Automatic Number Plate Recognition System for Vehicle Identification

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***Abstract*-The proposed system will be designed as for the automatic vehicle identification for the security purpose. The number plate of the vehicle is identified by image identification technology. This system can be implemented for the security checking in the area of the parliament and defence military area and also used in the toll plaza, parking fee collection etc. The images of the vehicles will be captured by cameras and those captured images will be processed by MATLAB. Here the MATLAB is used for the image identification and vehicle number extraction. The system contains embedded section for the automatic control of the gate and communication purpose. A LCD screen will be provided at the entry of the gate to gives the instruction to the driver and whether he is permitted to this area or not and the message will be passed to security cabin. The communication between MATLAB and microcontroller is done by using Zigbee. We can also extend to get the information of the vehicle owner, by incorporating the RTO database. The embedded section is programmed by using embedded c**.

Keywords— ANPR, character recognition, segmentation, OCR, edge detection, Binarization.

I. INTRODUCTION

The Automatic Number Plate Recognition (ANPR) system for vehicle identification was invented in the year of 1976 at the Police Scientific Development Branch in the United Kingdom. However, it grows more and more interest during the last decade along with the improvement of digital ANPR camera and the going on increase in computational capacity

This system is simply capable to automatically extracting and recognizing the vehicle number plate's characters from an image.In essence it consists of a camera or frame grabber that has the capability to grab an image taken by the camera, system finds the location of the number plate in the image and then ready to extract the characters for character recognition tool to translate the pixels of the number plate into numerically readable character.

ANPR system is the technology, which capture the number of the vehicle at a particular place using the image captured by the cameras. The system can be implemented in the places which mainly concern for the security purpose and this can be implemented in the toll plaza, parking fee collection etc [1].

The system consists of hardware section as well as software section. Whenever the vehicle is come in to that particular area, the sensors senses the incoming vehicle by using IR sensors .The camera will be active to take the images of the vehicle. These pictures from the cameras are sent to the MATLAB and those images are processed further to extract the number by the MATLAB. This data of number is transmitted to microcontroller via a Zigbee module [4]. If it is a stolen or theft vehicle the LCD display will display the message 'NOT ALLOWED' with the vehicle number at the time the alarm will ON, gate will not open. If it is a legal vehicle the LCD display will display the message as "ALLOWED" with the vehicle number and the gate will open.

II. WORK AND HARDWARE DESCRIPTION

The proposed Automatic Number Plate Reorganization system uses Zigbee for wireless communication is shown in Figure 1. This technique used to provides the low power, low price and more network flexibility. This is an ideal wireless communication technique for data reception and transmission. For command sending method. It is used in industrial data acquisition and control of home automation systems and for the environmental monitoring. Here Zigbee is used for communication with the microcontroller with the incoming vehicle is authorized vehicle or unauthorized vehicle. The microcontroller used for implantation for the system. The microcontroller receives the data from the MATHLAB and it controls the Gate.

The microcontroller is connected with peripherals such as Gate, alarm system, LCD display. These can be operated by using LPC2148. Here Gate is used for automatic open and close whenever vehicle is come in to the sensor area [4]. similarly a Alarm can be used for when unauthorized vehicle is come to that particular area, The alarm is ON LCD display will be used for Displaying the message to that particular vehicle which is allowed or not. These details are updated in a central database.

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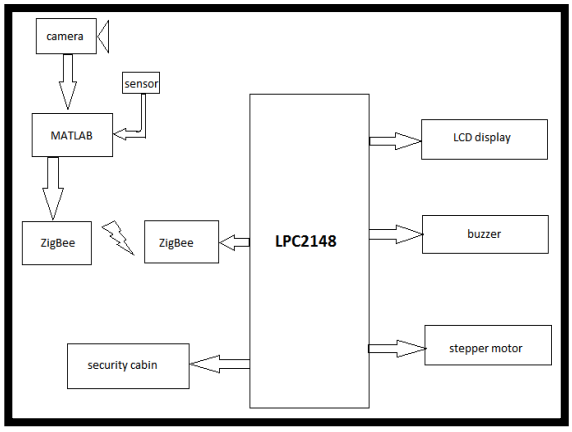

Figure 1: Proposed Architecture

A. *ARM LPC2148 Processor*

ARM7 processor requires significantly few transistors than other processors. Hence it uses the less power and heating problems also it reduces cost of the system. The ARM-7 processor provides on board serial communication interfaces such as SPI, USB 2.0, I2C bus, multiple UARTs, on chip SRAM from 8KB to 40KB. The processor provides Advanced Risk machine (ARM) of version 7 is high performance 16/32 bit microcontroller architecture which consume the less 3.3v of power supply, supports for 16 bit thumb2 instruction set along with 32 bit ARM instruction set is popularly called as ARM7/TDMI processor. The ARM-7 processor plays an important role in this ANPR system.

