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RASPBERRY PI BASED VEHICLE NUMBER PLATE RECOGNISATION USING OCR

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ABSTRACT

vehicle number plate recognition Although difficult but it is an essential system. This is very useful for automating toll booths, identifying signal breakers automatically, and identifying traffic law violators to grant admission to restricted locations. Here, we propose a Raspberry Pi-based automatic license plate recognition system that makes advantage of image processing. The system uses a Raspberry Pi computer and a camera in conjunction with an LCD display circuit. The technology continuously scans incoming camera footage for evidence of number plates. A number plate in front of the camera triggers an analysis of the camera input and the removal of the number plate section from the image. utilises Optical Character Recognition (OCR) to open the gate, process the recovered image, and extract the number plate number. The machine then displays the extracted number on an LCD display. As a result, we suggested a completely working car number plate recognition system based on the Raspberry Pi.
Keywords: Raspberry Pi, LCD, Camera, OpenCV, OCR, Vehicle, License Plate Recognisation

1. INTRODUCTION

Vehicle license plate recognition systems have undergone extensive research in numerous nations. The specifications for an automatic number plate recognition system vary depending on the types of number plates used in each nation. This study presents an Indian vehicle number plate location and recognition system. This system was created using digital photographs and can be readily integrated into parking garage systems to track customer access to parking facilities, ensure that they are used securely, and help stop auto theft. A digital image is used to extract the car license plate using an automatic license plate recognition system. The study uses a mix of the Internet of Things and image processing to fill in the gaps in the localization of license plates using an area criterion test. The plate characters were segmented using a horizontal and vertical scanning technique. The process of template matching enabled the character recognition using optical characters. We focus primarily on three steps: first, finding the

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license plate; second, separating the numbers and identifying each one separately; and third, identifying each character. This section explains how to locate a vehicle's license plate in photographs that have been collected. A multipurpose industrial ANPR system typically uses a colour camera and a monochrome camera with a synchronised IR projector. The monochrome camera with an IR projector is in charge of detecting plates at night or in other low-light situations. It is important to remember that the car plates should have been coated with IR reflective materials in order for the IR projector to work effectively. By taking care of the camera exposure time, IR projectors play a crucial role in detecting dirty plates even in broad daylight. The camera exposure duration and the IR projector power are closely related, and the exposure time has a significant impact on the final clarity of the vehicle plates. Due to the rapid movement of cars, photos with high exposure time values are blurry, while those with low exposure time values are dark. As a result, it's crucial to adjust the IR projector's output power in relation to the monochrome camera's exposure period. Additionally, a technique that adapts to changing lighting conditions is required to fine-tune exposure times. An adaptive process is used to adjust the exposure time, and it receives feedback from the thickness of the plate characters. Characters that are narrow indicate a high ambient light level. We need to shorten the exposure period in this situation. However, obtaining thick characters indicates that the ambient light level is low and that we need to lengthen the exposure period. The modification stages must be discovered experimentally because they depend on the configuration and application. For instance, during sunrise, light is reflected from moving eastward-to-westward cars. In these circumstances, exposure duration should be decreased to a level where reflections are completely eliminated. Algorithms with fixed and variable exposure times are contrasted. To support the appropriate traffic tickets, colour cameras are required to provide visual proof of the infraction scenes. The precise placement of plates in an image can be found using a variety of methods, as was mentioned in the introduction section. Most of the so far offered algorithms have been tested by us. On unclean plates and plates with little contrast between the plate characters and the background, all of these methods fail. The primary issue on the roads now is the daily rise in the number of vehicles. However, this approach is difficult and time-consuming because of the crucial time lost in traffic; hence, this issue cannot be resolved manually. A more effective and economical approach to solving this issue is required. The purpose of the paper is to use Raspberry Pi 3 models to overcome this issue. The project's goal is to create an ANPR system that runs entirely on the Raspberry Pi and makes use of Open CV and OCR. Before the extracted number plate is shown on the LCD after the camera takes a picture, image de saturation and character recognition are both completed on the Raspberry Pi. Python and a Raspberry Pi were used to prototype the developed system, and real-time results were displayed. Systems of hardware and software that analyse a signal and transform it into static images that can recognise the characters on a number plate are known as automatic number plate recognition systems. The camera records a succession of images when a car gets closer and saves them in a file. The number plate's extracted data is then saved in a cloud platform. The connected database offers details about the car and the user. An algorithm is created using Open CV on a Raspberry Pi to address the constraints in this application, which include the critical necessity for an efficient code and reduced computational complexity while delivering enhanced flexibility.

