Traffic Monitoring Using Real Time Image Processing

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Abstract- *This paper presents a powerful license plate recognition system, which is able to read license number of vehicle. Number Plate Recognition technique is used here which is nothing but an image processing technology. For identification of vehicle, number plate has been used. The optical character recognition (OCR) technique is considered for the character recognition. The data which is obtained as a result can be used for comparing with the specific information like the vehicle's owner, place of registration, address, etc. Implementation and simulation of this system is done in MATLAB only and the performance testing is carried out on real image. It is expected that the system must have desired high recognition, accuracy and reliability in order to achieve the goal of automatic recognition. Finally it is observed at the end that the system which is developed can successfully detects and recognize the vehicle number plate.*

Keywords- Arduino - UNO, IR sensors, MATLAB, License Plate Detection, Camera Image Processing, Optical Character Recognition.

I. INTRODUCTION

The number of vehicle is continuously increasing since 21st century with social development and improvement of living standards. Because of this, society and the environment are under huge pressure as the traffic condition is getting complex.

Thus keeping information regarding the complex traffic environment is very essential. Such kind of information is required not only for the traffic flow but also for vehicle discloser of traffic violation. From the recognition of vehicle license plate, one can get the Vehicle information easily.

License Plate Recognition plays various important roles in real-life applications, such as traffic law enforcement, road traffic monitoring, etc. In this processing, an emerging area is nothing but the vehicle registration plate detection. In general terms, keeping all the traffic records by traffic police seems to be very difficult along with the proof. Thus for making this difficult process into simpler one, the video cameras are placed at different height along with the different locations for detecting the registration plate. In this way the traffic can be controlled. The purpose of this system is to convert the images into characters.

In terms of security and intelligent traffic management system it plays a crucial role. The most important thing to be considered is that the plate should be stable while recognizing the registration plate. In the back end, plate region is selected as a first channel then thresholding is done and finally the characters are extracted with the help of histogram. Sometimes we see the confusing characters in our final result like '8' as 'B' and '0' as 'D'. Also validity checking is carried out against the vehicle related crimes.

II. EXISTING METHODOLOGY

The system for automatic car license plate recognition includes a camera, a frame grabber, a computer and custom designed software for image processing, analysis andn Recognition. Vehicle identification has been an active research for over the last few years.

A number of researches have been carried out to identity the type of vehicle such as a car, truck, scooter or motorcycle. In [4], optical character recognition (OCR) technique was used, which is a widely used technology which translates scanned images of printed text into machine encoded text.

Additional training is used for the difficult characters (E.g. I /1, B/8 and O/D) and in [5] comparison of distinguishing parts of ambiguous characters is performed. High recognition rates can be achieved by using large character images but this will result in a more complex structure of the neutral network as the number of weights will increase. The size corresponding to the best suitable results is used for the final neutral network. Each system proposed for vehicle identification and number plate recognition in the literature survey has its own pros and cons.

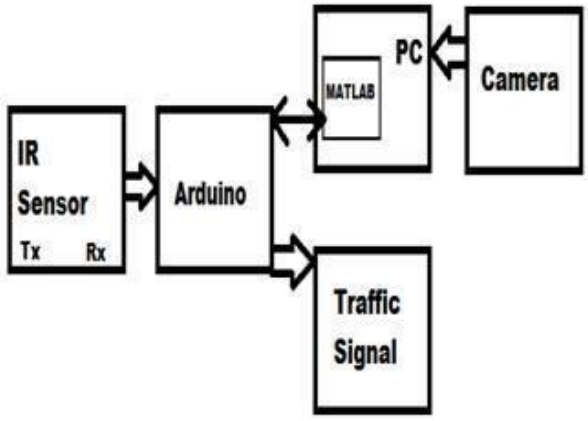

Fig. 1 Block Diagram for Traffic Monitoring System

III. ALGORITHM

A) ALGORITHM FLOWCHART FOR ARDUINO AND MATLAB

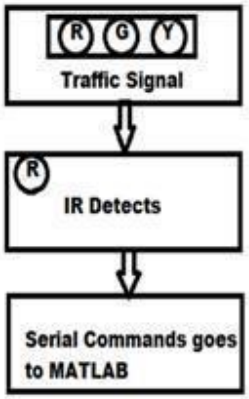

Fig. 2 Flowchart of Traffic Signal Algorithm in Arduino

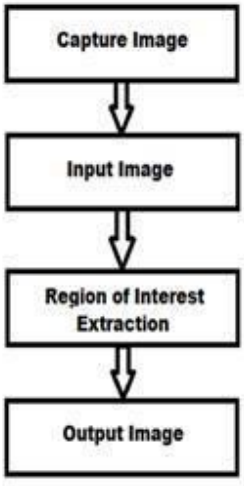

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Fig. 3 Flowchart of License Plate Algorithm in MATLAB

B) ALGORITHM FOR NUMBER PLATE RECOGNITION USING OCR

- Algorithm process is required to detect the plate data properly for the system of number plate recognitionalong with OCR.
- Plate localization is the 1st algorithm. This processfinds the plate on the image captured on the screen.
- Plate orientation and sizing can be carried out as a 2nd algorithm. In this process we will compensation for the skew and adjustment for the dimensions inorder to get the desired image size.
- The last algorithm is OCR (Optical Character Recognition) which majorly helps in Number PlateRecognition Process. It is less complex as compared to other methods.

