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Real Time Controlling of Autonomous Robot based on the Detection of Traffic Signs using MATLAB

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Abstract— As the need of identifying the traffic signs in the road has become a most important task in the view of safe driving, therefore it is in need that the driver should be alert in the time of travelling on the roads. But the major problem is that the driver will not be able to concentrate about the traffic signs at a time simultaneously during driving. So our project aims at providing a system which will capture the images of the road signs, processes the images and would efficiently assist the driver by the LCD display of the current sign identified and recognized. This is done with the help of MATLAB on the basis of image processing. The detection is carried out by using **a webcam to enable the captured** images **to be sent to the PC. Image processing in our project, involves conversion of RGB color images into grayscale images, setting of threshold levels, saturation of the features into binary images and setting of cut-off values to remove noise in the binary image. There after the zigbee communication is used to control the movement of the vehicle based on the corresponding sign detected on the road. Real time detection and alerting the driver at the same time is very important and it has lot many advantages like avoiding accidents and hence a safe drive.**

***Key words*—Traffic Sign detection, MATLAB, Webcam, RGB color space, Zigbee.**

I. INTRODUCTION

Intelligent vehicles are becoming a part of our day to day life. Due to carelessness of drivers while driving and violation of traffic rules, a large number of accidents occur today. Intelligent Transport Systems (ITS) play a great role in safe driving and in saving lives of pedestrians as well as in saving time and money. These systems are interconnected to the emerging technologies such as internet, General packet radio service (GPRS), Artificial Intelligence, smart sensors, Geographical Information Systems (GIS) and many more. ITS gives great importance to the field of road sign detection and recognition as it is a part of driving assistance system and autonomous navigation system. These systems must be fast and robust to detect sign in real time. ITS gives great importance to the field of road sign detection and recognition as it is a part of driving assistance system and autonomous navigation system. There are mainly two distinguishable phases for automatic traffic sign recognition system. First is the detection phase and the second is recognition phase. In the detection phase system searches the image for road sign. Detection algorithms are based on color or shape or both for segmentation. RGB color space represents a color directly as Red, Green and Blue. But the color of outdoor images depends on environmental conditions. Based on the shape and color, traffic signs are classified into one of the four categories. Further the traffic sign is recognized by multi-layer neural network for each category.

II. OBJECTIVE

Automated detection and recognition of traffic signs is becoming a very interesting area in computer vision with vital possibilities of wide applications in automotive industry. In this project we aim in providing the road and traffic sign detection and recognition system by using the basis of digital image processing and the MATLAB software. We describe the characteristics of the road signs detection and recognition, the different techniques used in the image segmentation based on the color and shape analysis. The technique for the recognition and

classification of the road signs and notify the driver about the appropriate signs ahead. One of the main advantages of this implementation is the traffic sign recognitions at dim landscapes and avoids lot more accidents.

III.OPERATING PRINCIPLE

It mainly consists of four stages: video capturing, pre-processing, detection and its classification of the traffic sign in the Image frame. Videos are captured using web camera, sampled to get images according to a particular frame rate. These images are processed for image enhancement according to environmental conditions. The colour segmentation is used for detection of the sign within the image. Objects with similar colour (red or blue) as that of traffic sign may also be segmented out of the image as sign candidate. To filter these candidate objects shape segmentation is used further to detect true traffic sign and to which class it belongs to. The detection stage must be fast and robust to speed up the computation of the real time detection system. The output of the detection stage is input to the recognition stage. Fig 1.1Block Diagram of Transmitter Section.

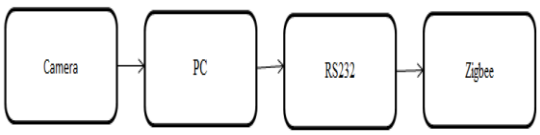

Fig 1.1Block Diagram of Transmitter Section

At first continuous frames of images are captured from the web camera and given to the PC or laptop. The DB9 cable or the RS232 cable acts as the communicator between the MAX232 and the PC. MAX232 converts the CMOS logic into the processing required TTL logic. Then the image segmentation and further processing takes place. Then the coded information is given to the transmitter section Zigbee to transmit it to the receiver Zigbee. Fig 1.2 shows the block diagram of receiver section consisting of receiver zigbee, PIC microcontroller, LCD display and motors.