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2. LITERATURE SURVEY

In the majority of electronic and intelligent system fields, automation is thought to be the phrase used most frequently. Automation has caused a revolution in the current technology. Due to its many applications, such as traffic surveillance, access control, parking fees and toll payments, ticket issuance, theft control, cars document verification, etc., automatic vehicle identification has become important [1]. An important field of research for the contemporary automation system and intelligent transportation system, which have been extensively investigated for many years [2–3], is the task of automatically recognising a vehicle's number plate number. The formats of license plates vary widely across different nations, but the methods of automatic recognition (detection, segmentation, and character recognition) can be the same. The identification of the license plate is the most important duty among the three main automatic recognition approaches, and its failure will significantly reduce the recognition's precision. Edge-based techniques appear to be well-liked and well accepted, according to [4]. Character segmentation, which comes after detection, involves dividing up the collected characters into groups based on their measured heights and widths. The projection method [5] is thought to be a very efficient character segmentation technique utilised for the majority of plate number identification. The final step, when the license plate has been properly divided into discrete blocks in keeping with the frame of the license plate, is character recognition. A variety of techniques, including template matching [6], corner detection algorithms [7], Neural Networks [8–10], Raspberry Pi [8], etc., can be utilised to do this. The Raspberry Pi serves as the system's brain in this investigation. Unknown vehicles are not permitted in many industrial environments. Security is very important, thus this study will enable security personnel identify the number plate numbers of vehicles as they approach the gate by enabling seamless plate number verification for vehicles coming in and going out. This confirms the owner's identity and the specifics of the vehicle using the data that the system has stored. There are four processes in recognising a license plate. The initial step is image acquisition, followed by license plate extraction, segmentation of the license plate, and character recognition. The research described in [9] focuses on a reliable method for detecting and recognisinglicense plates that is based on Hough lines and uses template matching and Hough transformation. It was created for the standardisation of automobile license plates in Islamabad. Two modules—the license plate detection module using the canny detector and the Hough transformation—were used in the proposed ANPR technique. The results of the studies, which included 102 samples from various scenarios and varying levels of illumination, revealed that the ANPR scored 89.70% for all the plates taken into account. In [10], a character recognition method utilising the Harris corner algorithm was suggested for capturing plate number images even in settings of variable motion and bright lighting. According to the method, the segmentation stage is completed by combining component analysis with pixel count, aspect ratio, and character height. The experiment's findings for correctly identifying license plates were 96.92%. [11] used Neural Network (NN) to offer a weighted statistical method to place a number plate image in a more prominent position. The license plates were distinguished using a combination of the momentum BP neural network technique and thick grid feature extraction. The results of the experiments demonstrate that the approach enhances both the speed and accuracy of character recognition. The research in [12] suggested using a neural network algorithm as

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well. A Convolutional Neural Network (ConvNet) was employed in the study along with a combined ConvNet-RNN model to perform feature extraction and identify the captured license plate. The approach outperforms the sliding window-based strategy, scoring over 76% accuracy in recognising plate number characters with a per-character accuracy of roughly 95.1%, according to testing data comparing the two approaches. In the research described in [13], deep convolution neural networks (CNNs) were used to construct the system's basic technology, the Sight Hounds license plate detection and recognition system. The CNNs underwent training and optimisation for improved performance in various environments and for a wide range of license plate numbers. In terms of quantitative analysis, we demonstrate that our system performs better than the top license plate detection and recognition technology, i.e. ALPR on a number of metrics. This study investigates the use of Optical Character Recognition (OCR) to extract the images of license plates taken by the camera. The usage of Raspberry pi for automatic license plate recognition was proposed in [14]. The characters are segmented to process the data, and the Raspberry Pi then authenticates the data. The study's methodology is comparable to the technique we took, even if our algorithm is very different. The experiment's findings revealed a 96% accuracy rate. The goal of this work is to finish an automatic recognition system employing OCR; to that end, closed circuit, television, road rule for informant, or task-specific cameras have all been deployed. The photos of a vehicle's license plate are taken, processed using character segmentation, then confirmed using the Raspberry Pi processor's suggested authentication

