



## SMART ACCESS CONTROL FOR RESTRICTED BUILDINGS USING VEHICLE NUMBER PLATE RECOGNITION SYSTEM

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**Abstract :** The rising security issues in hotels, government buildings, and business buildings necessitate detecting and controlling entry cars. License plate recognition based on vehicle photos is automated on the platform. When standardized plates aren't available, image-based recognition is employed instead. A license plate check, a police check, and a background check are all done. To address these flaws, this paper proposes a proposal for an automatic gate access regulating system that scans vehicle plate numbers with a camera and optical recognition algorithm and checks them to records kept in a database to determine whether to accept the car or not. This work also entails the installation of glowing LEDs in allotted parking spots, the reduction of brightness when the parking space is not in use, the registration of visitors' information, and database alterations depending on the requirements. The project was created utilizing a Raspberry Pi coupled to a camera and a servo motor. Python is used as a computer language to program different hardware components of the system..

**Keywords—**License plate recognition, optical character recognition algorithm, LED's, Raspberry pi, servomotor, python

### I. INTRODUCTION

The number of automobiles in rapidly developing countries is increasing every day. As a result, the number of license plates issued is increasing, resulting in increased plate identification and recognition. There has recently been work on developing a computer-based programmed license plate recognition system to address this need. Artificial Neural Systems (ANS)-based automatic car license plate recognition has been recommended in this case by an expert. This technique has three key components: locating the plate location from the car photo, fragmenting the characters on the license plate, and recognizing the fractured characters. The gate opens automatically if the plate is recognized by optical character recognition, which checks the database to see if it is already registered. There has been an increase in the importance placed on activity control and vehicle owner identification in each country studied.

Sometimes it's difficult to tell who's driving too fast and breaking the rules of the road. People who commit these crimes cannot be caught or punished since activity personnel may be unable to collect their vehicle's license plate number from a moving vehicle. It is therefore necessary to use an ANPR system (Automatic Number Plate Recognition). Toll collecting, traffic law authorization, parcel management, and street activity monitoring are just a few of the real-world uses for automatic license plate recognition (ALPR). When a vehicle's license plate number is captured by a color, dark or white, or an infrared camera, ALPR can read it. It requires a combination of methods to accomplish its goals. There are a number of procedures that can be used to identify an object or a specific area on a plate. There are several acronyms for ALPR: automatic license plate reading, automatic number plate recognition, and automotive optical character recognition.

