

PROJECT STAGE - 2 REVIEW

TOLLGATE TRAFFIC MONITOR AND ANALYZER

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

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AGENDA

WHAT WILL THIS PRESENTATION COVER

Abstract

Title Justification

Existing System

Drawbacks Of Existing System

Proposed System

Advantages Of Proposed System

Components Used

Block Diagram

Design & Output Screenshots

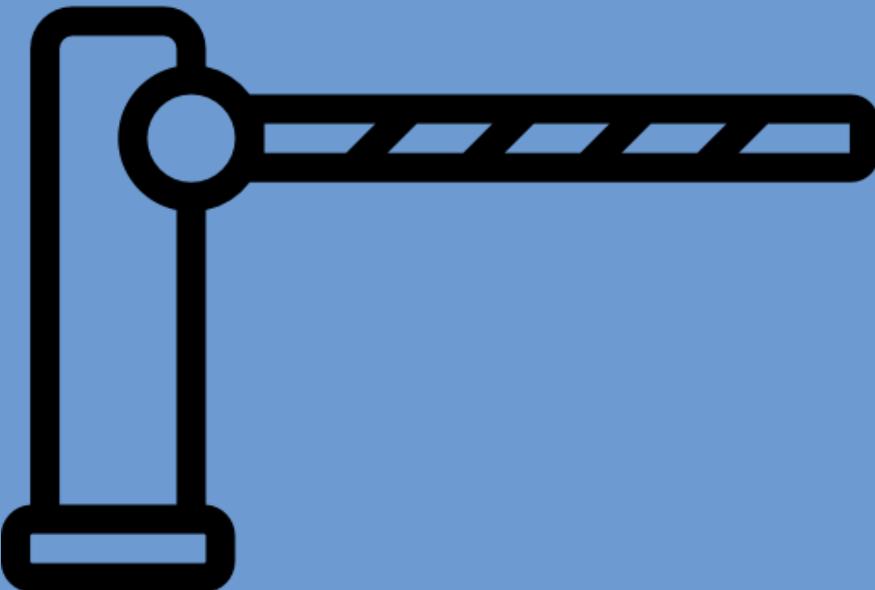
Future Scope

Abstract

A toll road, also known as a tollway, is a public or private roadway for which a fee is assessed for passage. It is a form of a tax implemented to help recoup the cost of road construction and maintenance. Generally, tollgates are operated manually with one person at each counter doing all the work. There are also some tollgates that are automated up to a certain degree. But they are not very meticulous in terms of security and reliability. Hence we propose a system to overcome the drawbacks of these existing systems. The system is implemented with raspberry pi integrated with several other modules and it has a three-level data check so it's not very easy to manipulate the system. The vehicle can only pass through the tollgate if data captured at these three levels coincide with each other, otherwise the buzzer is triggered and the tollgate does not open. All the relevant data is stored on the local database for easy analysis. The data at these three levels is the image processed data, RFID tags data, data on the local database.

Title Justification

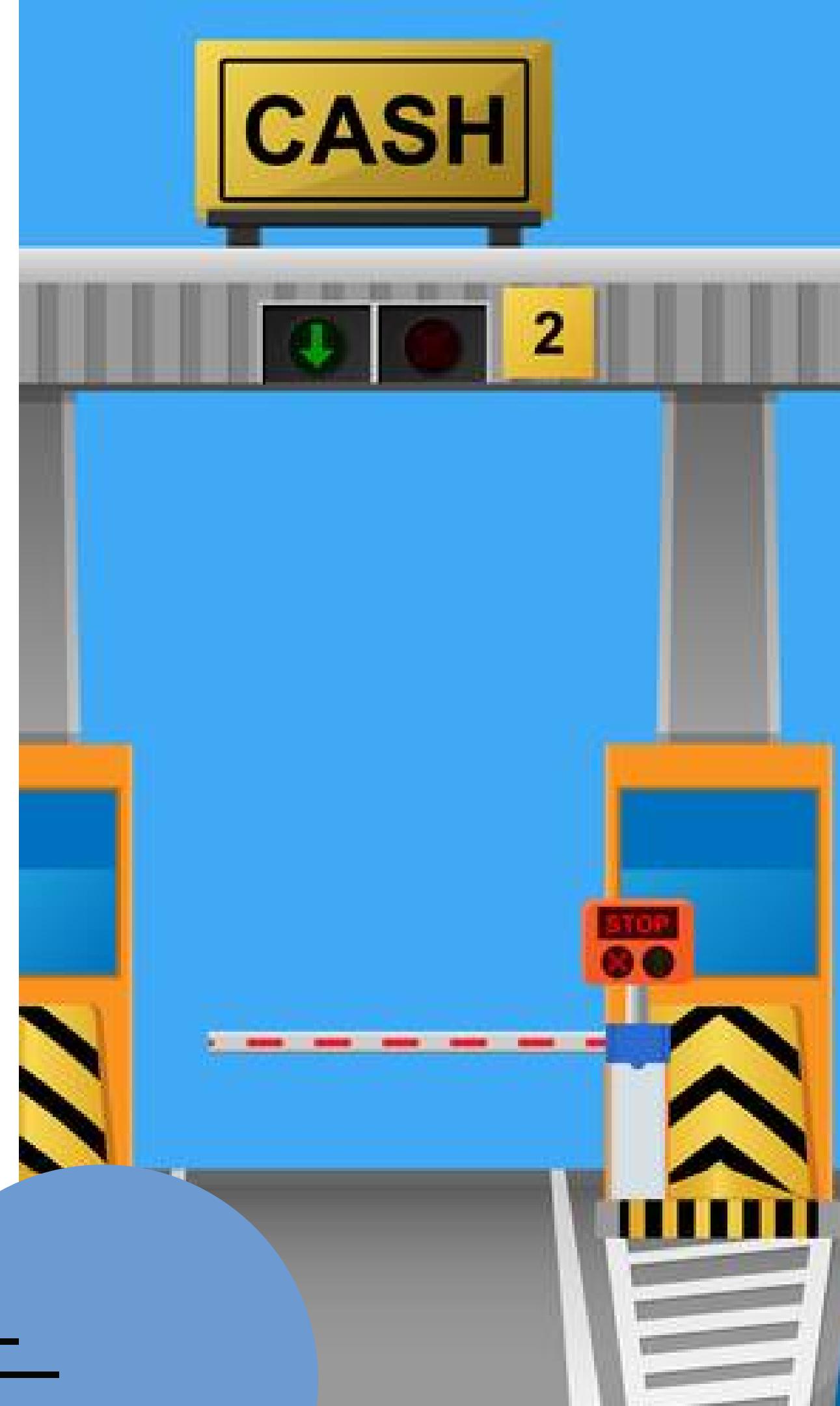
- The title that we came up for the project is, "Tollgate Traffic Monitor & Analyzer".
- The system monitors the vehicles through the camera (image processing) and through the information provided by the RFID tags.
- This monitored data and the data stored on the database are analyzed through raspberry pi in order to decide whether to open the tollgate or not.



