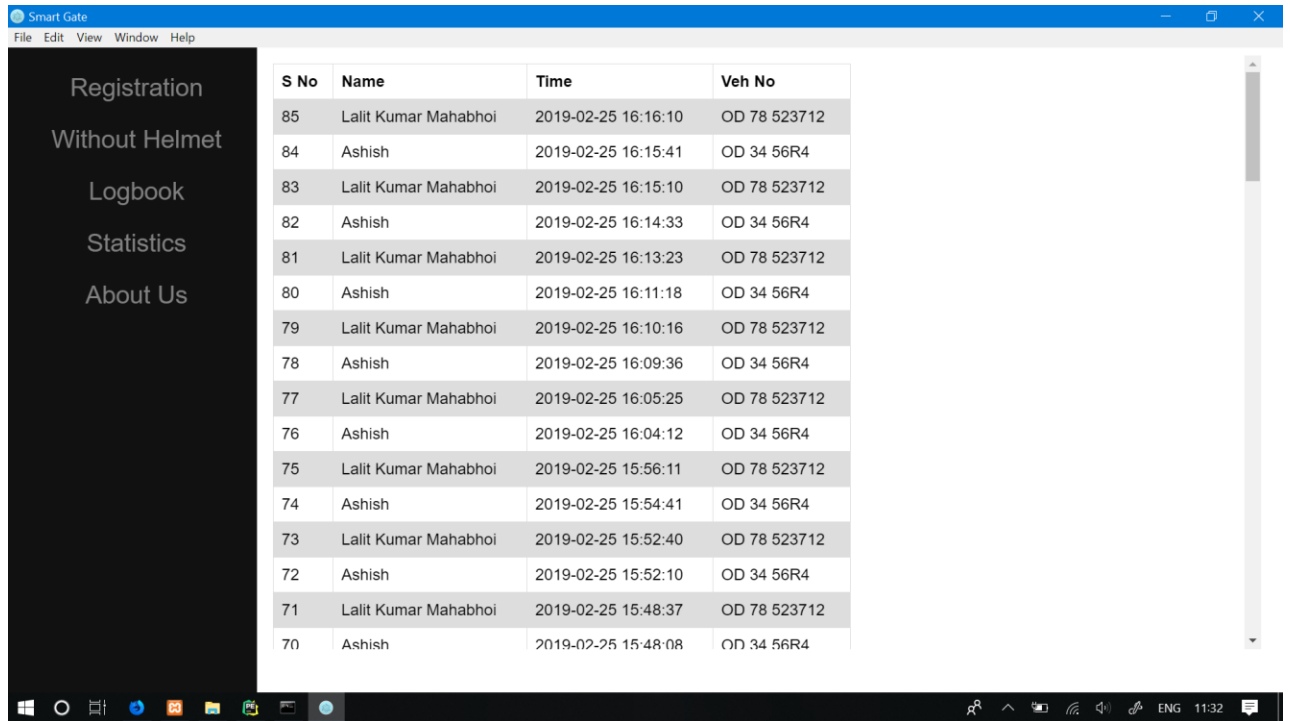
### **Raspberry pi3 data Testing:**

After receiving data from Arduino , Raspberry pi sending the data to database and if the authentication process need camera for capturing photo for authentication it will process the data and sent the data for further authentication for gate opening and closing

### **Database Data fetch testing:**

After getting data from Raspberry pi3 the database fetch the data and send to raspberry pi3 to opening and closing the gate in real time basis

