INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.165

Automatic Number Plate Recognition using Raspberry PI & PYTHON

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ABSTRACT*:* The basic idea of this research work is to build a number plate recognition system using python.Real-Time license plate detection and recognition can be very useful for automating toll booths, finding out traffic rule breakers, and for addressing other vehicle-related security and safety issues.The system uses a camera interfaced to a Raspberry Pi. The system constantly processes incoming camera footage to detect any trace of number plates. On sensing a number plate in front of the camera, it processes the camera input, extracts the number plate part from the image. Processes the extracted image using OCR and extracts the number plate number from it. The system then displays the extracted number on the monitor.

KEYWORDS*:* Automatic number plate, Raspberry PI, Image Recognition

I. INTRODUCTION

The basic idea of this project is to build a number plate recognition system using python.Real-Time license plate detection and recognition can be very useful for automating toll booths, finding out traffic rule breakers, and for addressing other vehicle-related security and safety issues. An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, sometimes with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure. In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be load and peripherals to be connected.

An embedded system is some combination of computer hardware and software, either fixed in capability or programmable, that is specifically designed for a particular kind ofapplication device. Industrial machines, automobiles, medical equipment, cameras, household appliances, airplanes, vending machines, and toys (as well as the more obvious cellular phone and PDA) are among the myriad possible hosts of an embedded system. Embedded systems that are programmable are provided with a programming interface, and embedded systems programming is a specialized occupation. Certain operating systems or language platforms are tailored for the embedded market, such as Embedded Java and Windows XP Embedded. However, some low-end consumer products use very inexpensive microprocessors and limited storage, with the application and operating system both part of a single program. The program is written permanently into the system's memory in this case, rather than being loaded into RAM (random access memory), as programs on a personal computer.

II. LITERATURE SURVEY

Title: RenZhengang, Design of Electronic toll collection system in Expressway Based on RFID," IEEE International Conference on Environmental Science and Information Application Technology, whhan China, 4-5 July 2009. This paper proposed the Electronic Toll collection System based on RFID which has advantages of less cost, small size and high reliability. It is very suitable for practical applications with the rapid development of national economy, total mileage of expressway and vehicle population remain constantly increase in china, accordingly, expressway network has becoming more complex [1].

Title:"Automatic Number Plate Recognition", 2018 International Conference on Advances in Computing, Communication Control and Networking (ICACCCN).Number Plate Recognition system is a security system. Image processing concept is used in Number Plate Recognition system. OCR (Optical Character Recognition) scheme is also applied in this for reading the image of vehicle number plate. Number Plate Recognition system is used for many purposes like toll way authorities uses this system for allowing the vehicle to enter the toll road by detecting their number plate automatically and provide them with pay-slip and then open the road for that particular car. Parking authorities also use this system for allowing the vehicle to park in their area. In this system, firstly we capture the image of number plate then process it and read each and every character present in the number plate for their perfect recognition. The most significant phase is OCR, where the letterings on the image of number plate are changed into the texts which can be decoded later. In this given research paper, a full algorithm and network flow for ANPR and its efficient applications are shown. The concept of ANPR system is based on the matching of templates and exactness (result) of this system was established as 75-85% for Indian number plates.

Title:"Number plate recognition and document verification using feature extraction OCR algorithm", 2017 International Conference on Intelligent Computing and Control Systems (ICICCS).The police forces around the world use vehicle number plate for legal vehicle authorization purposes, to check if a vehicle is registered or licensed. Most of us keep the vehicle papers in the vehicle itself, which is not at all safe in case of theft. In today's world, it is not secure to carry our vehicle papers and wherever we go. Hence, a system must be designed in which it is not necessary to carry our important documents to each and every place for verification. The aim is to design a system which captures the image of the number plate of a vehicle using a camera and the details are being retrieved using the character segmentation which is done by a feature extraction optical character recognition algorithm (OCR). Then the details retrieved from the number plate in text format is used to extract all the important information of the vehicle like, the name of the owner, address of the owner, date of registration of the vehicle etc. from the database. The police can verify whether the documents are fake or not. For us, it is useful as we do not have to carry our documents to every place with the fear of losing them.