Existing System

There are two types of systems presently in existence,

- The first is the old system in which everything needs to be done manually by a person.
- The second and the latest system that is being employed is with the use of only RFID tags.
- Both the systems have their own flaws, the former requires more manpower and the latter system is not very efficient in terms of security and reliability.



Drawbacks Of Existing System

- These systems require a lot of manpower.
- These systems lead to queuing up of the following vehicles for a very long time, thereby aiding pollution and wasting fuel and money.
- Also, there are chances of escaping from the payment of toll tax.
- These methods for toll collection are time-consuming.

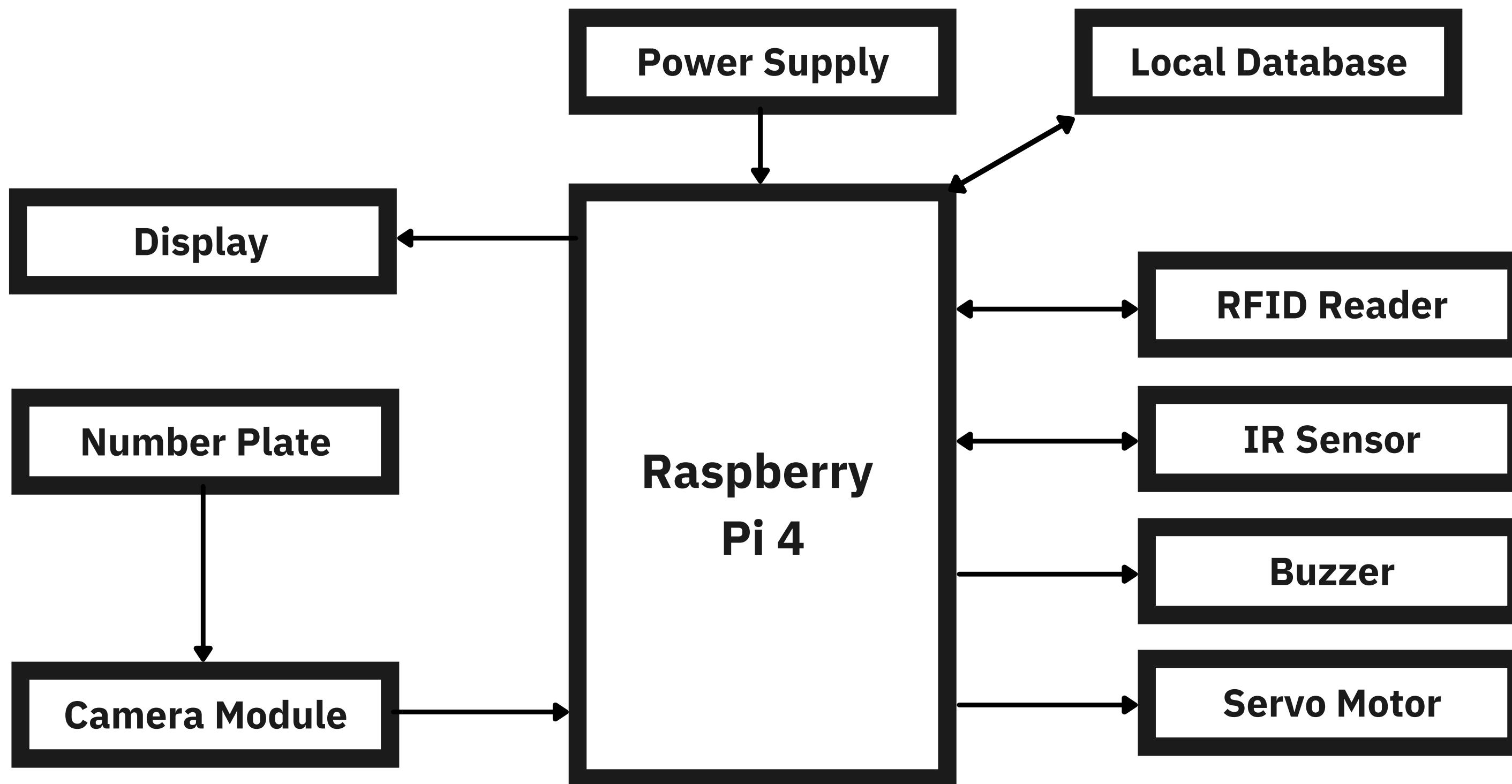
Proposed System

- The proposed system is completely implemented with raspberry pi integrated with RFID reader & tags, servo motor, infrared sensor, and a camera.
- Initially the RFID tag is swiped through the reader and when the infrared sensor detects a signal of car passage through it the camera captures the image of the vehicle number plate.
- The data captured from the camera is processed using openCV and tesseract OCR from which the text format of the number plate is obtained.
- This text format data and data from RFID tag are compared,
 - If the data matches and available on the database then servo motor is turned ON and OFF.
 - If the data does not match or not available on the database then servo motor doesn't turn ON and the buzzer is triggered.
- All the relevant data is stored on the local database.