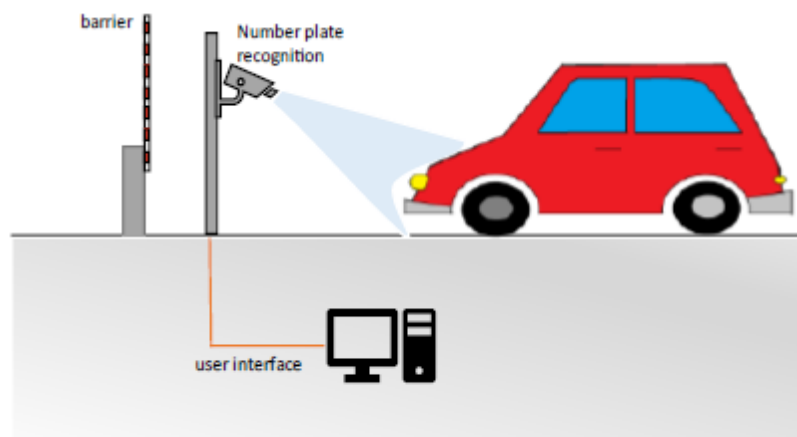


Figure 1: number plate recognition

## II. RELATED WORK

Because of rising security concerns, it is now necessary to identify and manage the entry of vehicles into hotels, government facilities, and commercial buildings. Automated license plate recognition based on photographs of automobiles is used in the platform. When normal plates aren't used, image-based recognition is the best option. Deformation of the license plate, the cops, and the background. In the past, gate keepers had to remain on their toes for long periods of time, keeping track of the vehicles that entered and exited the site manually. It is a long and wasteful operation that requires a lot of energy from security staff, and it might lead to security gaps in these premises[1]. Every country has a huge difficulty with traffic regulation and vehicle identification. It can be difficult to recognise the driver of a car who is breaking traffic laws or driving too fast. Since the speed of the car may prevent traffic officials from retrieving the vehicle's license plate number, those violators cannot be apprehended and punished. In order to address this issue, an ANPR system needs to be developed as one of the options. There are a plethora of ANPR systems on the market right now. Some elements, such as high speed of vehicle, non-uniform vehicle number plate, language of vehicle number, and lighting circumstances, can have a significant impact on the overall identification rate for these systems. The majority of systems are able to operate under these constraints[2].

ALPR is the extraction of car license plate information from an image or a succession of photos. Many applications, such as electronic payment systems (toll payment, parking fee payment) and traffic surveillance systems on freeways and arterials, can make use of the extracted data, either with or without a centralized database of some sort. It is possible to utilize either a colour, black and white, or IR camera to capture images with the ALPR system. The ALPR's success is heavily reliant on the quality of the photos it collects during the acquisition phase of the mission. ALPR, as a real-world application, must be able to process license plates in a variety of environments, including inside, outdoors, and at any time of the day or night. As a result, the system should be able to handle license plates from many countries and jurisdictions as well. Typically, these plates come in a variety of colors, languages, and typefaces; some have a single color background, while others feature graphics. Dirt, illumination, and towing equipment on the vehicle can all obscure the license plates[3]. Image-based recognition becomes difficult in cases where standardised license plates are not used, due to variances in license plate backdrop, fonts, and deformations[4]. The rising number of vehicles on the road has necessitated more traffic control personnel in recent years. Computer-based automatic control systems are being developed to address this issue[5].

## III. PROBLEM IDENTIFICATION

The current system consists of a gate at the entrance of a building which provides access to any car passing through it. Security check is done physically by a manual guard present at the gate, where no device is used to check the plate. In some inevitable circumstances, this leads to theft as a result of unauthorized entry. Due to improper parking slots, it can sometimes result in excessive traffic in parking places. Hence, smart[6-9] parking systems are necessary.



Fig 2: Thefts due to unauthorized entry

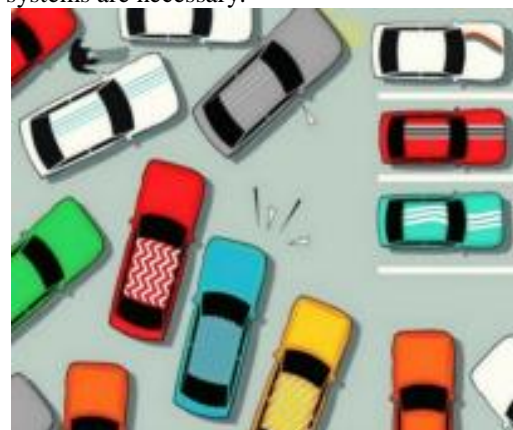


Fig 3: Traffic in parking areas

#### IV. PROPOSED SOLUTION

A system is proposed where the camera interfaced to a Raspberry Pi captures the vehicle number plate. Whenever the vehicle is detected by ultrasonic sensor, the camera will automatically start to capture and displays the number of that vehicle on the monitor. As soon as it detects a number plate, it processes that image [11-12], extracts the number plate portion, uses OCR technology to extract the number plate number from it, and displays the number plate information. An image file or physical document, such as a scanned document, can be identified using Optical Character Recognition (OCR) software and converted into machine readable text for use in data processing. The database already has the vehicle identification numbers of the owners. The servo motors which operate as a gate lift the barrier, allowing the car to enter, if the number plate on the vehicle matches any stored information