IV. IMPLEMENTATION

The system is implemented with the help of different modules which are explained in the following section.

A) IR SENSOR

An infrared sensor is an electronic device. It emits in order to sense some aspects of the surroundings. It not only measures the heat of an object but also detects the motion .These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiation are IR LED. When IR light falls on photodiode, the resistance and these output voltages change in proportion to the magnitude of the IR light received.

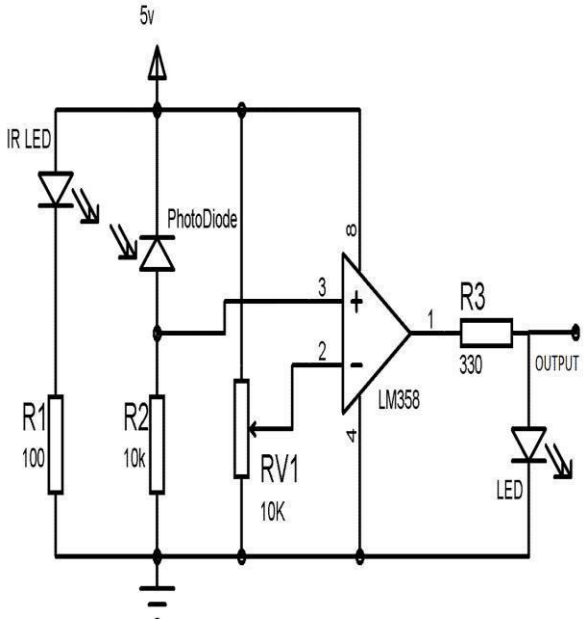

Fig. 4 IR Sensor Module Circuit Diagram

B) ARDUINO

Arduino is an open source computer hardware and software company, project and user community that designs and manufacture single-board microcontrollers and microcontroller kit for building digital devices and interactive objects that can be sensed and control objects in the physical and digital world.

"Arduino Uno is a microcontroller board based on AT mega 328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and the reset button". It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC to DC adapter or battery to get started

"UNO" means one in Italian. This word was chosen to mark the release of Arduino software (IDE) 1.0.

The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino projects provides an integrated development environment (IDE) based on the processing language project.

A program for Arduino may be written in any programming languages with compilers that produce binary machine code for the target processor. The Arduino project provides the Arduino integrated development environment (IDE), which is a cross platform application written in programming language Java.

It is originated from the IDE for the language processing and wiring. It includes the core editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching and syntax highlighting, and provide simple one click mechanism to compile and upload programs to an Arduino board.

c) TRAFFIC SIGNAL

A traffic signal can also be termed as control over the vehicle traffic passing through the intersection of two or more roadways. It can be done by giving a visual indication to drivers. Indications like when to proceed, when to slow and when to stop. Obviously traffic signal is used for giving indications to the driver. Traffic signals can be operated manually or by simple timer. This will allow less complexity in the traffic flow. Let us say on one roadway for a fixed period of time the simpler timer traffic signal is used in order to control the traffic. Similarly, on the other road way for another fixed period of time before repeating the cycle the timer is set.

d) MATLAB

In terms of technical computing MATLAB is considered as a high performance language. Integration of computation, visualization and programming is carried out in MATLAB. It is very easy as the problems and solutions are expressed in mathematical notion which is very familiar.

MATLAB is an interactive system. In this the basic data element is an array that does not require dimensioning. "It solves many technical computing problems, especially those with matrix and vector formulations, enough fraction of the time it would take to write a program in a scalar non interactive language such as C".

MATLAB has involved over a period of years with input from many users. For industry and advanced courses in mathematics, engineering and science it is considered as standard instructional tool. If we consider industry then MATLAB is considered as the tool of choice for high productivity such as for research, development and analysis purposes. In this project, we can use MATLAB software for the following purposes.

OCR - OPTICAL CHARACTER RECOGNITION

OCR is the recognition of printed or written text characters by a computer. "This involves photo scanning of the text character by character, analysis of the scanned in image, and then translation of the character image into the character codes, such as ASCII, commonly used in data programming". The OCR is nothing but recognition method. In this input is considered as an image and the output as string of character. This process separates the different character from an image. Template matching is one of the approaches of OCR. The cropped images are compared with the template data which are stored in database. It automatically identifies and recognizes the characters without any indirect input. The characters on the number plate have uniform forms than the OCR for number plate recognition.