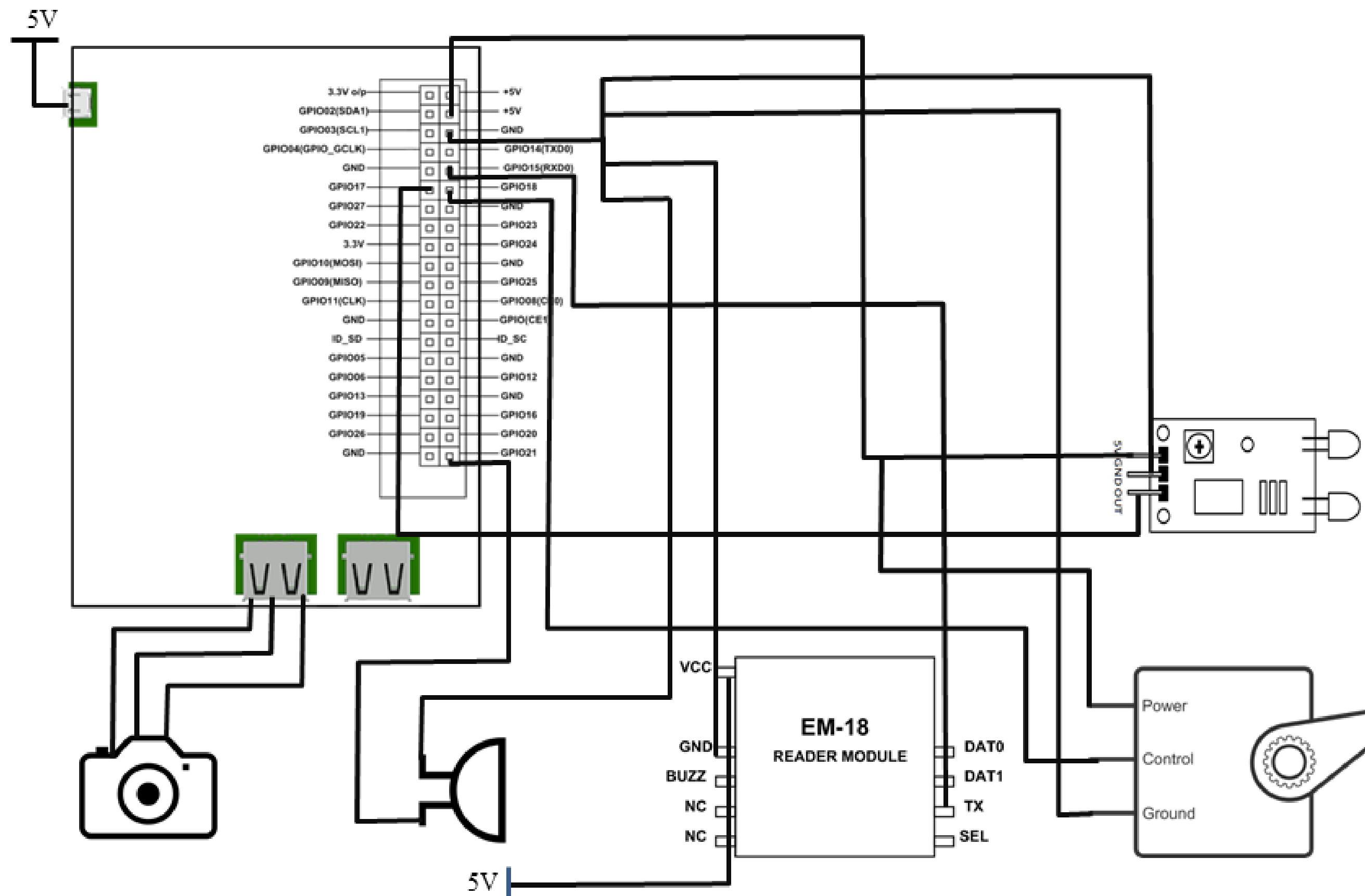
Advantages Of Proposed System

- The waiting time at the toll gates can be decreased which in turn reduces traffic as well as pollution from the vehicles.
- Vehicle number plate breaches or theft vehicles can be identified easily.
- The use of manpower is reduced as everything is automated.
- All the vehicles data is stored in the database for easy analysis.

Block Diagram



Schematic Diagram



Components Used



Hardware Components:

- Raspberry Pi 3
- Camera
- RFID Module & Tags
- IR Sensor
- Servo Motor
- Display

Software Components:

- OpenCV
- Tesseract OCR
- Python IDE

tesseract

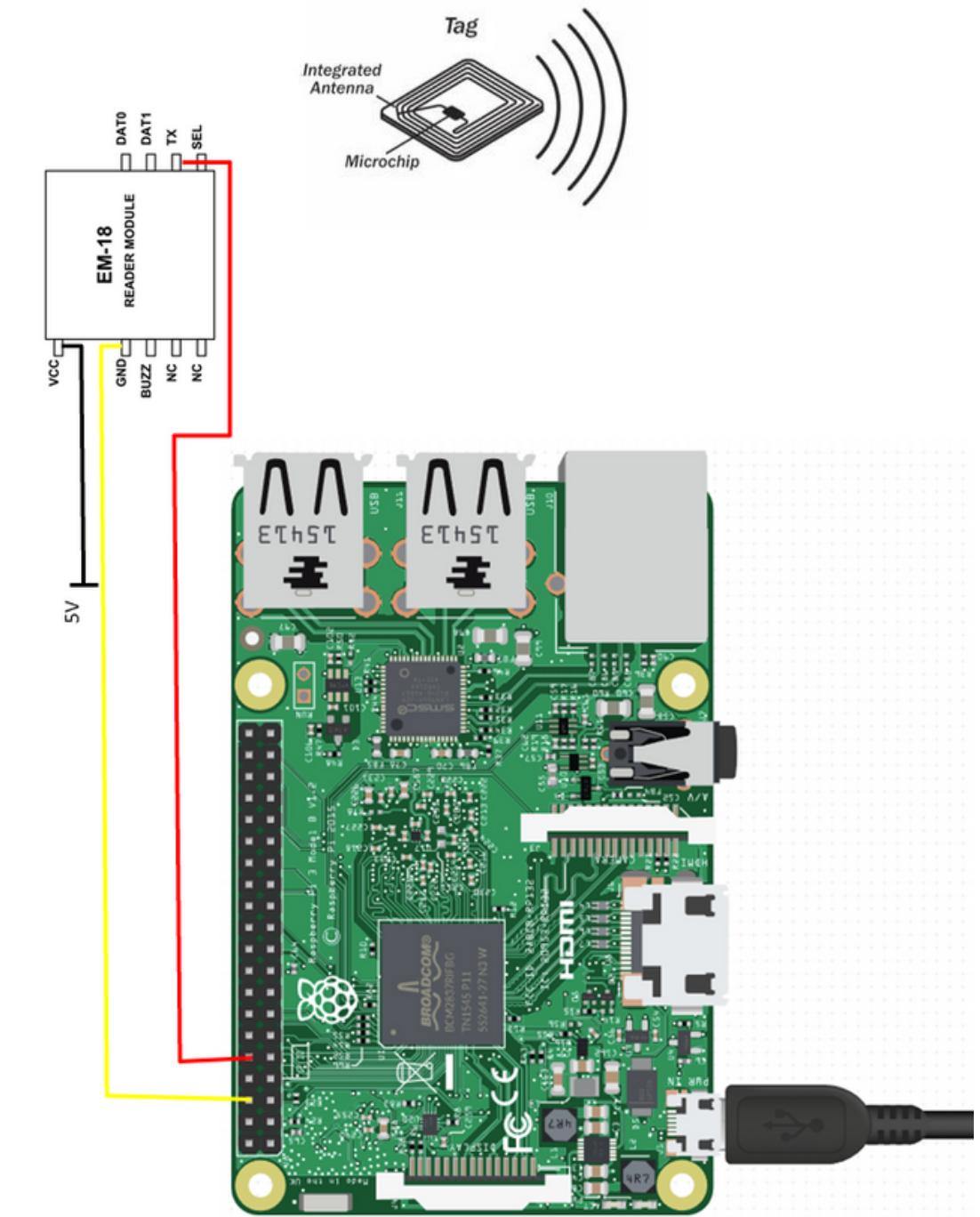


IDLE



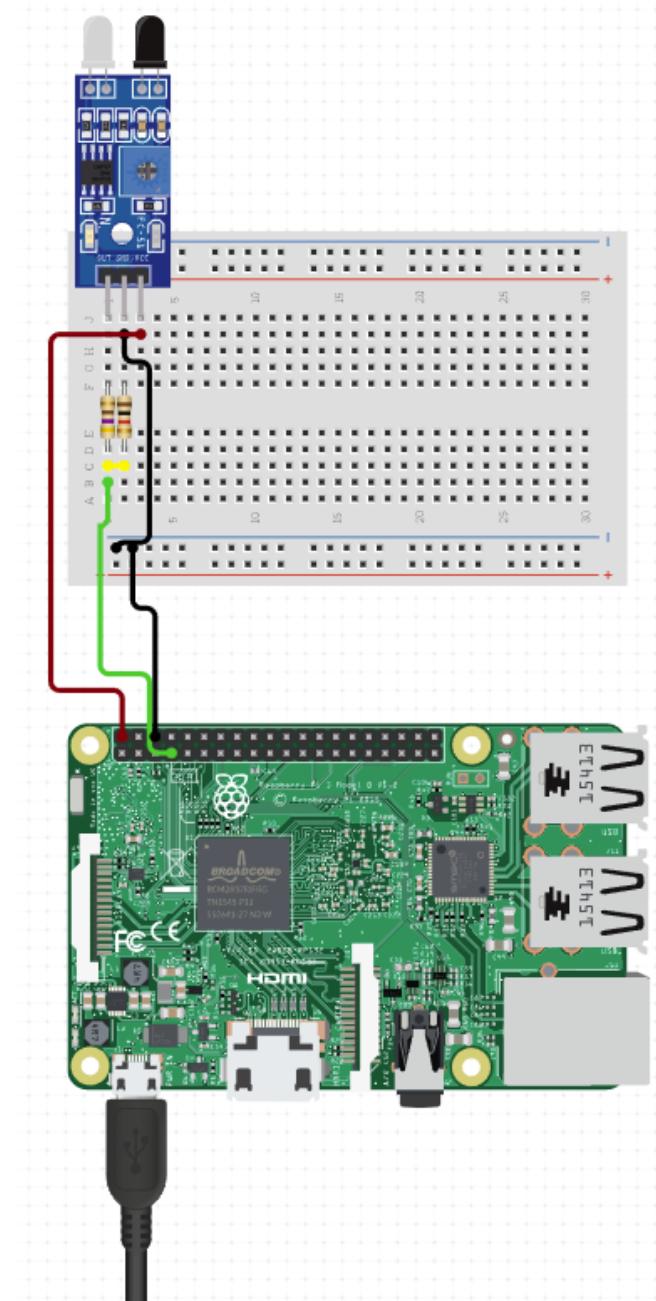
EM 18 RFID MODULE

- It is used to read unique ID from RFID tags.
- Whenever RFID tags comes in range, RFID reader reads its unique ID and transmits it serially to the raspberry pi.
- RFID reader has transceiver and an antenna mounted on it. It is mostly fixed in stationary position.
- This used for identifying the vehicle details when it is swiped at the tollgate



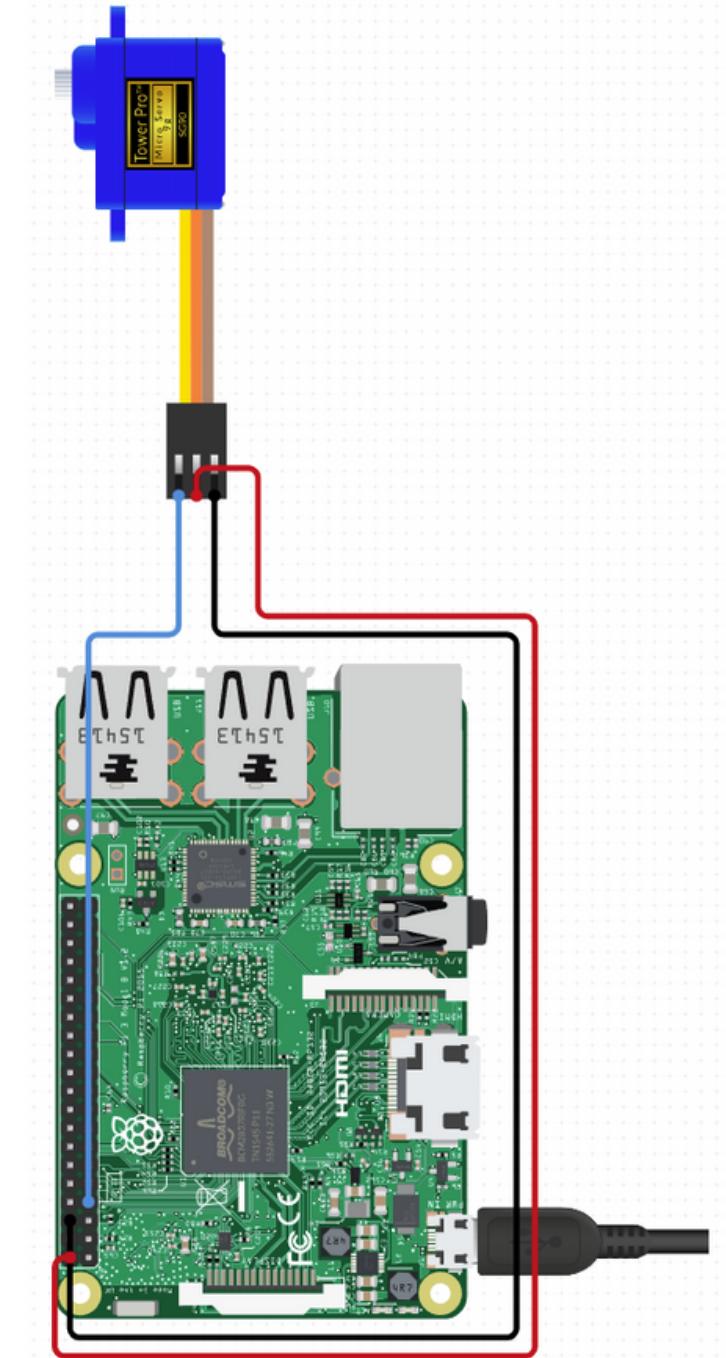
INFRARED SENSOR

- An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.
- When an object comes close to the sensor, the infrared light from the LED reflects off of the object and is detected by the receiver LED.
- This is used for detecting that passage of the vehicles through it so that the servo motor can be triggered ON.