B. *Camera*

The presence of the vehicle is identified by the sensors. Whenever vehicle is crossed the sensor area, there is a change is induced and current which detects the presence of vehicle. At this time the camera capture the images of the vehicle [4].The captured images are stored in the memory these images are used to process by the MATLAB. The images in the memory high quality images those can be captured by high definition camera which helps to easily identify the vehicle.

C. *MATLAB Process*

Image processing will be done by following the below three steps Figure 2

1. Importing the image with optical scanner or digital photography.
2. Image is then analyzed and manipulated for data compression, image enhancement and
3. Output is the last stage in which result can be altered image or report that is based on image analysis

Image processing is basically a one of the technique in which an image is converted from image into a digital from and there are various operations performed on this image in order to get an enhanced image and to extract the full of information from it can be seen from the Figure 2.

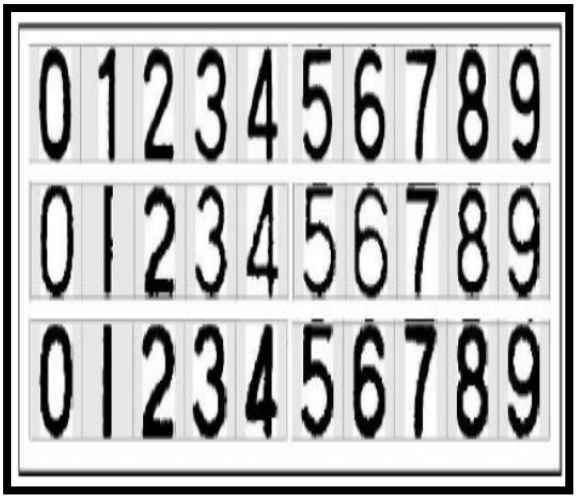

Figure 2: Recognized number

The numbers on the vehicle number plate all printed digits which are easier to recognize than the hand written digits [5]. However the vehicle numbers on the plate is different fonts making the recognition problem much harder, some vehicle numbers have clear their numbers on the number plate and some of those quite dirty[6]. The images are digitized with the help of photo camera or by a video camera which is connected to Zigbee and which transfer the signal or data to microcontroller in fig.2. The digitization is done so that it can be stored in the computer's memory or in a form of media storage like CD ROMs and Hard disk. [4]

Figure 3: vehicle number

D. *IR Sensor*

IR Sensor consists of two sections-transmitter and receiver. Transmitter which continuously sends the IR signal and receiver which receives the reflected light from the obstacle. So, it has been used as the object detector in the proposed system. To get precise output, LM339 comparator has been used. Whenever receiver receives the reflected signal IR the LED glows indicating object is detected on its path. IR sensor pin is connected to input pin of LPC2148 processor to detect objects in vehicle path.

E. Zigbee

Zigbee- based wireless network communication technique it provides to consume less power, less cost and network flexibility is more, which is an ideal wireless method for data acquisition and commands sending.

Therefore, it is widely used in home automation systems, industrial data acquisition and control, and environmental monitoring systems, Here Zigbee can be used for communication with the microcontroller, were the incoming vehicle is authorized vehicle or, an unauthorized vehicle [1].

F. DC Motor as a gate

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors are can be driven simultaneously by the motor driver, both in clockwise and anticlockwise direction. The L293D is a Dual Full Bridge driver this can drive up to the 1 Amp per bridge with supply voltage up to 24V. Two H bridges of L293D driver can be connected in parallel to increase its current capacity to 2 Amp. Motor drivers L293D act as current amplifiers since they take a low-current control signal and provide a higher-current signal. Input logic 00 it will stops the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

G. Buzzer

It plays important role in this ANPR system. If the vehicle is unauthorized vehicle it will immediately inform by the sound which is placed at the gate and buzzer are related to each other. The operation of buzzer and gate has been done by controller.

III. ARCHITECTURE DESIGN

Pre-processing of Image after getting number plate image from camera is shown in Figure 4. Processing conditions are taken into the consideration and if the camera captured image consists of blur factors as well as noise factors that may affect the quality of the numbers and may cause the data loss. In order to avoid these loss and affects contrasts adjustment, de-blurring and edge detection is should be used to done. Here the image is converted from RGB into gray scale and after sharpening and smoothing of the image is done [2].

In edge detection techniques various algorithms are used like Sobel, laplacian. Mainly laplacian is used, it works as follow:

1. First it takes the input image and compares it to the similar images.
2. Blurring of the number plate images is done to the edge detection.

