A Traffic Surveillance System Based On IoT Using Raspberry Pi and Open CV for Smart Cities

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Abstract-License Plate Recognition system is a real time embedded system which automatically recognizes the license plate of vehicles. There are many applications ranging from complex security systems to common areas and from parking admission to urban traffic control. This paper presents an alternative method of implementing Python and the Open Computer Vision Library. Number Plate Detection is the technology which is used to read vehicle number plate from an image containing a still or moving photograph of a vehicle. It is a major breakthrough in the technology which is very helpful for the law enforcements and traffic management authorities. The variation of the plate type and some environmental illuminations are considered in this paper. This technology uses special kind of surveillance cameras to track down and record the vehicles registrations and track down their activities easily.

Keywords- *open-cv(computer vision)*

I. INTRODUCTION

Computer vision is a field of computer science that works on enabling computers to see, identify and process images in the same way that human vision does, and then provide appropriate output. It is like imparting human intelligence and instincts to a computer. In reality though, it is a difficult task to enable computers to recognize images of different objects. Computer Vision and Image Processing are like cousins, but they have quite different aims. Image Processing techniques are primarily used to improve the quality of an image, convert it into another format (like a histogram) or otherwise change it for further processing. Computer Vision, on the other hand, is more about extracting information from images to make sense of them. So, you might use Image Processing to convert a color image to grayscale and then use Computer Vision to detect objects within that image. If we look even further up the family tree, we see that both of these domains are heavily influenced by the domain of Physics, specifically Optics.

In this project License Plate Recognition Systems use the concept of optical character recognition to read the characters on a vehicle license plate. In other words, LPR takes the image of a vehicle as the input and outputs the characters written on its license plate. LPR sometimes called ALPR (Automatic License Plate Recognition) has 3 major stages.

A. License Plate Detection: This is the first and probably the most important stage of the system. It is at this stage that the position of the license plate is determined. The input at this stage is an image of the vehicle and the output is the license plate.

B. Character Segmentation: It's at this stage the characters on the license plate are mapped out and segmented into individual images.

C. Character Recognition: This is where we wrap things up. The characters earlier segmented are identified here. We'll be using machine learning for this.

In this we are using a Software as a service (SAAS) cloud i.e. openlpr in which we will upload the image and it will process the raw data which we give and pre-process and covert and give the number plate number of the car.

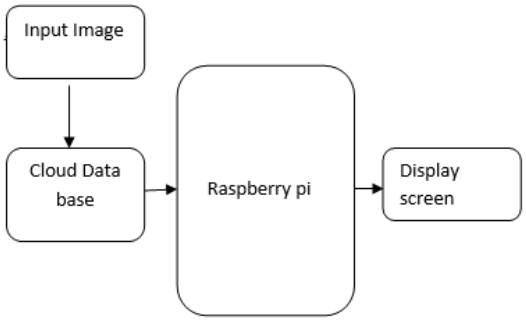


Fig.1: Block Diagram

The above block diagram explains the components used in this project. Here a single board computer i.e. Raspberry pi 3 is used acts as a CPU with a speed 1.2GHz of ARMv8 (BCM2837) microprocessor with 1 GB of RAM. Which will be programmed with the python program? The image is given to the OPENALPR cloud API where the car is localized and then using the algorithm it will pre-process and will give the number plate as the output.

FLOW DIAGRAM

The flow chart explains the program of the project License Plate Detection: This is the first and probably the most important stage of the system. It is at this stage that the position of the license plate is determined. The input at this stage is an image of the vehicle and the output is the license plate. Next Character Segmentation: It's at this stage the characters on the license plate are mapped out and segmented into individual images. Character Recognition: This is where we wrap things up. The characters earlier segmented are identified here. We'll be using machine learning for this.

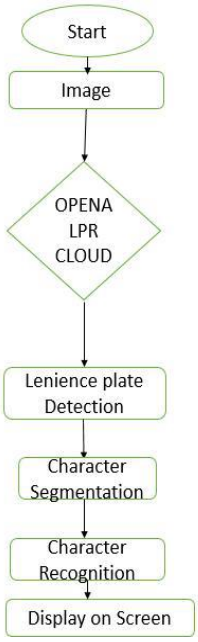


Fig 2: Flow Diagram

HARDWARE COMPONENTS

Fig.3: Raspberry pi Board

The Raspberry Pi foundation is working on yet another model of the popular Raspberry Pi boards, as the Raspberry Pi 3 model B board. The new board looks very similar to Raspberry Pi 2 model B, but adds on-board WiFi 802.11 b/g/n (2.4GHz only) and Bluetooth 4.0. Let's play "spot the difference" with Raspberry Pi 2 at the top and Raspberry Pi 3 under.We'll find the WiFi/BT chip antenna on the top left corner, and two through holes on the right of the 40-pin connectors, likely the RUN header for reset that can be found on the RPi2 where the chip antenna is now placed on RPi 3. So the through holes are not new, they've just moved it. All connectors have the exact same placement between the two versions. Let's check out the other side of the board.

The wireless module (likely Broadcom based) can be found just above the micro SD slot, and J5 connector is soldered. J5 is the JTAG connector, so it will probably not be soldered with the version that ships. The picture is not very clear but it looks like they've used the same Elpida B8132B4PB-8D-F RAM chip (1GB) as on Raspberry Pi 2. So although we can't be 100% certain right now, the RAM appears to be the same, and the processor is still connected to a similar USB to Ethernet chip, so they've probably kept the same architecture, expect possibly for the CPU core. So the only major changes on Raspberry Pi 3 appears to be built-in Wi-Fi and Bluetooth, and 64-bit ARM cores (likely Cortex A53). Since they've basically kept the same features as Raspberry Pi 2, beside changing the Cortex A7 cores to 64-bit Cortex A53 ones, and adding built-in WiFi and Bluetooth via a BCM43438 module, firmware support is basically the same with various Linux distributions – Raspbian being the recommended distro – and Windows 10 IoT.