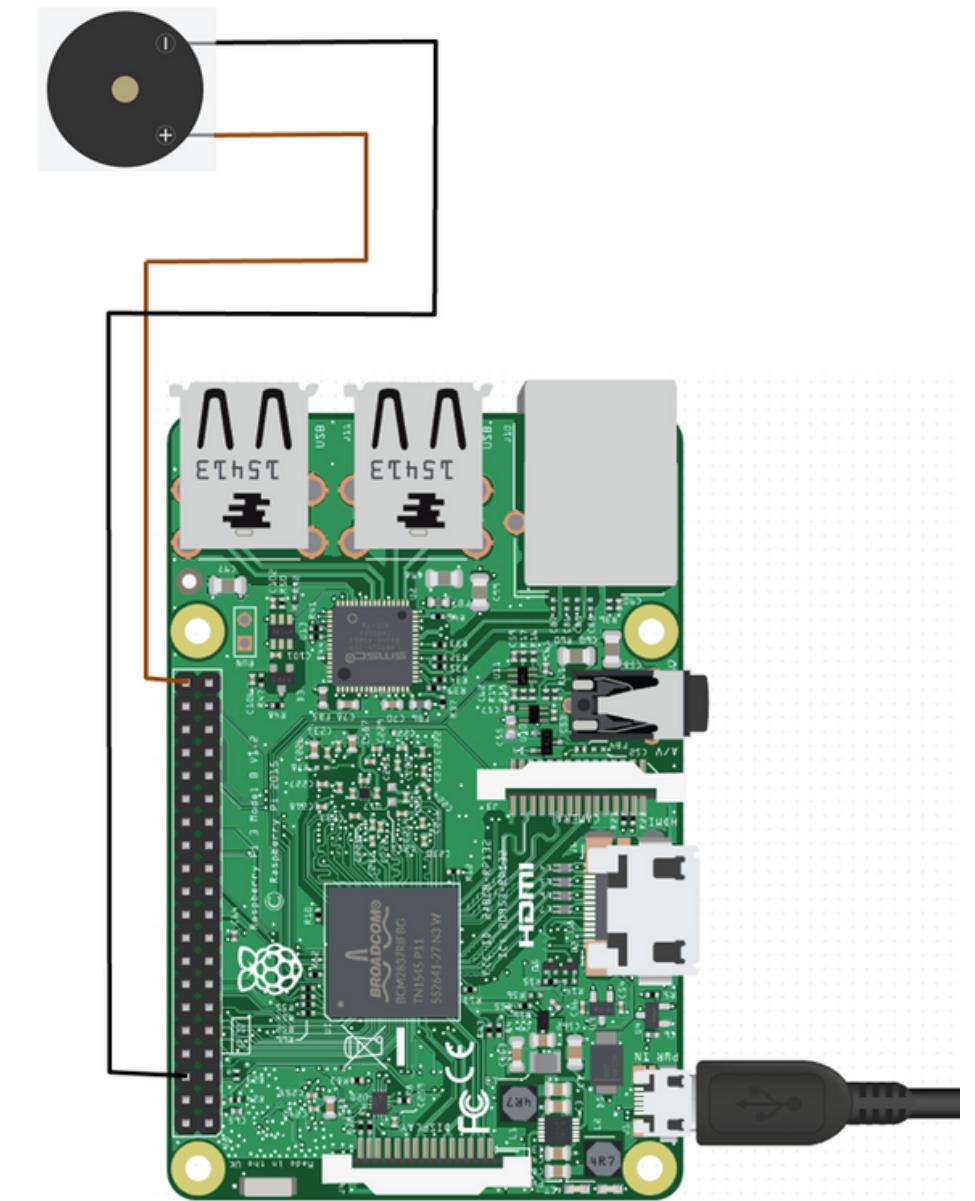
SERVO MOTOR

- It is a closed-loop system where it uses a positive feedback system to control motion and the final position of the shaft.
- Here the device is controlled by a feedback control signal generated by comparing output signal and reference input signal.
- This is used for opening and closing the tollgate with a delay for the passage of the vehicle.



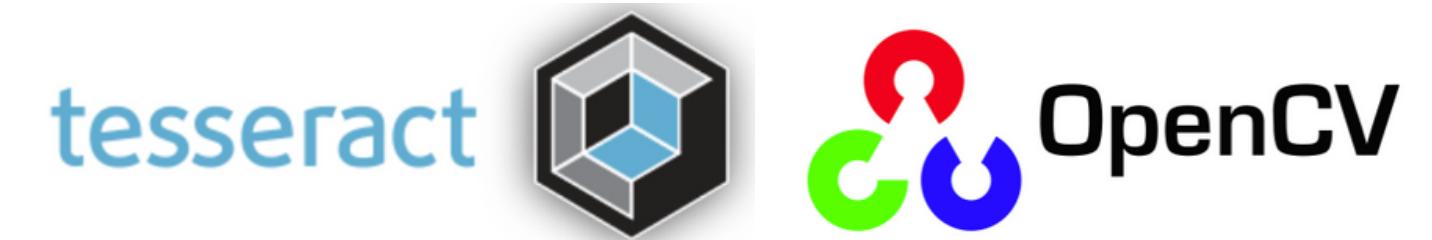
BUZZER

- When an alternating voltage is applied to the piezoceramic element, the element extends and shrinks diametrically.
- This characteristic of piezoelectric material is utilized to make the ceramic plate vibrate rapidly to generate sound waves.
- This is used for alarm incase of number plate breaches or identification unregistered vehicles