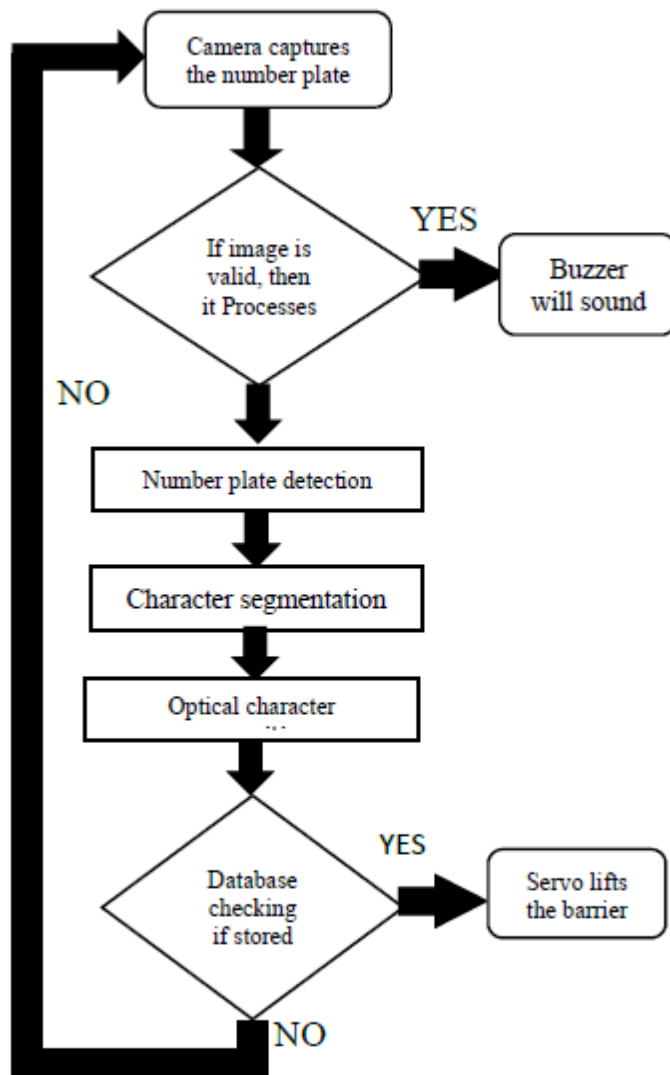


Fig 4: Flow Chart

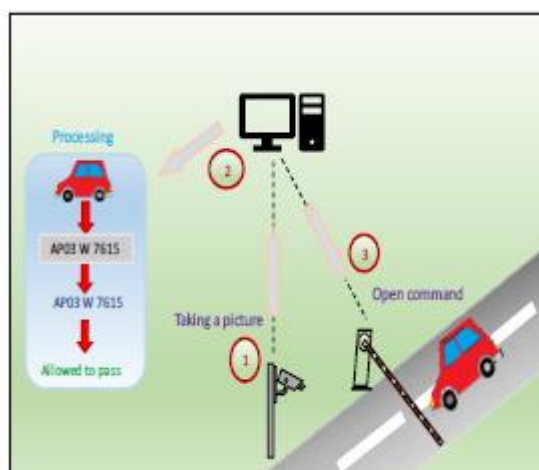


Figure 5: Physical System diagram

Specific parking slots are assigned to get an organized parking area. As soon as the vehicle is detected at the gate, the LED present at its assigned slot will glow. Then the IR sensors at the parking slot detects the car after parking and turns off the LED. Another IR sensor placed at the center of the parking area helps to reduce the brightness of the main light if no humans are detected.

## V. RESULTS

### A. Number plate detection

When an ultrasonic sensor detects an automobile in front of the Gate, the camera begins taking pictures of the license [10] plate number. After capturing the complete vehicle, only the license plate image is shown.