3. EXISTING SYSTEM

We used the YOLOv3 algorithm for nuberplate recognition in the current framework. The following are its drawbacks. Utilising integrated OCR-based number plate recognition, we are able to overcome everything.No random images (cat, dog, etc.) for the Detection model's training Cars were the only vehicles used for training (the dataset wasn't available) Because Tunisian data was used throughout the issue, OCR can read numbers but not characters (Arabic language). Images of poor quality (blurred, partial, etc.)Nothing video data.

4. PROPOSED SYSTEM

This study was partly motivated by the difficulties traffic law enforcement officials in Nigeria had in prosecuting drivers of illegal cars. With the aid of our vehicle identification system, which records and recogniseslicense plates using Open CV and OCR, we hope to overcome these difficulties. The system takes use of a Raspberry Pi, or onboard computer, as it is also known. The input and output modules in use can effectively communicate with the onboard computer. The Raspberry Pi is a single-board computer the size of a credit card that connects to a 2MP camera and a 3.5" touch screen for display. The 2MP Pi Camera that is connected to the system takes a picture of the vehicle plate, which is then

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stored on an SD card for processing and recognition. The characters on the plate are recognised using optical character recognition (OCR), and the relevant characters identified on the plate are displayed, after the preprocessing is completed by starting OpenCV.

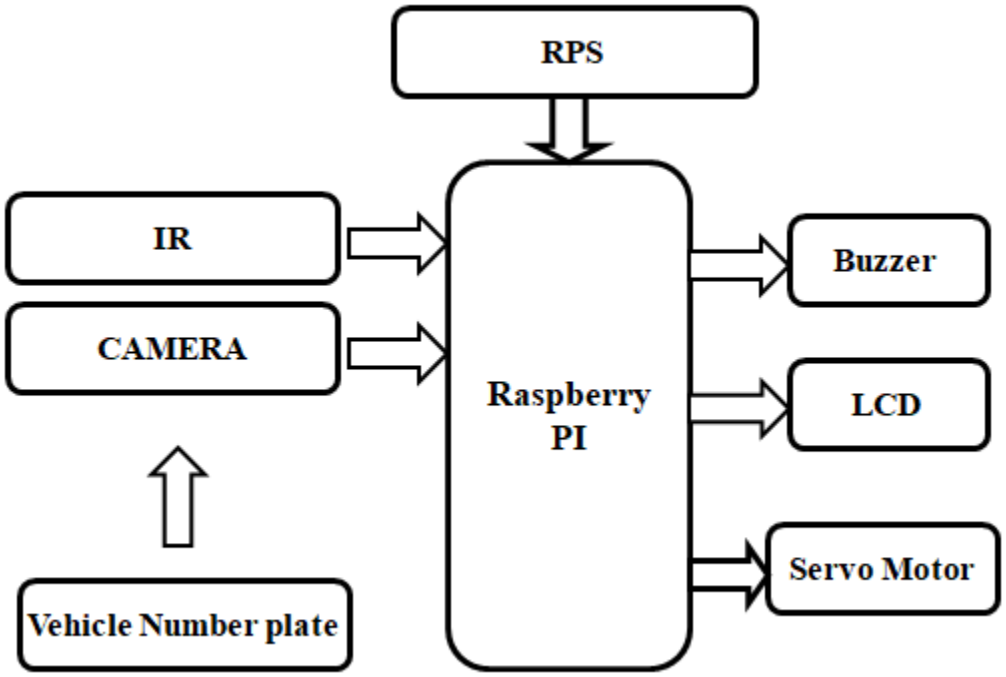

Fig.1. Proposed block diagram

WORKING MODEL:

To begin, we must connect the Raspberry PI to the hotspot. To do this, the mobile hotspot must have the Project user and Project1234 password. Then, using an advanced IP scanner, we must perform an ip scan to obtain the IP. Use pi as the user name and 12345 as the password to log into the ipwith VNC viewer where the Raspberry PI application is executing. Before diving in, we must maintain the vehicle information in a database using a text file with the first few letters of the vehicle's VIN, such as wb06f5977.txt. Every time a vehicle enters a nearby gate in the project, an IR sensor detects the object and authorises the camera to take a picture. The LCD displays the status of the picture as taken.

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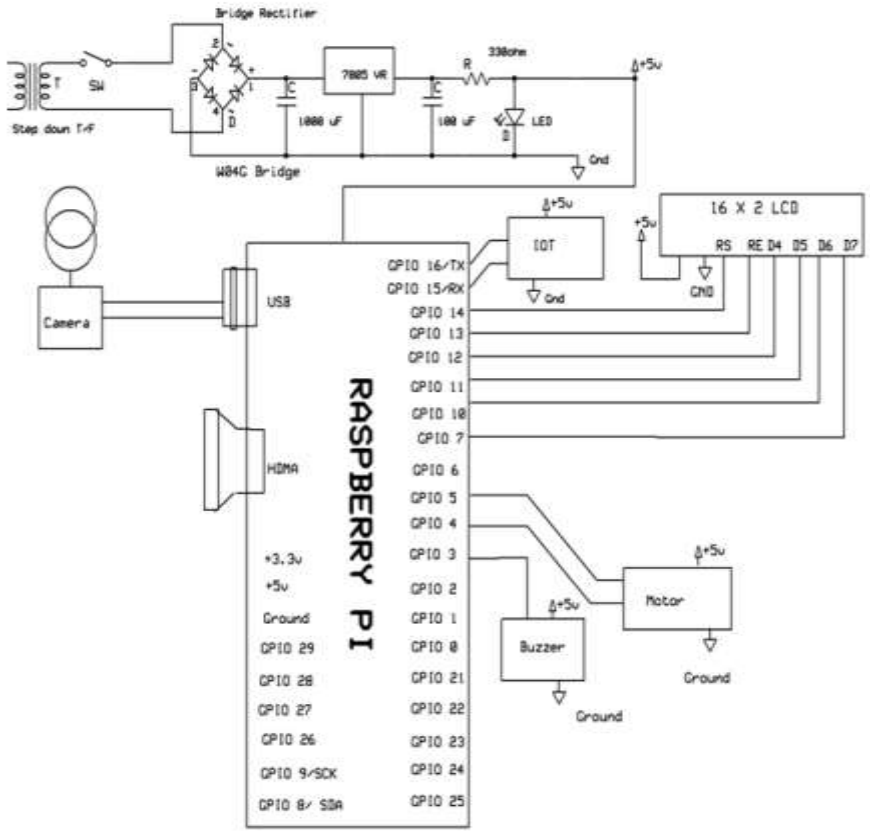

Fig.2. Proposed Circuit diagram

After taking the photo, the Raspberry Pi uses image processing to compare the vehicle number to the database using OCR and OCV technologies. If the vehicle number plate matches the database, the Raspberry Pi opens the gate and displays ACCESS GRANTED WELCOME on the LCD. If the vehicle's license plate doesn't match the database, a buzzer will sound and an LCD message reading "ACCESS DENIED NO ENTRY" will appear. We are utilizing a Broadcom BCM2837 microcontroller in this project. There are 32 pins in all. Buzzer attached to GPIO 3 with a 5 volt supply, and motor connected to GPIO 4 and 5. GPIOs 7 through 14 are linked to a 16x2 LCD display, and GPIOs 15 and 16 are linked to an IOT.