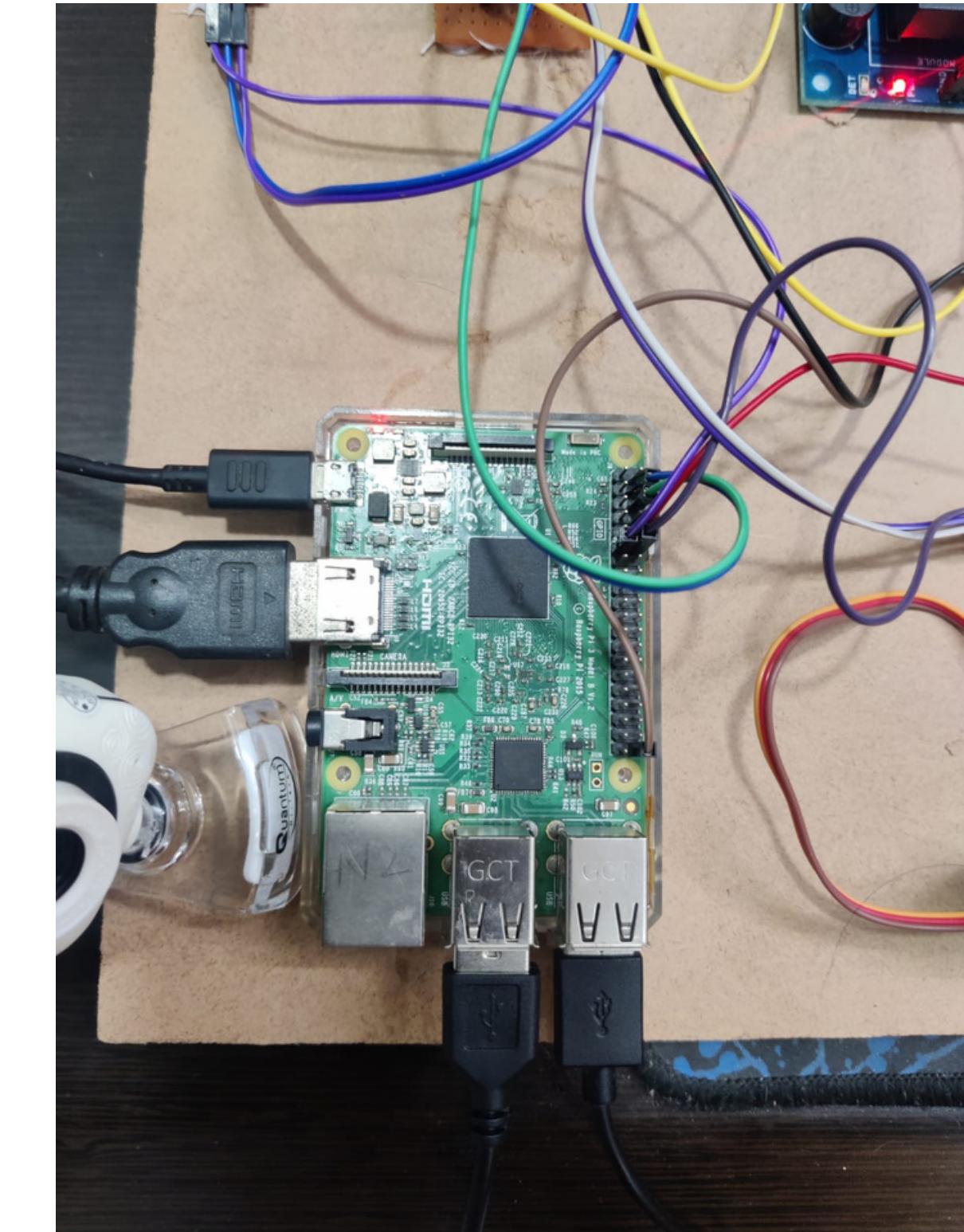
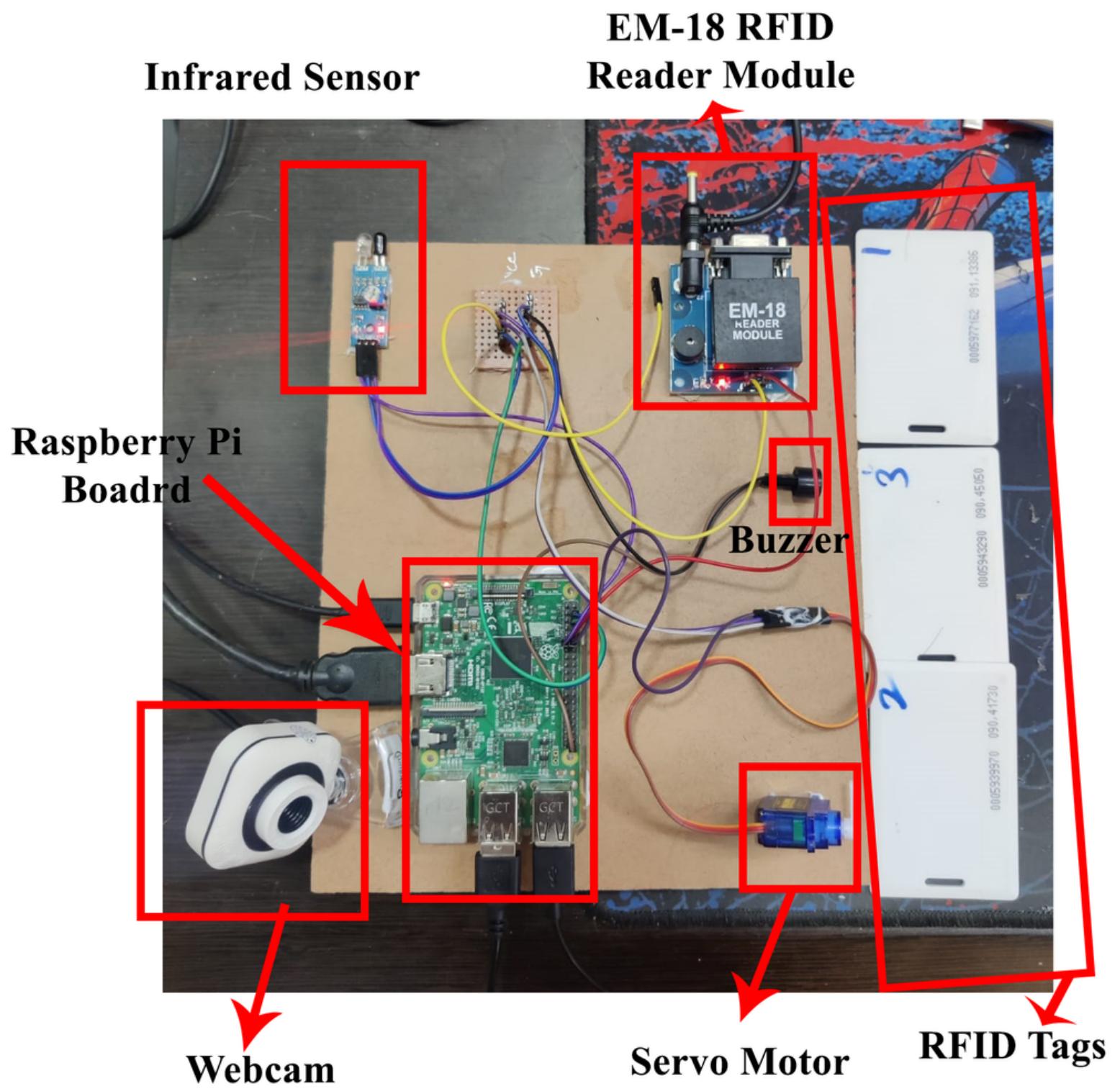