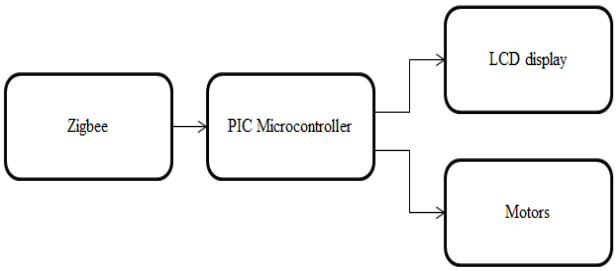

Fig 1.2 Block Diagram of Receiver Section

IV. COMPONENTS REQUIRED

A.PIC Microcontroller

PIC 16F877A is one of the most advanced microcontroller from Microchip.PIC Microcontroller is a 40 pin IC, it has 5 ports,3 Timers,4 Registers,14K bytes of Flash memory,368 bytes of RAM and 256bytes of EEPROM.

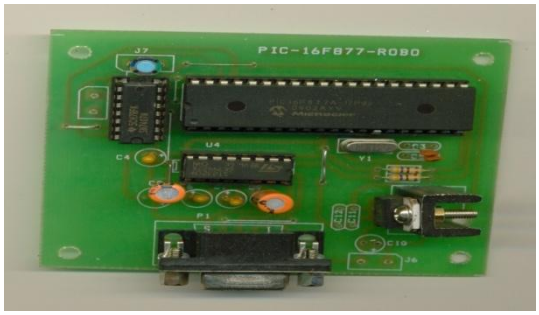

Fig.4 PIC Microcontroller 16F877A

B.Web Camera

A Web Camera also called as webcam is a video camera that feeds its images in real time to a computer, often via USB, Ethernet, or Wi-Fi. Webcams typically include a lens, an image sensor, support electronics, and may also include a microphone for sound. The most commonly used is consumer-grade webcams being a plastic lens that can be screwed in and out to focus the camera.

Fig 5. Web Camera

C.LCD Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel of LCD consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

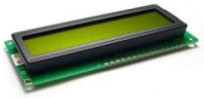

Fig 6. 16X2 LCD Display

D.MAX232

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. The MAX 232 is to connect a serial port device to a serial port which uses the RS232 standard.

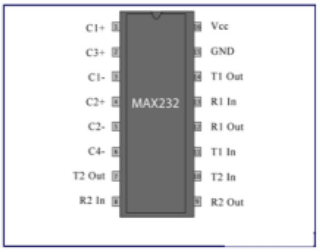

Fig 7.MAX232

E. Zigbee

Zigbee is the only standard-based technology designed to address the unique needs of low cost, low power wireless sensor and control networks. Zigbee modules are designed with low to medium transmit power and for high reliability wireless networks.

F.L293D Driver

The L293D, is a quadruple half H-bridge bidirectional motor driver IC that can drive current of up to 600mA with voltage range of 4.5 to 36 volts. It is suitable to drive small DC-Geared motors, bipolar stepper motor etc. The L293D is a monolithic integrated, high voltage, high current, 4-channel driver. Basically this means using this chip you can use DC motors and power supplies of up to 36 Volts. It is suitable to drive small DC motors, bipolar stepper motor and the chip can supply a maximum current of 600mA per channel, the L293D chip is also known as a type of H- Bridge. The H- Bridge is typically an electrical circuit that enables a voltage to be applied across a load in either direction to an output, e.g. Motor.

G. Motor

DC motor is a simple device which converts electrical energy into mechanical energy. DC motors are widely used because of their small size and high energy output. They are excellent for powering drive wheels and other mechanical assemblies. It operates with 12V.Fig 9 .shows the dc motor.

Fig 9.DC Motor

V. FLOW CHART

The flow chart of transmitter section and receiver section are as shown in fig 10 and fig 11 respectively.