For reading text, and sophisticated software for analyzing image, an optical scanner is required. All OCR system should carry such optical scanner. Most OCR systems are combination of hardware and software to organize characters, although some inexpensive systems do it entirely through software. Advanced OCR system can read text in large variety of fonts. For a OCR system of the number plate recognition, algorithm processes are as follows:

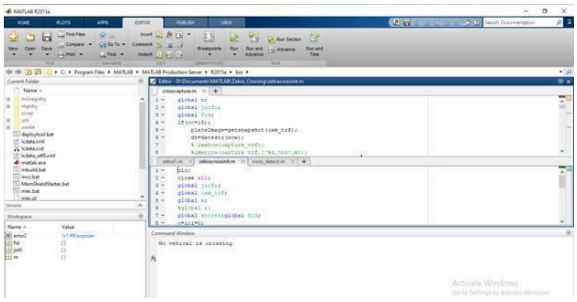

Fig. 5 MATLAB Software with the Respective Code

a) CHARACTER RECOGNITION

Character Recognition identifies the characteristics of the character input image which is most important and critical stage in the NPR system. The segmented characters are rescaled in this process just for matching the characters input on a window.

To achieve this each character is normalized to the proper size of binary image. It is done by reshaping it to the standards dimension before further processing. For template matching fitting approaches is also essential. Such different methods are used for character recognition, letters and characters in the paper. Identification process can be completed just by calculating the similarity of features.

If similar character are observed then make the second identification. That method is nothing but feature point matching." Another approach is that once the lines in an extracted vehicle number plate are separated, the line separation process is now applied column vice so that individual character can be separated". Thus these individual separated characters are then stored in separate variables.

Characters are extracted from the number plate and the data coming from those extracted characters are being stored for matching purposes. Hence, further template matching is done. Template matching for character recognition is considered as an efficient algorithm. The characters from the image are matched with the even database in order to obtain the best resembling outcome. Another approach for character recognition is the OCR. It is used to compare the each and every individual character against the complete alpha numeric database. For matching of individual character, OCR uses correlation method. Finally the number is identified and stored in a variable format. In this way for authorization those characters are compared with the database.

b) PLATE LOCALIZATION

Initially it localizes the vehicle number plate simply by detecting the number plate size. For that an algorithm is used for detection of the rectangle number plate region in the image. This is called as Region of Interest (ROI).

Then extraction of the plate region is done. This method is combinations of edge statics and mathematical morphology. It is applied to detect that particular region. Gradient magnitude and corresponding local variance in the vehicle number plate image are computed in this method. In short, first it locates and extracts the possible number plate of vehicle from the image for further processing. Block-based processing can also be useful in plate localization.

Software module is considered as the decisive portion of this NPR system. This software module uses image processing toolbox which is further executed in MATLAB. NPR system consists of four steps named as image acquisition, license plate extraction, character segmentation and character recognition. These various approaches are used for the efficient and accurate results.

c) IMAGE PROCESSING

The captured image is affected by many factors like: Optical system distortion, system noise, lack of exposure or excessive relative motion of camera or vehicle, etc." Result is degradation of a captured a vehicle image and the adverse

influence to the further image processing therefore before the main image processing preprocessing of the captured image should be taken out which includes converting RGB to Gray, noise remover, border enhancement for brightness".

For improvement in the image quality preprocessing is carried out on the captured image. It is done as the processing gets simpler and easy. After the preprocessing, enhancement of an image and changing the color image into gray is fed into the main body of NPR system. After this preprocessing NPR system has 2 main steps. Those are localization and character recognition.

V. RESULT

The desired output is shown in the following pictures.

Fig. 7 Number Plate Image- Input

Fig. 8 Number Plate Image- Output

VI. CONCLUSION

A very high degree of accuracy is required in terms of License Plate Recognition process as the images are captured from different angle at different distance. Our test of license plate detection with different noise level and motion blur shows that the algorithm is tolerable to the motion blur in a certain range. The aim or target for expected result was that it should be efficient, fast, simple and friendly vehicle license plate recognition system. It ensures a cheap hardware. The design of the system is so simple that it ensures a fast and real time system. The system is implemented in the MATLAB. After implementation in MATLAB the performance is tested on real images. If high resolution camera is used then system robustness and speed can be increased.

Problems regarding to the traffic, stealing cars, etc are increasing rapidly. So there should be such immediate need for the number plate recognition system. This kind of system is very economical and eco-friendly until and unless it is applied efficiently.

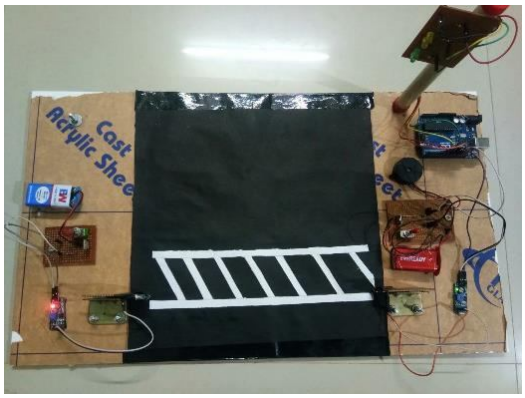

Fig. 6 Hardware Diagram

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