OPENCV & TESSERACT OCR

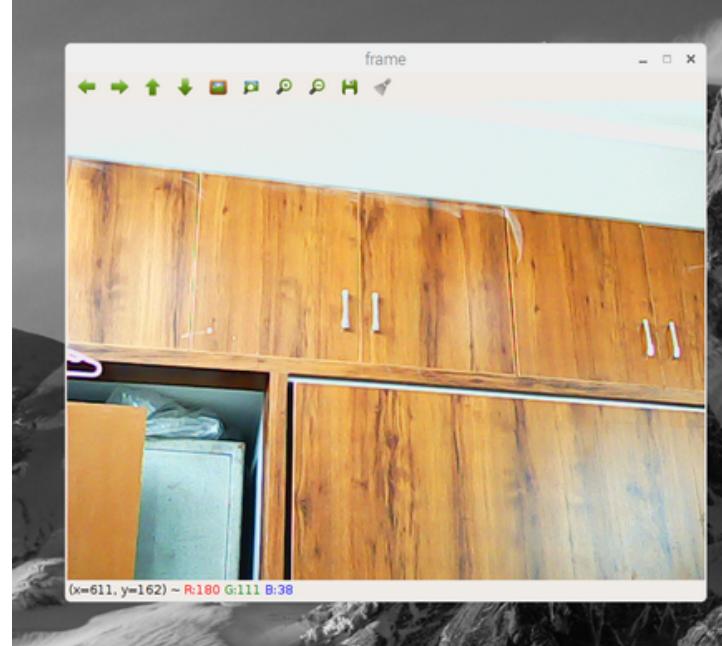
- OpenCV is used for accessing the camera and for capturing the image, then identifying the text region in the image.
- Once we have detected the text regions with OpenCV, we'll then extract each of the text ROIs and pass them into Tesseract, enabling us to build an entire OpenCV OCR pipeline!
- This pipeline will contain the raw text data that is detected on the image.



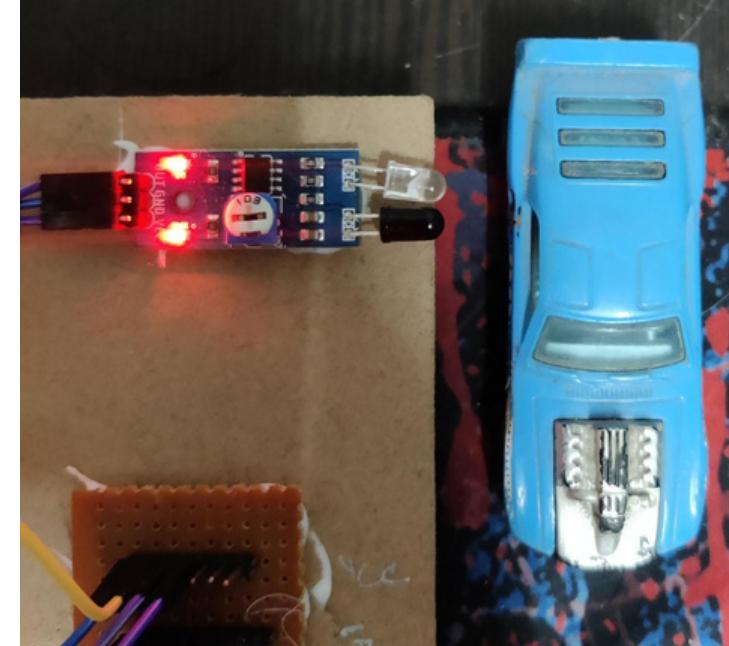
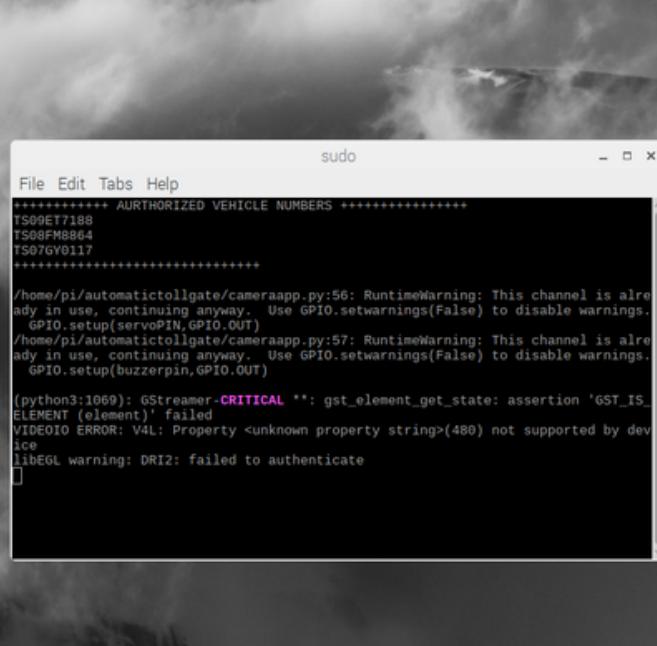
Design Screenshots



