Real Time Vehicle Number Plate Recognition by using Raspberry Pi3

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Abstract: **The number plate Recognition system for vehicles plays very important role for authentication of specific vehicle. The system also has lot of commercial uses. As number plate having different formats and variety of fonts present over the vehicle. In this dissertation, a simple, smart, efficient and cost effective system can be implemented using OpenALPR Cloud. the system would be connected with this cloud. Thus the system works on real time inputs. The system make use of raspberry pi3, pi camera and PIR sensor as a hardware tools. Here we have use a Node-RED which is a flow-based development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs and online services as part of the internet of things. The system uses a Passive infrared sensor which detects the number plate of vehicle then pi camera captures image and send it to an OpenALPR Cloud which further authenticates the vehicle.**

Keywords: **Authentication, Raspberry pi3, OpenALPR, Node-RED.**

1. Introduction

The automatic Number plate recognition was invented in 1976 at the police scientific development branch in the United kingdoms. The system is capable of determining if the vehicle is registered or not, and then informing the authority regarding the status of vehicle. As Number plate is a unique identification of a specific vehicle. Number plate recognition has been applied in enormous applications.

Thus the system with Automatic Number plate recognition is a combination of integrated hardware and software that will not need of humans to do it. The purpose of this paper is to develop and implement a smart system for optimum use of information and communication technology. The main goal of system is to recognize the number plate of vehicle and to allow the specific vehicle only in an organization.

2. Literature survey

This paper focuses on security of parking at any premises. The implementation of Vehicle number plate recognition was achieved using Raspberry pi [1]. The main objective of this project is to design and develop an Automatic registration number of the vehicles automatically without any human intervention [2]. This paper is helpful for the identification and detection of vehicle number plate using raspberry pi2 [3].

3. Proposed System

The proposed system will be comprising of Raspberry Pi3 processor. It will be a kind of heart of the project. This onboard computer is able to effectively as well as efficiently communicate with the output and input modules being used. The Raspberry pi is a credit-card sized single board computer which was developed in UK by the Raspberry pi foundation. Here, the operating system for the detection of vehicle number plate using Raspberry pi3 is the Raspbian JC. For the recognition purpose, Raspberry pi modelB+ is used. Raspberry pi is a SOC (system on chip) device has inbuilt 1.2 GHz BCM 2837 Arm Cortex processor. The arm cortex processor is of 64 bits. Raspberry pi has 1GB Ram. The average power is ranging from 1.5 to 6.7 watt. Raspberry pi has 40 digital input output pins out of which 27 pins are GPIO (General Purpose Input Output). The operating system is installed in external SD card for booting and storage purposes.

As in many industries, they do not allow the unknown vehicles for the security issues. Their security is very important for industries thus a system is required to help for recognize of unknown vehicle on gate. Recognizing vehicle number plates is a difficult but much required system for today's world. This is very useful in the places like automating toll booths, automated signal breakers identification and identifying traffic rule breakers. Thus we propose a Raspberry Pi based vehicle number plate recognition system which automatically recognizes number plates of vehicles.

The system uses a camera circuit interfaced to a Raspberry pi. The system processes incoming camera footage to find or detect any trace of number plates. On placing a number plate in front of the camera, it further processes the camera input, extracts the number plate part from the provided image. Processes the extracted image using ALPR and extracts the number plate number from given input. Hence we put forward a vehicle number plate recognition system using Raspberry Pi3.

The camera plays important role in capturing images of

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vehicle number plate in this system. Here the ALPR (Automatic License Plate Recognition) technique is used for recognition of characters on vehicle number plate. When number plate gets detected further the verification takes place as the raspberry is connected with the cloud server the characters of vehicle number are send to the cloud.

The predefine information present on the cloud is shown. Later on if the condition gets verified then DC motor opens the gate otherwise the buzzer blows when the vehicle is unknown. Figure shows the complete execution process of recognition of vehicle number plate using Raspberry pi.
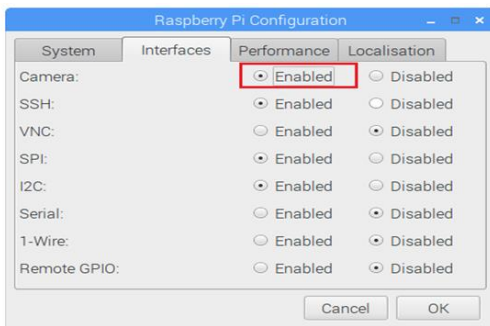
4. Design and Implementation

Step 1: Installation of Operating System
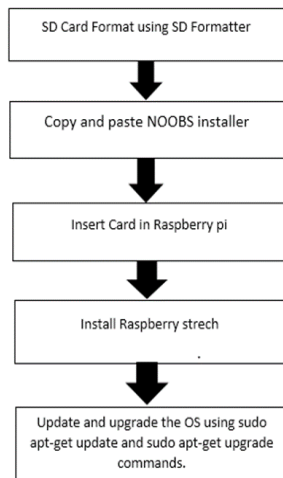

Step 2: Enable the Raspberry Pi Camera Module

To use the Raspberry Pi Camera module, you need to enable the camera software in your Raspberry Pi Configuration window under the Preferences menu, open the Interfaces tab and enable the Camera.