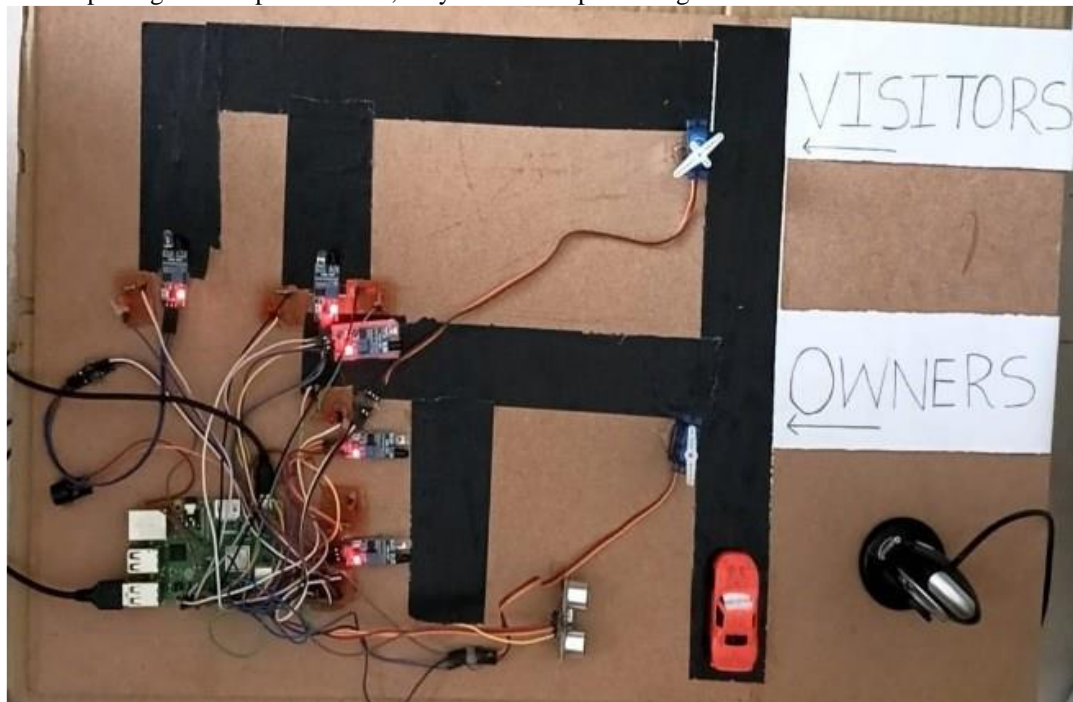


Figure 6: Ultrasonic sensor detecting the car

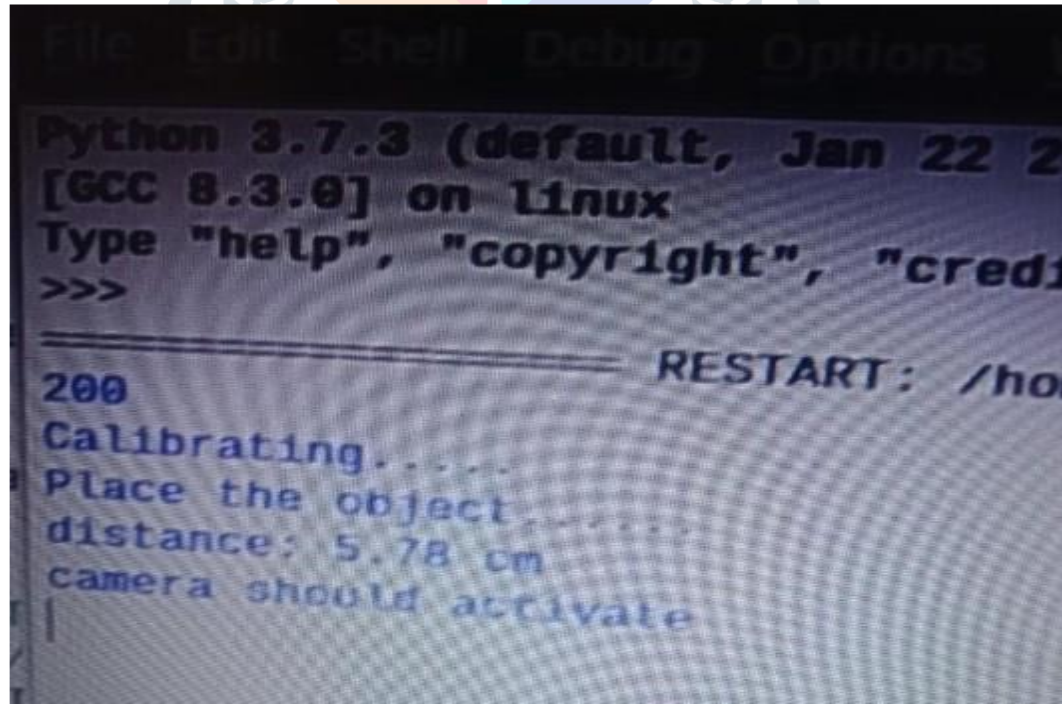


Figure 7: Camera activating after car detection

### B. Processing the image

After the camera captures the plate number, if the number matches with the database, the car is authorized and the servos acting as gate lifts the barrier automatically. Based on the number