Output Screenshots



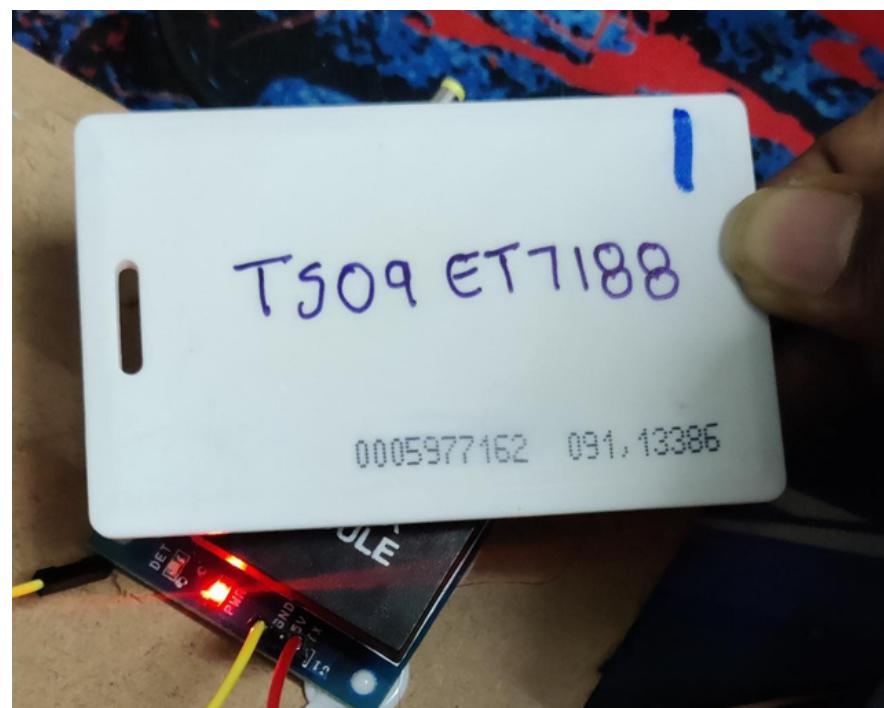
Application is set up and ran



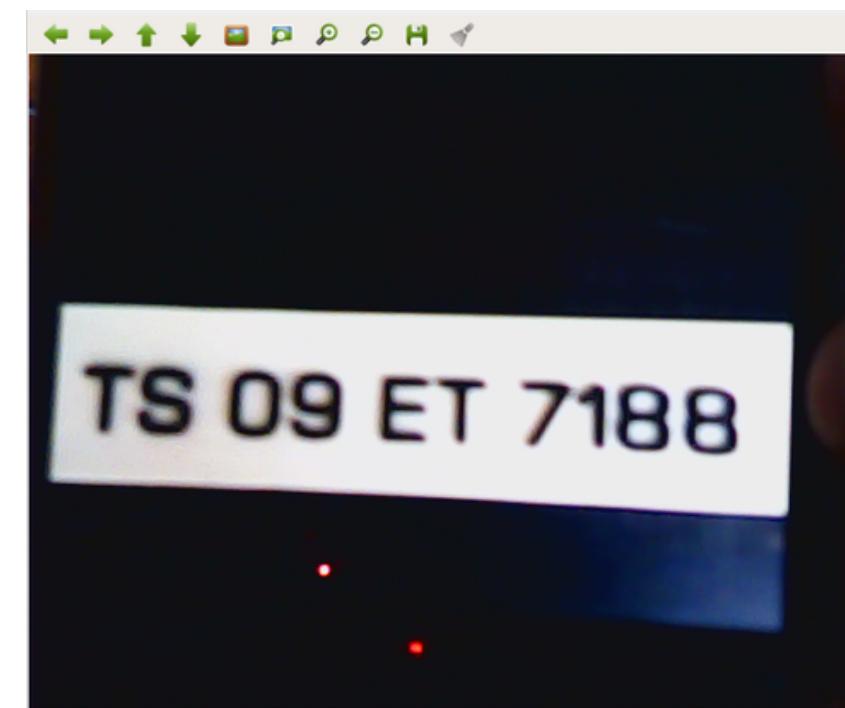
Sensor detecting car



Servo motor turning
ON and OFF



RFID Tag is scanned



Camera detecting number plate

```
TS09ET7188
-----
Recognized LP Number:
TS09ET7188
---VALID NUMBER 1 PLATE AVAILABLE IN DB ---
4B005AA302B0Input was LOW
-----
```

Display showing relevant information

Output Screenshots



```
File Edit Tabs Help
+++++ AURTHORIZED VEHICLE NUMBERS +++++
TS09ET7188
TS08FM8864
TS07GY0117
+++++
```

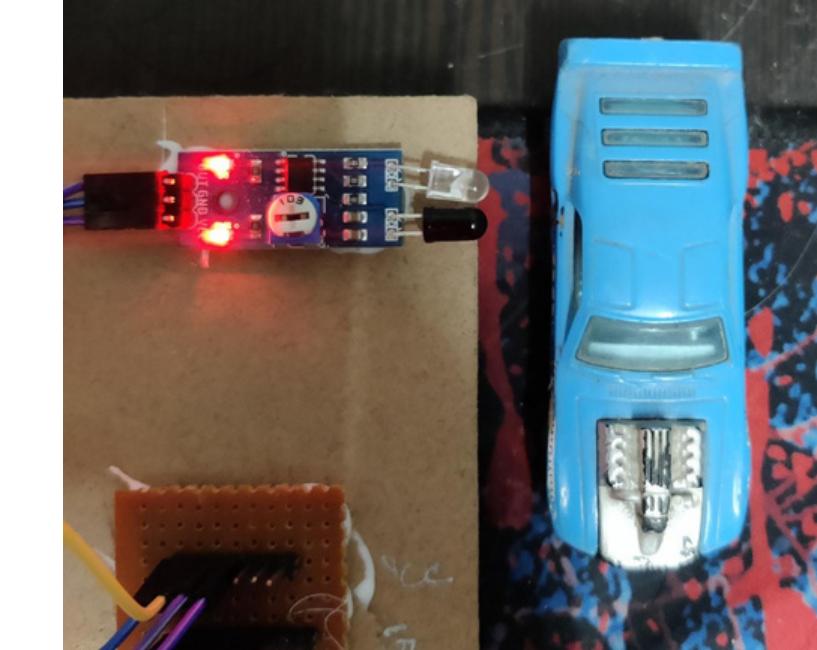
Available data on the database



RFID tag is scanned



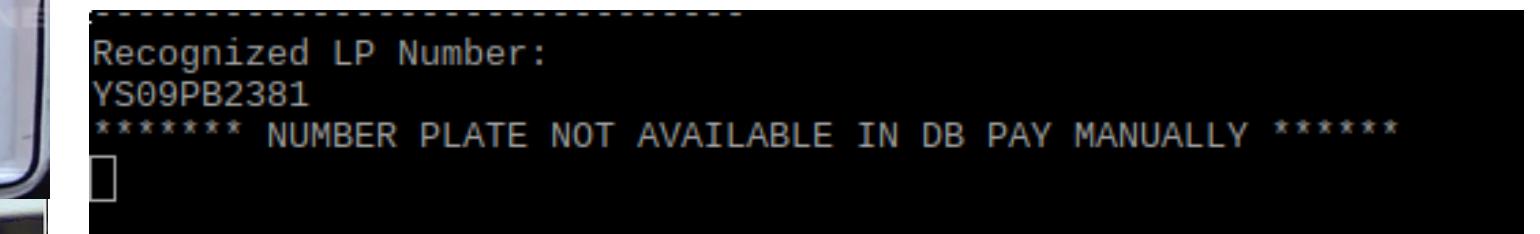
Camera detecting number plate



Sensor detecting car



Servo motor is stationary



Display showing relevant information

Future Scope

- It can be used for parking ticket fee collection in shopping malls, movie theaters, etc.
- It can be included in public properties like airports, railway stations, etc.
- With the further extension of the technology with GPS-based systems, complete toll gates can be eliminated.



Thank you!