II. CAPTURE

The image of the vehicle is captured using a high resolution photographic camera. A better choice is an Infrared (IR) camera. The camera may be rolled and pitch with respect to the license plate

III. SOFTWARE REQUIREMENT

Linux

Linux is a free open source operating system and it belongs to the Unix operating systems. Actually Linux means the kernel itself which is the heart of the operating system and handles the communication between the user and hardware. Normally Linux is used to refer to the whole Linux distribution.

Linux distribution is a collection of software based on the Linux Kernel. It consists of the GNU-project's components and applications. Because Linux is an open source project, anyone can modify and distribute it. That is the reason why there are many variations of Linux distributions. Most popular distributions are Ubuntu, Red Hat Linux, Debian GNU/Linux and SuSe Linux.

Raspbian Wheezy

Raspbian Wheezy is a free operating system based on Debian distribution. It is created by a small team of developers who are fans of Raspberry Pi. Raspbian is optimized for the Raspberry Pi's hardware and it comes with over 35 000 packages and pre-compiled software. Raspbian is still under

active development and it aims to improve the stability and performance of the Debian packages. (Raspbian [Ref. 15.2.2015])

Raspbian is officially recommended for beginners and it includes the graphical desktop environment called LXDE. Raspbian Wheezy is one of the fastest ways to setup and get the RasPi running.

Programming languages

There are considerable numbers of programming languages which have been adapted for Raspberry Pi. Python programming language is recommended by The Raspberry Pi foundation especially for the beginners. Basically any programming language which can be compiled for ARMv6 can run on the Raspberry Pi. There-fore the users are not restricted to use only the Python. On the Raspberry Pi there are preinstalled several languages for example C, C++, Java, Scratch and Ruby.

Python programming language

Python programming language is developed in the late 1980s at the National Re-search Institute by Guido van Rossum. Python has grown in popularity, and it is widely used commercially. (Upton, E. &Halfacree, G. 2012, 152.)

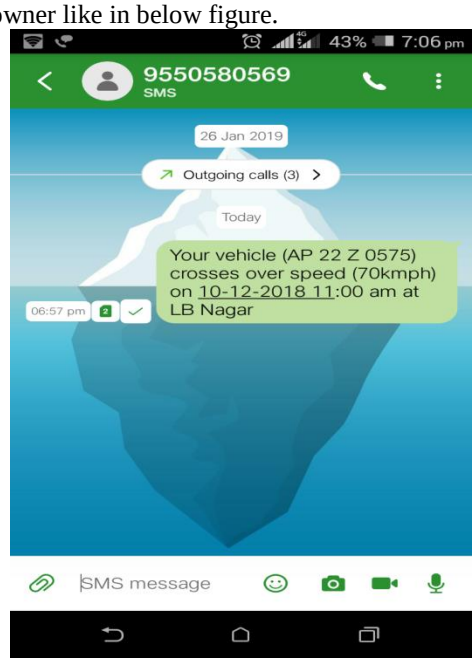
Python is a flexible and powerful programming language but still it is easy to learn and follow. The clear syntax of Python makes it a valuable tool for users who wants to learn programming. This is one of the reasons why it is recommended by the Raspberry Pi Foundation. Python is published under an open-source license and it is available for different operating systems. Python runs on Linux, OS X and Windows computer systems. (Upton, E. &Halfacree, G. 2012, 152.)

Cross-platform support guarantees that the programs which are written in Python are also compatible in other platforms. There are few exceptions where the pro-grams are not compatible. For instance, when the Python is addressed to use the specific hardware such like Raspberry Pi's GPIO. (Upton, E. &Halfacree, G. 2012, 152.)

IV. RESULT

The proposed system can help detect vehicles which are passing with a greater speed than normal speed limit. If the vehicle crosses limit, number plate of the vehicle is captured by camera and compared with database and number is notified to concerned authorities.

Real time alert is sent to the registered mobile number of the vehicle owner like in below figure.



V. CONCLUSION

In this paper LPR sometimes called ALPR (Automatic License Plate Recognition) has 3 major stages .License Plate Detection: This is the first and probably the most important stage of the system. It is at this stage that the position of the license plate is determined. The input at this stage is an image of the vehicle and the output is the license plate. Character Segmentation: It's at this stage the characters on the license plate are mapped out and segmented into individual images. Character Recognition: This is where we wrap things up. The characters earlier segmented are identified here. We'll be using machine learning for this.

REFERENCES

[1]. Prathamesh Kulkarni, Ashish Khatri, Prateek Banga, Kushal Shah, Automatic Number Plate Recognition (ANPR) System for Indian conditions

[2]. S.V. Rice, F.R. Jenkins, T.A. Nartker, The Fourth Annual Test of OCR Accuracy, Technical Report 95-03. Information Science Research Institute, University of Nevada, Las Vegas,(1995).

[3]. http://opencv.willowgarage.com/documentation/python/

[4]. A.Conci, J. E. R. de Carvalho, T. W. Rauber, A Complete System for Vehicle Plate Localization, Segmentation and Recognition in Real Life Scene, IEEE LATIN AMERICA TRANSACTIONS, VOL. 7, NO. 5, SEPTEMBER 2009

[5]. Nobuyuki Otsu (1979). A threshold selection method from gray-level histograms. IEEE Trans. Sys., Man., Cyber. 9: 62-66.

[6]. Chih-Hai Fana, Yu-Hang Peng, Vehicle License Plate Recognition System Design, Chung Hua Journal of Science and Engineering, Vol. 7, No. 2, pp. 47-52 (2009)