Title:"Automatic Number Plate Recognition System for Vehicle Identification Using Optical Character Recognition", 2009 International Conference on Education Technology and Computer. Automatic number plate recognition (ANPR) is an image processing technology which uses number (license) plate to identify the vehicle. The objective is to design an efficient automatic authorized vehicle identification system by using the vehicle number plate. The system is implemented on the entrance for security control of a highly restricted area like military zones or area around top government offices e.g. Parliament, Supreme Court etc. The developed system first detects the vehicle and then captures the vehicle image. Vehicle number plate region is extracted using the image segmentation in an image. Optical character recognition technique is used for the character recognition. The resulting data is then used to compare with the records on a database so as to come up with the specific information like the vehiclepsilas owner, place of registration, address, etc. The system is implemented andsimulated in MATLAB, and it performance is tested on real image. It is observed from the experiment that the developed system successfully detects and recognize the vehicle number plate on real images.

Title:"Automatic Number Plate Recognition System(ANPR)":International Journal Of Computer Applications.In this system, firstly we capture the image of number plate then process it and read each and every character present in the number plate for their perfect recognition. The most significant phase is OCR, where the letterings on the image of number plate are changed into the texts which can be decoded later. In this given research paper, a full algorithm and network flow for ANPR and its efficient applications are shown. The concept of ANPR system is based on the matching of templates and exactness (result) of this system was established as 75-85% for Indian number plate

Title: GisuHeo, "Extraction of Car License Plate Regions using Line grouping and density methods," IEEE International Symposium on Information Technology Convergence (ISITC 2007). This paper proposed that, the double chance algorithm as an approach to car license plate extraction. The first algorithm extracts the line segments and group them based on set of geometrical conditions, using real life data base collected by speed enforcement camera, they obtained a high success rate of 99.5%, through double chance approach with verification [2].

Title: Dongjin Park, "Vehicle Plate Detection in Car Black Box Video," Department of Embeded System Engineering, Incheon National University, Incheon, Republic of Korea, 28 November 2017. This paper proposed a method to detect

Korean vehicle plates from black box videos. It works in two stages: The first stage aims to locate a set of candidate plate regions and the second stage identifies only actual plates from candidates by using a supportvectormachineclassifier. Internet services that share vehicle Black Box videos need a way to obfuscate license plates in uploaded video because of privacy issues [3].

Title: AishwaryaAgarwal, "Automatic License Plate Recognition using Raspberry Pi," IEEE International Interdisciplinary Conference on Science Technology Engineering Management Singapore, 22nd, 23rd April 2017. The objective of this paper is to complete automatic recognition system using OCR, they have used to the existing closed circuit, television or road rule for informant cameras or ones specifically designed for the task. The images of vehicles license plate is captured and is processed by segmentation of character and is verified by Raspberry pi processor authentication proposed . The system aims at designing system which captures the image of vehicle number plate and these details were used to Raspberry pi processor for authentication. The system also alerts the authorities when any unauthorized image of number plate is detected using buzzer alarm system. In this case number plate recognition can be indicated even through LED indicators. When any vehicle passes by system, the image of number plate is capture by camera. The image of number plate details are fed as input to the Raspberry piprocessor.