## 10.3 Creating Test Data

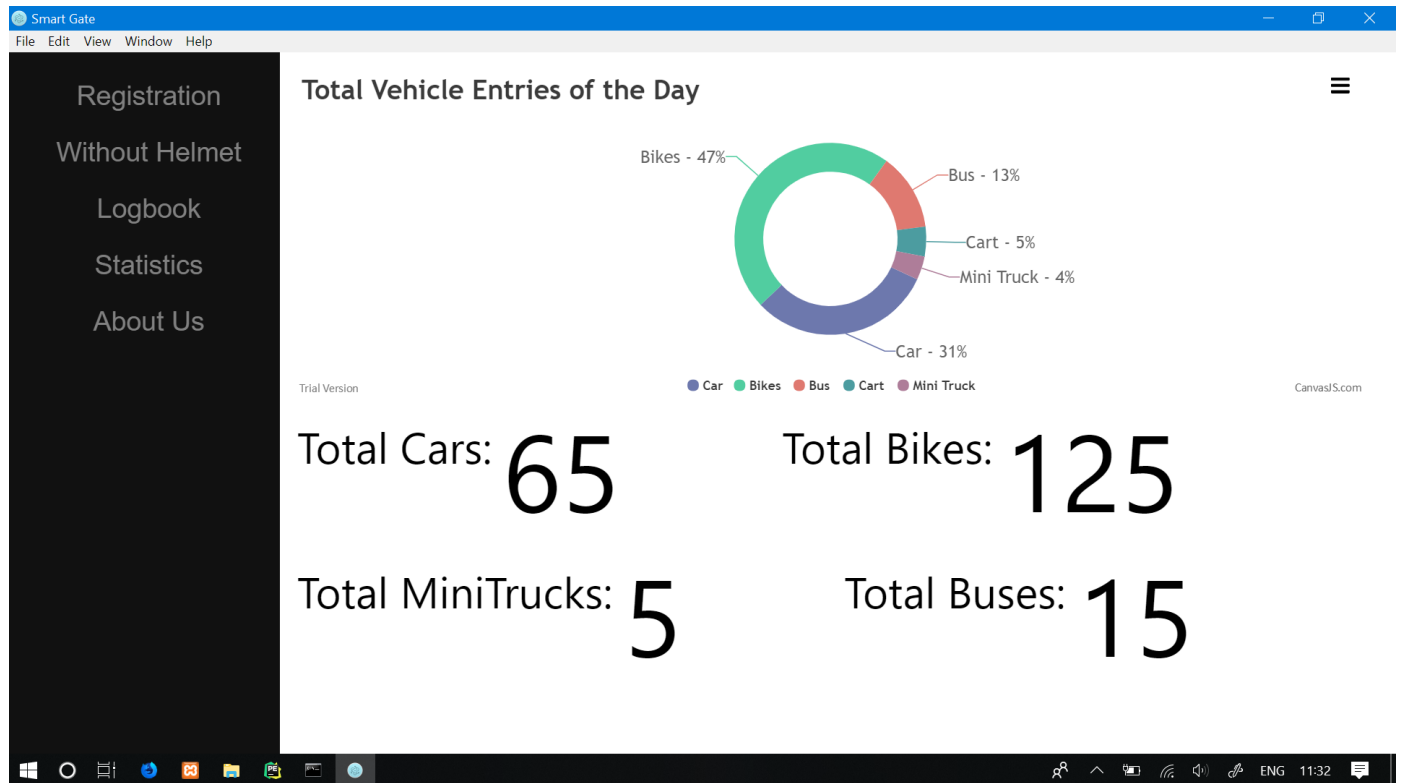


The screenshot shows the 'Smart Gate' application window. On the left is a dark sidebar with menu items: 'Registration', 'Without Helmet', 'Logbook', 'Statistics', and 'About Us'. The main area displays a table with the following data:

S No	Name	Time	Veh No
85	Lalit Kumar Mahabhoi	2019-02-25 16:16:10	OD 78 523712
84	Ashish	2019-02-25 16:15:41	OD 34 56R4
83	Lalit Kumar Mahabhoi	2019-02-25 16:15:10	OD 78 523712
82	Ashish	2019-02-25 16:14:33	OD 34 56R4
81	Lalit Kumar Mahabhoi	2019-02-25 16:13:23	OD 78 523712
80	Ashish	2019-02-25 16:11:18	OD 34 56R4
79	Lalit Kumar Mahabhoi	2019-02-25 16:10:16	OD 78 523712
78	Ashish	2019-02-25 16:09:36	OD 34 56R4
77	Lalit Kumar Mahabhoi	2019-02-25 16:05:25	OD 78 523712
76	Ashish	2019-02-25 16:04:12	OD 34 56R4
75	Lalit Kumar Mahabhoi	2019-02-25 15:56:11	OD 78 523712
74	Ashish	2019-02-25 15:54:41	OD 34 56R4
73	Lalit Kumar Mahabhoi	2019-02-25 15:52:40	OD 78 523712
72	Ashish	2019-02-25 15:52:10	OD 34 56R4
71	Lalit Kumar Mahabhoi	2019-02-25 15:48:37	OD 78 523712
70	Ashish	2019-02-25 15:48:08	OD 34 56R4

The application window has a standard Windows taskbar at the bottom with various icons and a system tray showing 'ENG 11:32'.

## 10.4 Test Cases:





## Chapter 11

### Limitations and Future Prospects

#### 11.1 Limitations:

- There is some Limitation of this Project:
- When it is heavy rain Sensor may not work Properly.
- In Night time light should be clear or otherwise camera module can not work properly
- When electricity is not available have to follow traditional gate system
- Always have good internet connection

#### 11.2 Future Prospects

We are focusing to remove these Limitation and use to some other way to make this product more reliable.

We are focusing Improve the Model To make as Implement Challenge all type of Problem.

## Chapter 12

### Conclusion:

- By using this IoT device in Traditional gate we can automate everything by Using Machine Learning for automation to make the process swift and efficient for work.
- It also provides security and maintain record of Daily entry data of an organization.

## Chapter 13

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- ❖ <https://randomnerdtutorials.com/security-access-using-mfrc522-rfid-reader-with-arduino/>