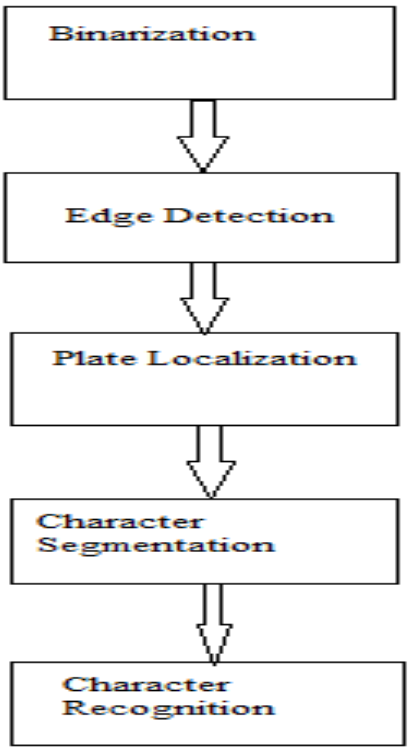

Figure 4: Preprocessing of Image

The captured images are classified into two classes: One is Surface image, second one is edge image. Image segmentation is deals with separation of uniform patches. Intensity and ranges of the images are segmented. After detecting edge of the image then surface of image is detected, after those characters from the number plates are separated from image [3]. License Plates contain the different fonts and colors. Extracted data from image is stored in the text file.

IV. RESULTS

The system is starts from object detect sensor, whenever the vehicle is come in to the sensor area sensor will detect the vehicle and activate the camera. The MATLAB processed vehicle number plate the recognized character from the number plates are comparing with the templates, the templates are from A to Z and 0 to 9.

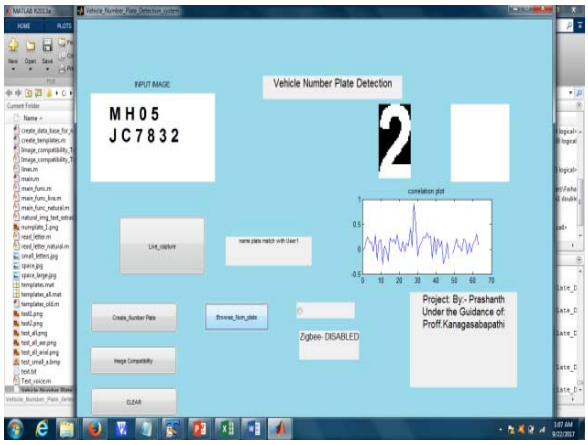

Figure 5: simulation result number plate

For in the case of template matching of vehicle number with templates correlation is used. The following Figure 6 and Figure 7 show the number in text file, here the MATLAB is chooses for system moves to a real time environment, and for the fast computation.

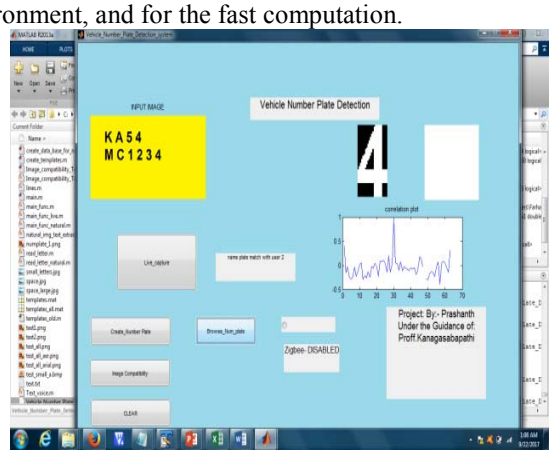

Figure 6: simulation result of number plate

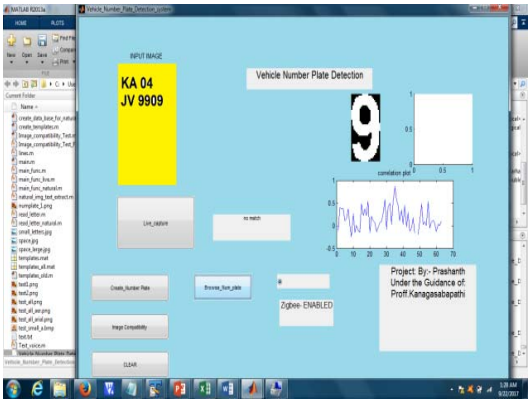

Figure 7: simulation result of number plate

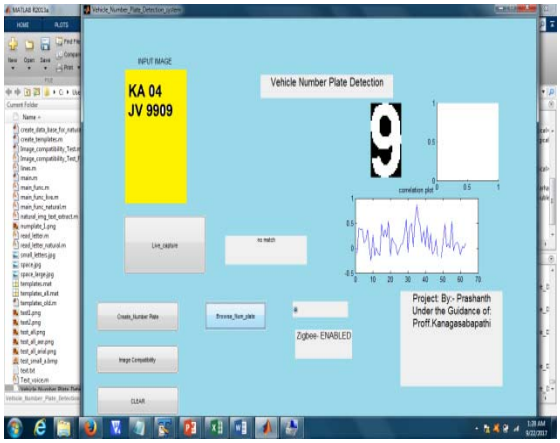

Figure 8: simulation result of number plate

V. CONCLUSION

Different R and D engineers proposed various designs and solutions for this system. However, every design has its own successful and unsuccessful reviews. But the proposed system is successful in implementing ANPR system. And the system is ready to differentiate the vehicles whether they safe or not. The issues faced by many organizations can be solved by using Automatic number recognition system. It gives very accurate and efficient record of all the motor vehicles. Also it can reduce the error rate of manual checking but automating the system. This automated system is easy to use and very transparent.

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