Step 3: Connect the Camera

Connecting the Raspberry Pi Camera Module is easy. With the pi shut down, connect the camera to the Pi CSI port as shown in the following figure. Make sure the camera is connected in the right orientation with the ribbon blue letters facing up as shown in the next figure.
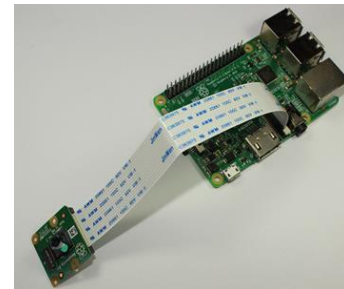
Pi Camera

Step 4: Installation of Node-Red

Getting Node-RED installed in your Raspberry pi is quick and easy. It just takes a few commands to installed Node-RED:

pi@raspberry:- $ bash <(curl – sL
https://raw.githubusercontent.com/node-red/raspbian-deb-package/master/resources/update-nodejs-and -nodered)
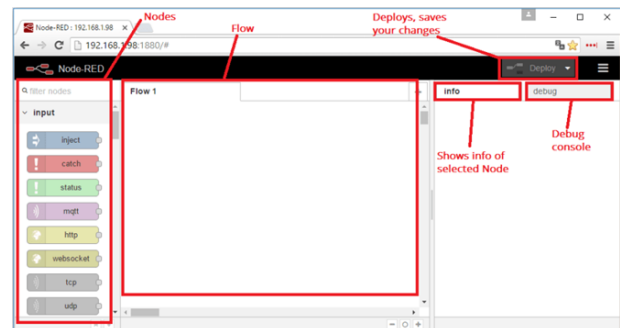
Step 5: Testing the installation

When your Pi is back on you can test the installation by entering the IP address of your Pi in a web browsers followed by the 1880 port number:

http://YOUR_RPi_IP_ADDRESS:1880

A page like this loads:

Step 6: Take Photos with the Camera

Step 7: Creating a free account

To get started with OpenALPR cloud API, you can create a free account. Open the cloud API tab to access your secret key. Save your secret key in a safe place.

Step 8: Creating the Node-Red flow

Before creating the flow make sure you have the camerapi

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take photo node. If there is no camerapi take photo node, then you will have to entered the specific commands for the installation of the node.

Step 9: Testing the flow

After deploying the flow, move your car to a place that you can take a photo with raspberrypi. Point the camera to the car and tab the square next to the timestamp node to trigger the flow. That should take a photo with your pi camera, save it at /home/pi/pictures/car-phoyo.jpeg and make a request to the cloud API to identify your car plate and model. It should print the JSON response in the debug window. Next, in the node-RED window, at the top right corner, select the menu, and go to Import > Clipboard. Then, paste the code provided and click Import. The next nodes should load in your flow: After importing the flow, you need to make some changes to make it work for you. Open the take photo node, Edit the nodes to have the settings as required. further Double-click on to the cURL POST node, then change the Command field to include your Secret Key and Country code.

Open the function node Identify Car to adds your car license plate and model. You need to replace the car plate and car model variables with your own car plate and model name. after making all the required changes, press the Deploy button.

5. Conclusion

This system which is able to captures the image of the number plate of a vehicle and these details of number plate were verified with the predefined details present on cloud using Raspberry Pi processor for authentication. The system alerts the authorities when any unauthorized image of number plate was detected through camera using buzzer. License plate extraction method is designed for real-time license plate extraction. Input to the system is an image which contains the license plate, acquired by a pi camera which is connected to raspberry pi3; and its output is the license plate region. After camera recognizes the number plate the information is sent to cloud through Wi-Fi module. System checks and authenticates vehicle number plate. If there is any unauthorized number plate of vehicle is observed, then buzzer will blow automatically. Experimental results show the proposed system using Raspberry pi can authenticate the system successfully.

6. Results

The Vehicle number plate Recognition using Raspberry pi can be implemented in any sector where the organization allows only specific vehicles. Also the system works on the real time inputs with greater efficiency and the system can be implemented with affordable cost. The systems use the ALPR Cloud software due to which the user don't need to maintain any kind of database. Authentication of vehicle number plate can be done easily by using this system.

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