Title:C.V. KeerthiLatha, "License Plate Extraction of Images using Raspberry PI", IEEE International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) volume 4 Issue, 1 January 2015.The main objective of this paper is to provide researchers an analytical inspection of Automatic License Plate Recognition research by assorting the existing techniques according to the attributes they used. System based on number plate validation to control , LCD acknowledgement and Email notification. The paper present the algorithms for localization of yellow color license plate using morphological operation, character segmentation using histogram and intensity projection and optical character recognition using template matching. The traffic monitoring system by registration number identification is nowadays developed as solution for traffic monitoring with the help of technology. In this case the vehicles jumping the signals will be detected by laser and LDR sensor and there images captured by camera. The recognized registration number of vehicle will be stored. Also it provides SMS alerting system to the monitoring person.
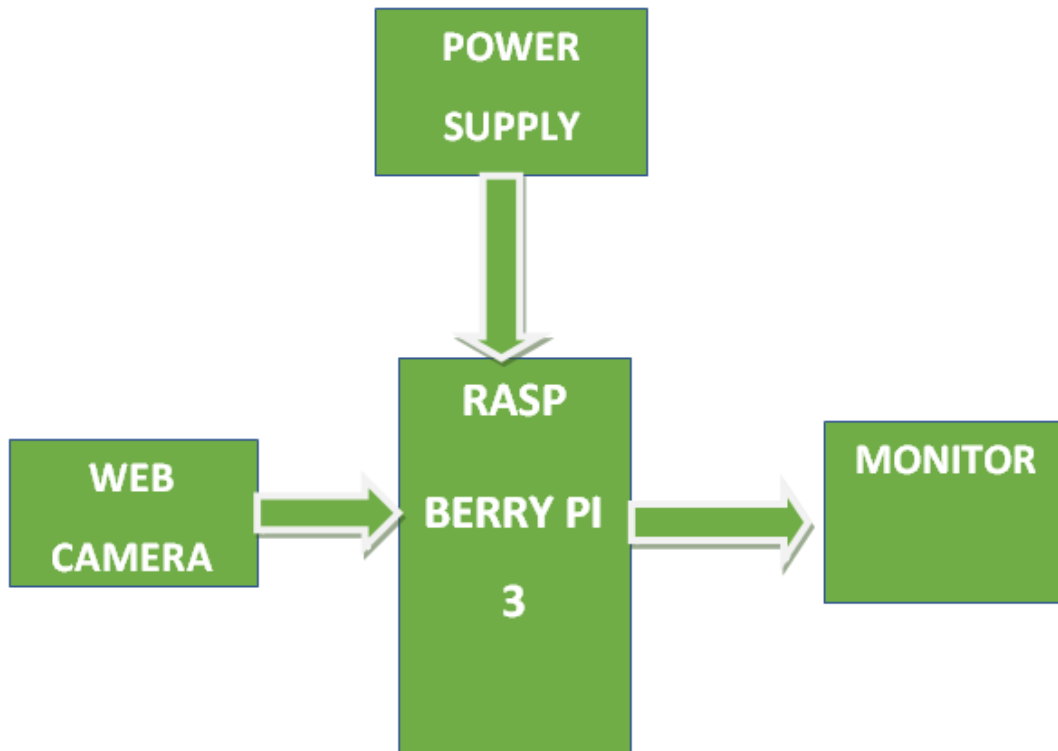
III. PROPOSED METHODOLOGY

Fig :3.1 :Block Diagram

The system uses a camera interfaced to a Raspberry pi. Whenever the vehicle is detected, the camera will automatically starts to capture and displays the number of that vehicle on the monitor . On sensing number plate using OCR and in front of the camera,it processes the camera input,extracts the number plate which consists of character, name,number,colour using filtersfrom the image. Processes the extracted image using OCR and extracts the number plate number from it. ANPRis a technology that uses optical character recognition on images to read vehicle registration plates to create vehicle location data. It can use existing closed-circuit television, road-rule enforcement cameras, or cameras specifically designed for the task. ANPR is used by police forces around the world for law enforcement purposes, including to check if a vehicle is registered or licensed. It is also used for electronic toll collection on pay-per-use roads and as a method of cataloguing the movements of traffic, for example by highways agencies.Automatic number-plate recognition can be used to store the images captured by the cameras as well as the text from the license plate, with some configurable to store a photograph of the driver. Systems commonly use infrared lighting to allow the camera to take the picture at any time of day or night. ANPR technology must take into account plate variations from place to place.Privacy issues have caused concerns about ANPR, such as government tracking citizens' movements, misidentification, high error rates, and increased government spending. Critics have described it as a form of mass surveillance .The ANPR equipment incorporates all the hardwarenecessary to capture the images of the vehicles and torecognize the number plate. Moreover, it incorporates theANPR engine. The ANPR equipments are designed to offerthe maximum reliability.
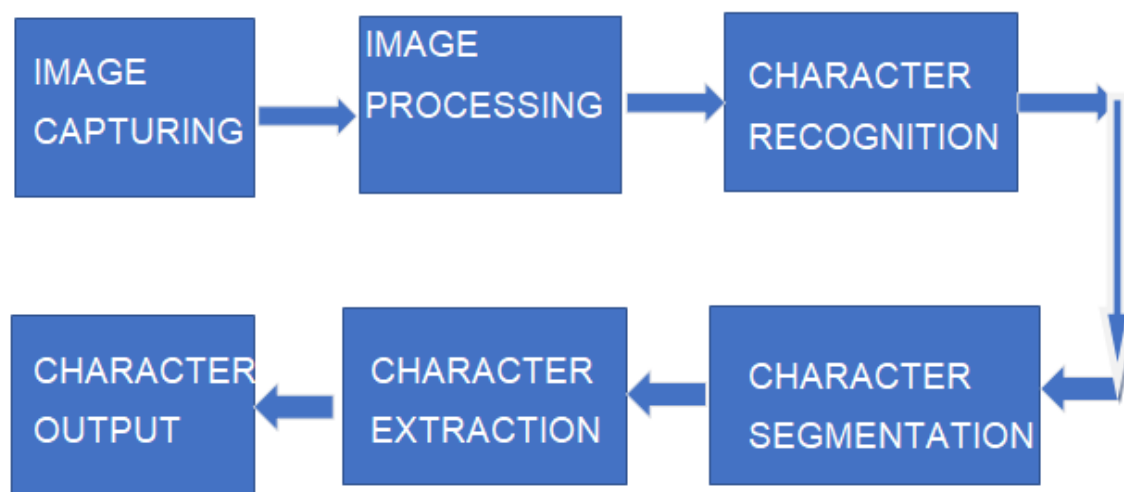