plate, the system differentiates owners to the visitors and the LEDs glow at their respective slots. The system displays the text visitor when visitor comes and text owner when the owners come.



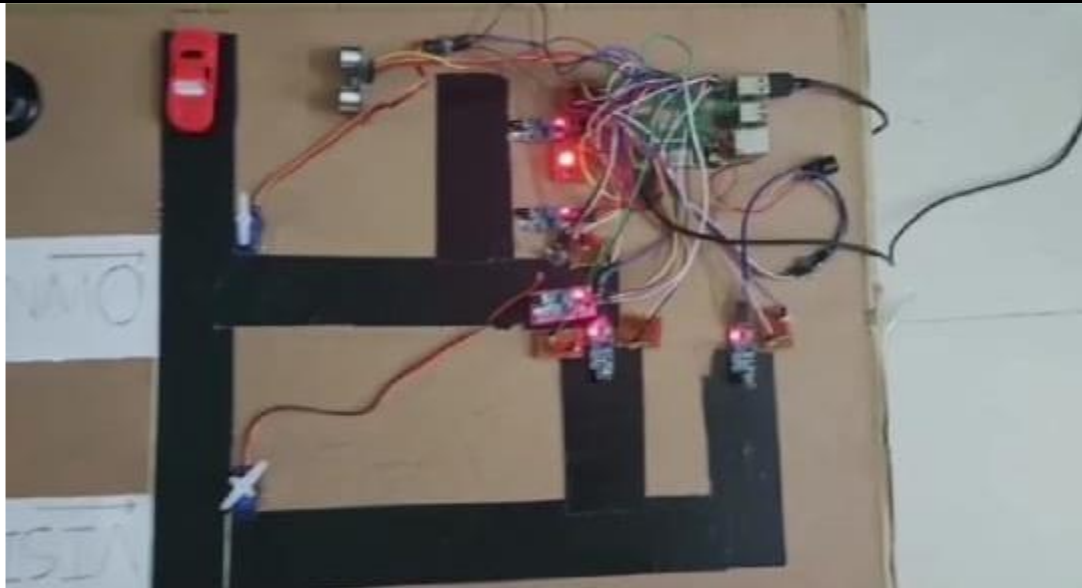


Fig 8: LED glowing at the assigned slot

After the car is parked, the system turns off the LED at the parking slot and displays the text which says slot filled.

