

Door Unlock System for Registered Vehicle Using Optical Character Recognition (OCR)

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Article Info

Volume 83

Page Number: 18684 - 18687

Publication Issue:

March - April 2020

Abstract

The exponential growth in the number of vehicles used in cities and towns is leading to management overhead of vehicles. So for a guard in any premise or in the toll road people have to check the vehicle plate and decide whether vehicle is authorized to go through or not. So all of this takes plenty of human efforts and time to lock and unlock manually again and again. This paper deals with those vehicles which are already registered under any home or any organization. When any registered vehicle comes in front of the door the camera is attached to the door which will read the vehicle plate number. Then Raspberry pi 3 board with Raspbian OS in which camera and DC motor are attached where the OCR(Optical Character Recognition) algorithm along with rest of the python code that will detect the vehicle plate in machine readable language and later the decision will be made whether to open the door or to keep it closed. Soit provides solution in those fields where the registered vehicle of any organization routinely arrives and departs. So every time guard will no longer has to stay on the door to verify. Also the entry time of the vehicle would be saved in the database and would therefore help the people at higher posts to know about when a particular employee entered the office, if he was on time or was he late. It would also save the exit time of that vehicle in the database when the vehicle leaves the premises and it would thus help in maintaining the proper system.

Article History

Article Received: 24 July 2019

Revised: 12 September 2019

Accepted: 15 February 2020

Publication: 30 April 2020

Keywords: OCR Algorithm (Optical Character Recognition), Raspberry pi 3, camera, DC motor, Camera.

1. Introduction

A door unlock system according to vehicle plate number is the unique way to identify a vehicle whether it is the authorized one or not. It uses image processing technology to recognize vehicles plate. Image that is read by camera undergoes various stages to get each character that is written over the plate. Automatic vehicle plate number has three stages: extraction of vehicle number plate, segmenting the characters and Optical Character Recognition (OCR).

This recognized plate can be used in numerous ways. Real time recognition of plate number can be used to recognize stole vehicles, maintaining traffic rules. Concept of identifying vehicle plate has application in

various fields like parking area, toll plaza. This could also help the police investigations in case there is an accident of that particular vehicle or anything like that as the police could use the data of the entry and exit time of the vehicle for their investigation purposes.

Lot of algorithms have already been discovered to identify the plate number like template matching algorithm, Haar Cascade algorithm, OCR algorithm, novel algorithm etc. Out of all the present algorithms OCR provides the best recognition.

For opening the door out of various microprocessors any one of them can be embedded with code. Raspberry Pi is the most suitable for such purposes which uses python coding. Based on the output of code, a DC motor can be attached which converts electrical energy into mechanical energy. This mechanical energy helps in opening the door.

2. Literature Survey

In a with huge population like that of India or China gated communities, offices, college campuses come across so many unrecognized vehicles. These vehicles may come with different fonts, different text formats or varying sizes. So many vehicles leave the premises each day and this becomes challenging for gate guard to note this manually and maintaining the same. This paper aims to extract clear picture from cameras attached and reads the vehicle number. Later or read plate number is converted into machine readable text. Template matching concept is used in this paper. This is used in recognizing digits and letters. [1]

This paper discusses about vehicle number plate recognition and also discusses how different countries use it for their benefits. Many algorithms for recognizing vehicle plates have been discovered. Most of them provide good recognition rate above 87%. But images with noisy background are hard to comprehend by existing methodologies. This paper propose a data which is able to handle noise rate up to 16% with 84% rate of recognition. [2]

Chuin-Mu Wanget. al [3] proposed a system that recognizes license plate with concept of neural network. In order to make the system fast and precise the proposed system has designed a corresponding workflow. When using it photographic lens gives images to the concerned owner. [3]

Ibrahim El Khatibet. Al [4] talks about how recognizing plate can make people's tasks easy. In this paper they have introduced a good, efficient algorithm for vehicle plate recognition, with focus majorly on Lebanese license plates. The proposed algorithm is implemented by using MATLAB R2013b feature Image Processing Toolbox.

Here the objective is to introduce door lock system which is secure which uses Raspberry pi where pi-lids and cameras are being used to give an alarm system which informs the owner. The authorized person is the only one to access the door. The purpose is achieved through taking the picture of the person with camera and code. [5]

SouravRoyet. al. [6] talks about the smart door, which helps to protect the path of the gate with respect to the identity of the person .It generates the system based on Raspberry-pi 3 and ensures that the entry inside the premise is given when your face gets recognized and detected by the recognition algorithms in the Open CV library. OpenCV is an open source which possesses computer vision library. This library also possesses a lot of optimized algorithms which are therefore used in many Information of Technology sectors that includes face detection and recognition. Being the libraries of the project they've made the best use of the LBPH (Lower Binary Pattern histogram) face recognizer and Haar classifier. The system used algorithm Haar Cascade that is used for detecting the object for which it was taught.[6]