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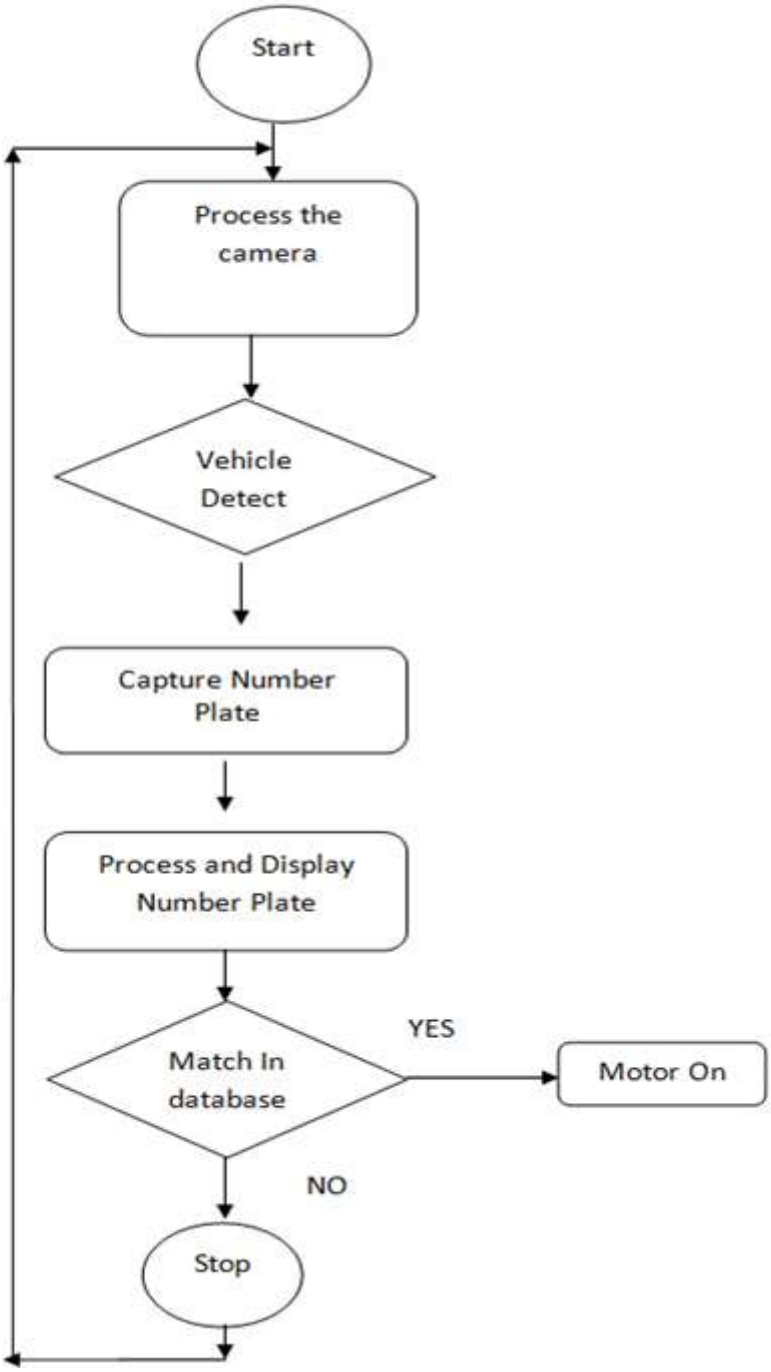