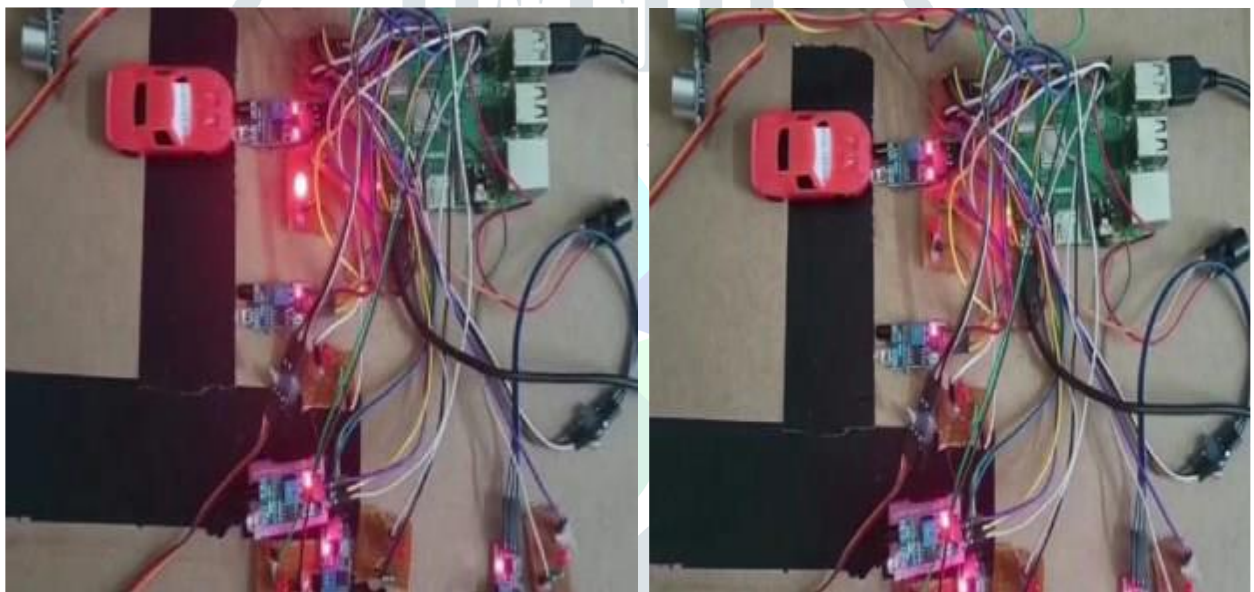


Fig 9: Status of LED after detecting parked car

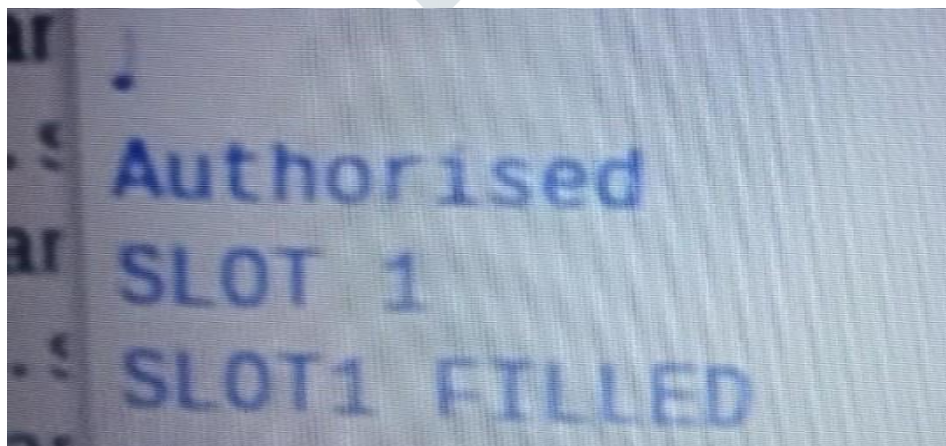


Fig 10: Parking slot is filled

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