Fig ; 3.2 Functional Block Diagram

Number plate is a pattern with very high variations ofcontrast. If the number plate is very similar to background.It's difficult to identify the location. Brightness andcontrast is changes as light fall changes to it. In this paperthe morphological operations are used to extract thecontrast feature within the plate.

The work is divided into several parts:

A. Input car image

B. Gray scale conversion

C. Reduce noise using mid-filtering method

D. License Plate Detection

E. Character segmentation

F. Character Recognition

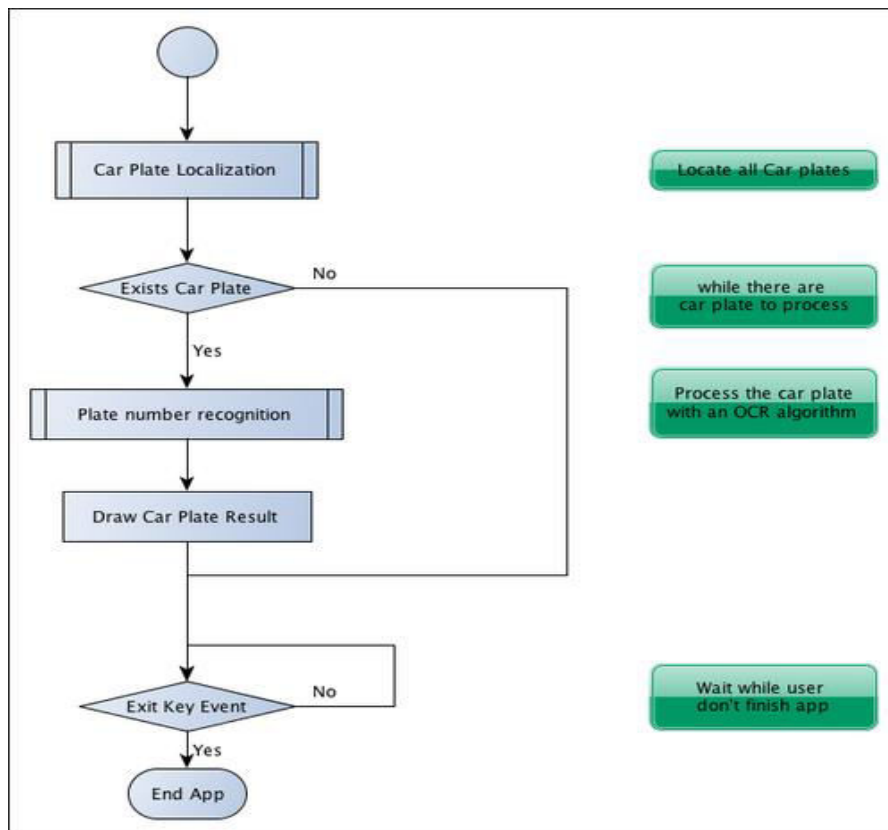Fig :3.3:Flow Chart

Operation of the system:

➢ The system "CU+PU" is the combination of two parts .The Capture Unit that takes the image of the vehicle, andthe Process Unit that receive the image from the CaptureUnit and makes the recognition of the number plate. TheProcess Units can control one or more Capture Unitssimultaneously.