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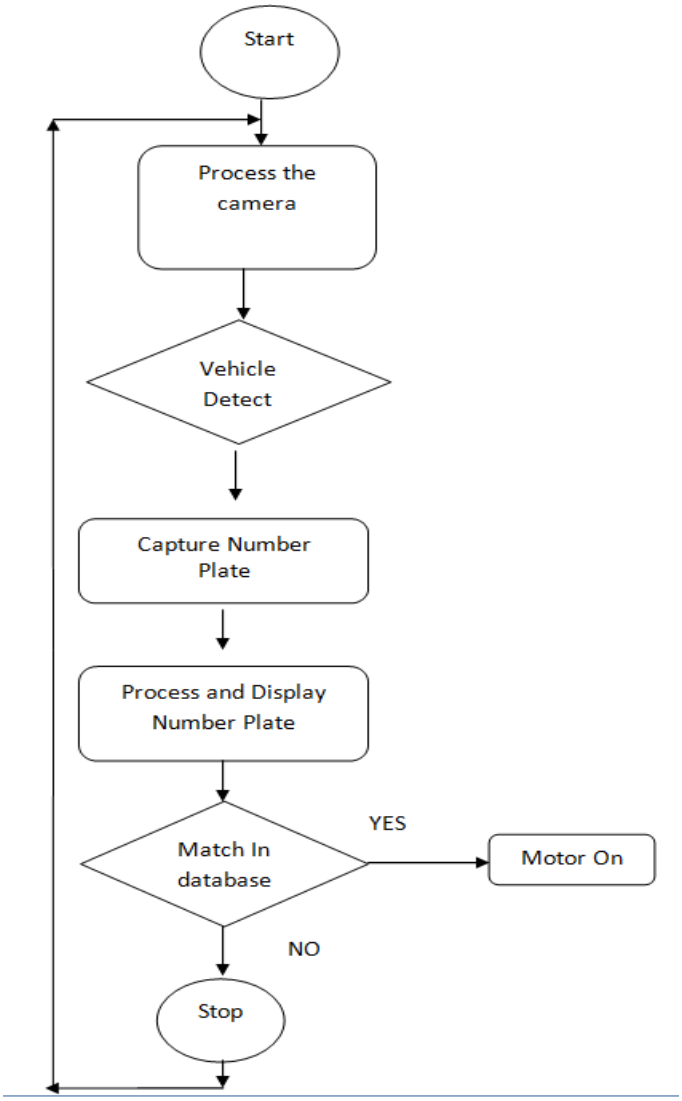

5. RESULTS

Here, a regulated 12 volt power source is used to switch on the circuit before being converted to 5 volts of direct current. Since the LED serves as a visual indicator for 5 volt current, it automatically illuminates in the presence of 5 volts. Every piece of hardware in the circuit receives the 5v dc current that is created.

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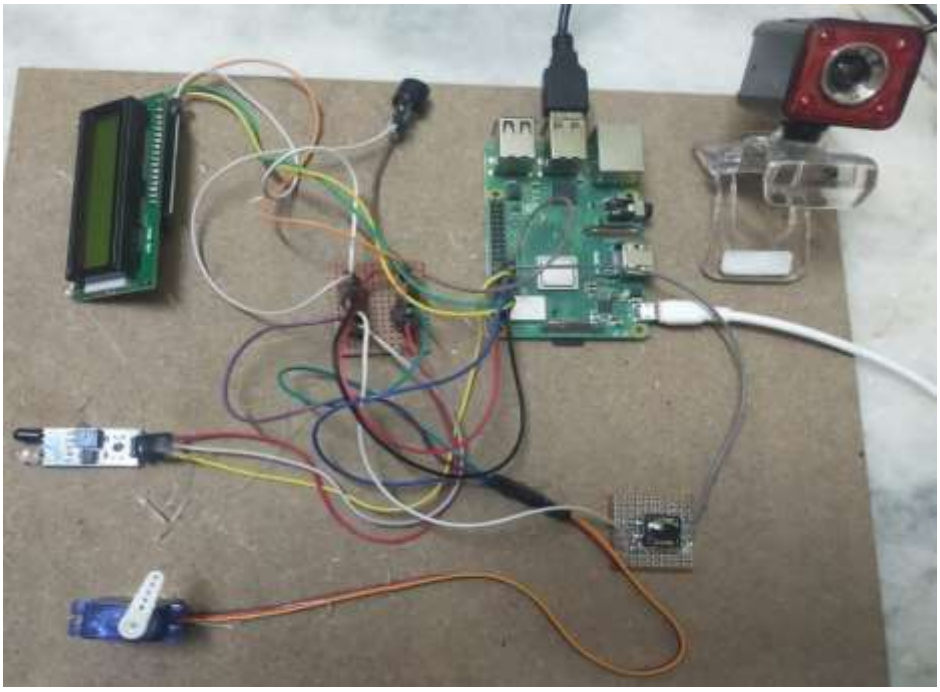