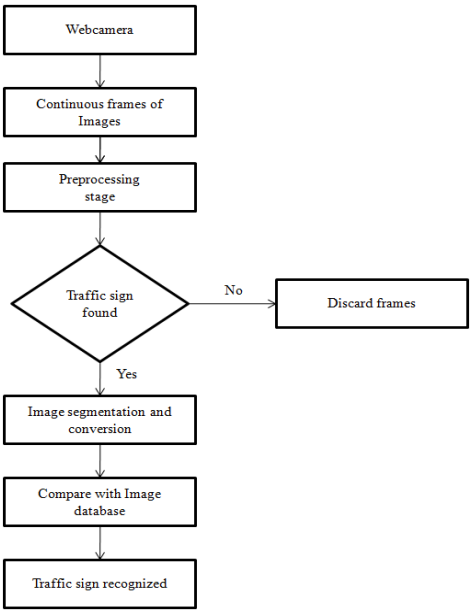

Fig 10.Flowchart of Transmitter section

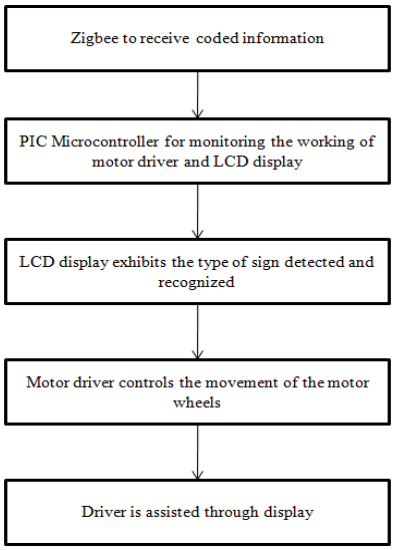

Fig 11.Flowchart of Receiver section

VI. RESULT

The main task of the classification module is to classify the extracted regions of interest presented to its input into the road-sign category they belongs. Initially pre-processing is required which is a series of operations performed on the extracted traffic sign from the image. It essentially enhances the image rendering it suitable for feature extraction. The segmented traffic symbol is initially subtracted from background using masking operation and

also masked by either red or blue to remove the triangle, circle or rectangle i.e. the respective shapes. It's followed by the various morphological operations Binarization and Thinning. Binarization process converts a gray scale image into a binary image using global thresholding technique. Erosion of the image and filling the holes present in it are also performed to produce the pre-processed image suitable for feature extraction.

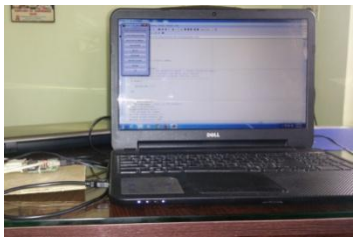

Fig 11. Snapshot of Transmitter Section

Fig 12. Snapshot of Receiver Section

VII. FUTURE WORK

The system we have designed in the project is costlier to implement in vehicles, it would be better to implement a camera with high resolution which would work fine in all environments. And a Bluetooth which intimates the driver with both about the traffic signs, signals and even the navigation to the particular destination. Then the system would act as a turning point in the field of ITS (Intelligent transport system)

VIII.CONCLUSION

Traffic sign detection based on color and shape is presented in this work. Color space is used for color segmentation to overcome the illumination sensitive characteristic of RGB space. The recognition rate can be improved further by increasing training data. This pre-classification improves recognition rate. Hence recognition phase is easier, faster and much more efficient than training a single network for the whole set of traffic sign.

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BIOGRAPHIES

Mr. Mahanthesh U obtained his B.E degree in Electronics and Communication Engineering at HMS Institute of Technology, Tumkur under VTU Blegaum in 2009. He Obtained M- Tech degree in Computer Networking Engineering at National Institute of Engineering, Mysuru under VTU Belgaum in 2014. He has published many national & international journal and conference papers. His areas of interest are AEC, C++, Computer Networks, Signals & Systems, DSP, Control Systems. Presently, he is working as Assistant Professor at GSSS Institute of Engineering & Technology For Women, Mysuru.

Currently, she is pursuing her BE degree in Instrumentation Technology at GSSS Institute of Engineering & Technology For Women, Mysuru. She undertaking her academic project on Real Time controlling of autonomous Robot based on the detection of traffic signs using MATLAB at GSSSIETW Mysuru, from V.T.U. Belgaum in 2015.

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