➢ The quality of the solution depends on each manufacturer,although generally the "CU+PU" architecture hasdisadvantages respect the ANPR All-in-One, they are thefollowing ones:

➢ Non robust architecture

➢ The Capture Units controlled from the one only ProcessUnit will fall if the Process Unit does not work

➢ Complex installation and start-up

➢ It is necessary to install video and control wire for each oneof the cameras.

➢ Furthermore, it is necessary to provide power supply cableto the cameras, focus and Process Units. If the distancebetween the lanes is too long, the signal of the cameras willnot arrive with clearness to the Process Unit. For example:

➢ If we have to control 4 lanes gathered in groups of two andseparated by a distance of 2 km, It will not be possible tocontrol the 4 lanes with the same Process Unit. Sometimesthe cost of the installation may increase because of thelimitation of distances between the Capture Unit and theProcess Unit . If the Process Units are installed directlyon the lane it will be necessary to protect it with a weather proof of rack.
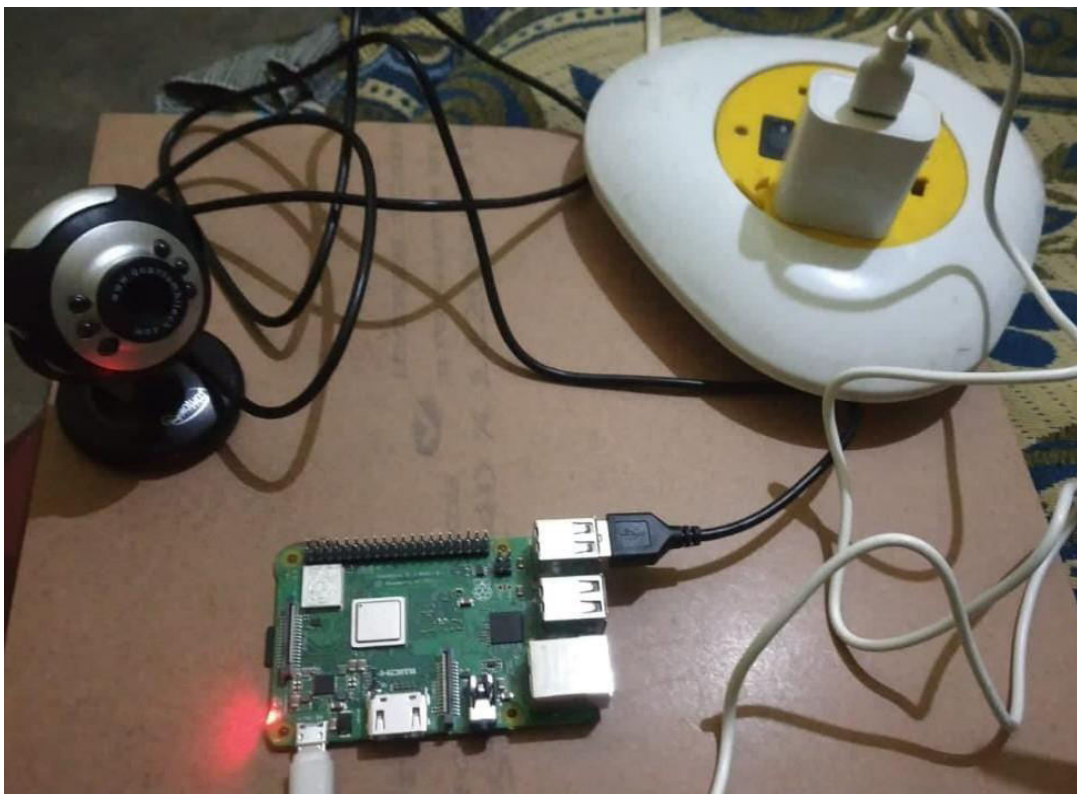
IV. EXPERIMENTAL RESULTS