Fig.3. Proposed Output model

As the car number is displayed as true, which means the data is matching and will permit the vehicle by accessing the data, the Raspberry Pi is scanning the vehicle number and analysing the data to see whether it matches our database or not.

Fig.4. LCD Output Level Indication

This display shows that the car number in this case matches the database, allowing entry to the vehicle by opening the gate.

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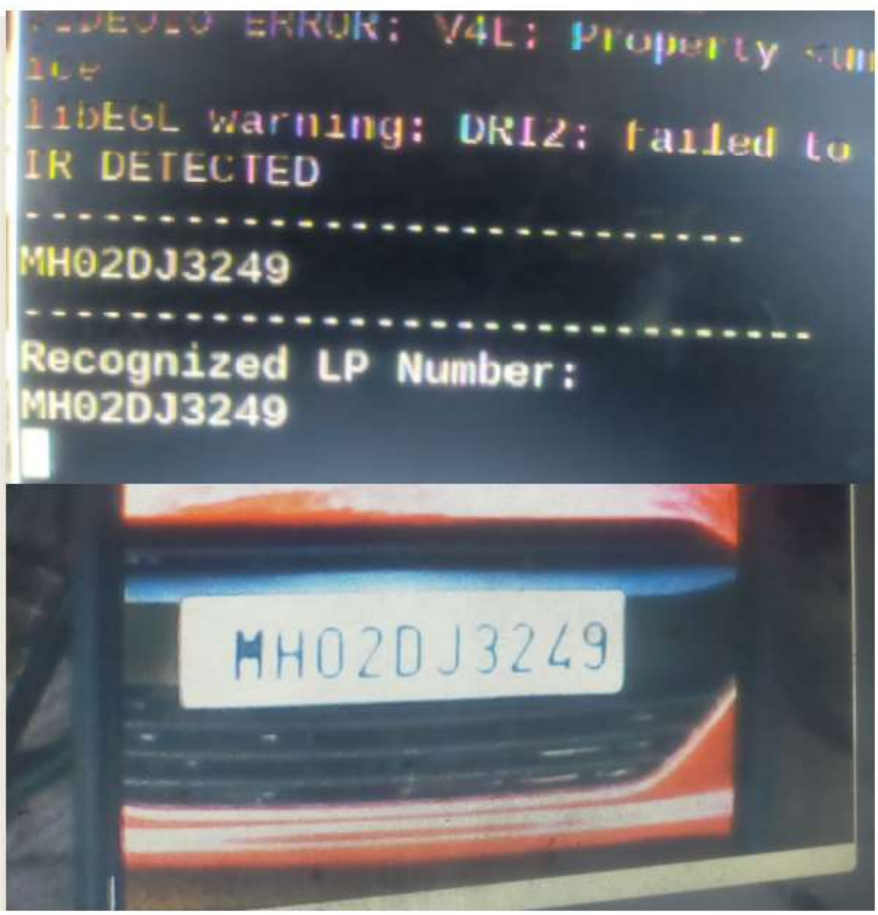

Fig.5. LCD Monitor Number plate

When a car number does not match the database, the vehicle is refused entry by buzzer while also being shown this display remark..

Fig.6. LCD Denied Output Indication

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6. CONCLUSION

We designed and implemented vehicle number plate recognisation with automatic vehicle accessing system. In this we proposed raspberry pi based processor to design. Web camera access the vehicle license plate and convert that image into text format and then check in database if it is available in database give permission to allow vehicle, if not access denied. This helps very accurate reading number plate and access using Optical Character Recognisation Method.

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