Here in this paper primary step is capturing image which should be around a meter away. The motive is to get

a clear image with good quality so that the text is readable and the image should not be distorted. Then we crop the number plate from the captured image. The image is then used as an input. Then the last stage is character recognition where OCR technique is used for knowing what the character is. [7]

3. Proposed System

This project has the purpose that whenever a vehicle comes in front of a gate of any organization or building, image of the plate number would be captured with the help of a camera. When the image is taken then the picture of the number plate is accessed by Python code which is running on raspberry pi 3. From the code first captured image is converted to JPEG/ PNG format and later OCR algorithm is applied. Then each character or number in the image is converted into some machine readable form individually turn by turn. There is also a database which stores various characters of the number plates of the people who should be allowed to enter inside the premises and the door should open for them like the teachers of a school or employees of an office or work place. If the characters which are present inside image of the plate number of the vehicle present at the entrance matches with the characters of the number plates that are stored inside the database then the door would open with the help of a DC motor.

In the figure 1 of architecture diagram firstly the vehicles comes then the image is captured using the USB camera which is connected to raspberry pi. Then the captured image is converted to machine readable characters by OCR technique. Then the characters extracted by the OCR technique will be compared to the existing vehicle plate's number entries in database. Then the decision will be taken whether to open the door or not and the entry exit time will be saved.

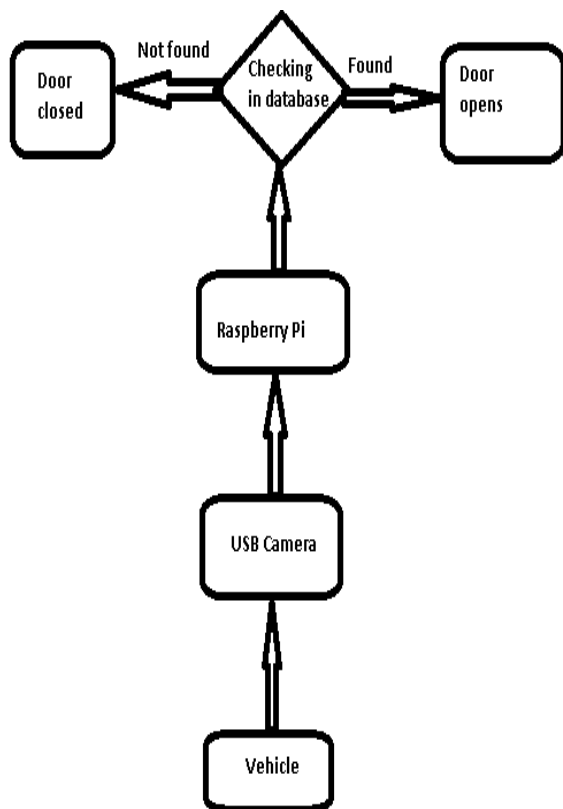


Figure 1: Architecture diagram

The proposed system has the following components:

3.1 Raspberry Pi

Raspberry Pi is a microprocessor which will process the input and based on logics embedded output is produced. The Raspberry Pi 3 is the third generation Raspberry Pi belonging to model B category. It runs on the 5V power supply. It uses raspbian OS which is installed on SD card. Raspbian is a Linux-based computer OS. Raspberry pi is used because it can be interfaced with Camera and dc motor easily.

3.2 USB Camera

Pi Camera Module is used for capturing image as an input device. It can move up to 58 degrees providing frame rate of 30 Fps. It has 30 MP cameras. It has lens with $f=6.0$ and $F=2.0$ along with this it has night vision too.

3.3 DC Motor

DC motor belongs to a class of rotating electrical machines which converts one form of energy into other form. Here electrical energy is converted to mechanical energy. DC motors can be used in toys, appliances and tools. The motor that is universal can operate on direct current but a light weight motor is used for portable tools. Main objective of using this motor is to opening the gate based on the result given.

3.4 OCR Technique

This is the image processing technique. OCR technique has lot of applications in areas such as in toll road, parking area, high security fields etc. Automatic number plate recognition can be classified in 3 steps: vehicle number plate extraction, segmenting the letters and Optical Character Recognition (OCR). Extracting vehicle plate is the phase in which vehicle is detected. It is processed and then result is passed to the segmentation. There the extraction of individual characters is done. The characters that are segmented are given to OCR algorithm. In the end information will be converted into machine readable text. The final output should be given in form of string of characters which is later compared with database whether the string is matching or not.

4. Result

Project to identify authorized vehicle is successfully implemented with chosen components. Vehicles are detected within a second if inclined properly in front of the camera.

Input image:

This input is taken by the camera attached on the door is represented in figure 2.



Figure 2: Input image

Output:

Door is successfully opened if the vehicle is already registered, otherwise it remains closed.

5. Conclusion

The project has been implemented to unlock the door using OCR technique. This paper illustrates how efficiently with OCR algorithm and right hardware devices connected can make a useful project. Only drawback is to identify which one is fake or legit number plate. This kind of project has future scope in various fields like parking management, theft control, boarder securing etc.

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