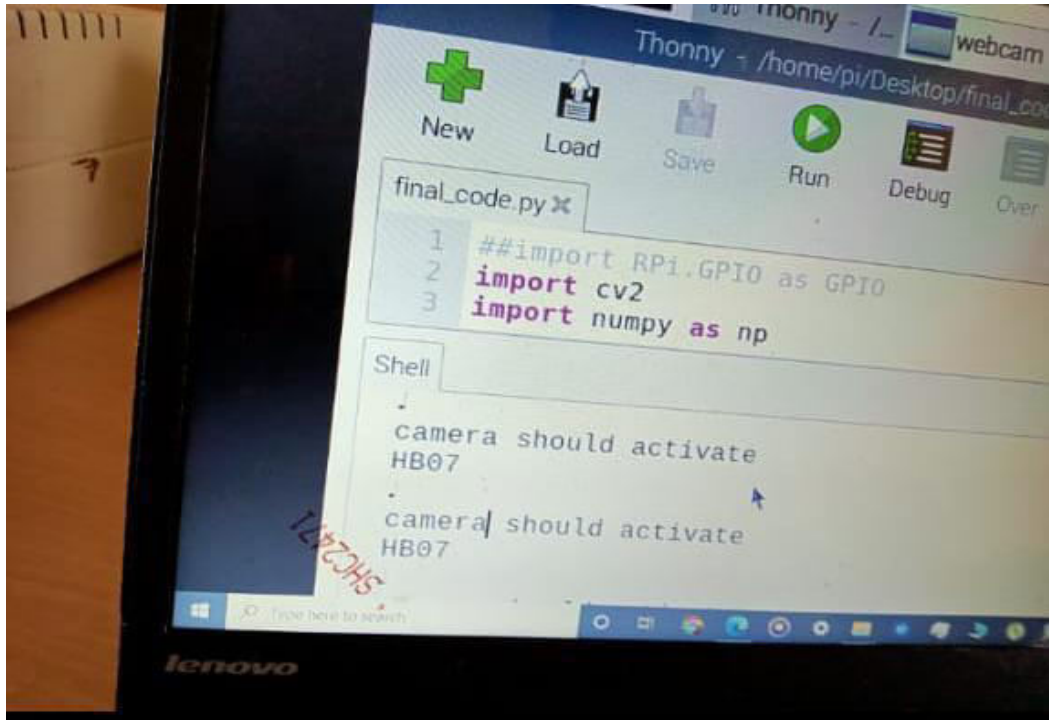Fig :4.1 : Automatic number plate system using Raspberry pi
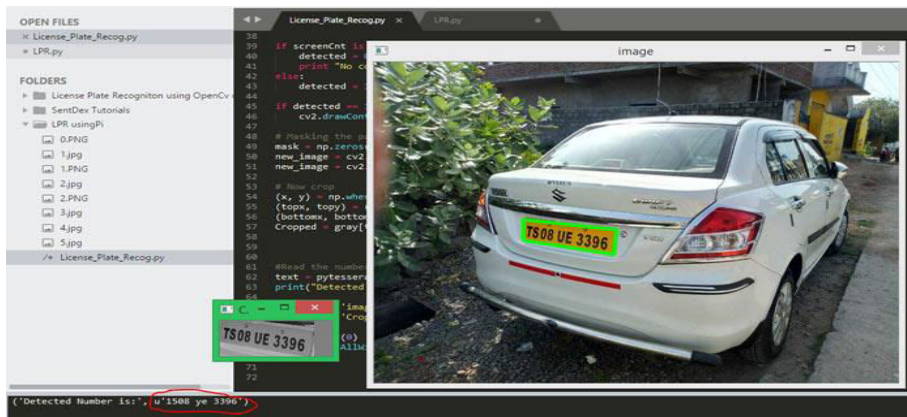
Fig :4.2 : output

Fig :4.3 : Output with Image

V. CONCLUSION AND FUTURE SCOPE

The automatic vehicle identification system using vehicle license plate is presented. The system use series of image processing techniques for identifying the vehicle from the database stored in the IOT. The system is implemented in Embedded Systems and its performance is tested on number images.The future scope is that the automatic vehicle recognition system plays a major role in detecting threats to defence.Also it can improve the security related to the women's as they can easily detect the number plate before using cab or otherservices. The system robustness can be increase if bright and sharp camera is used. Government should take some interest indeveloping this system as this system is money-saving and eco- friendly, if applied effectively in various areas.

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