© 2017 IJSRST | Volume 3 | Issue 2 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X

National Conference on Advances in Engineering and Applied Science (NCAEAS)
16th February 2017
In association with
International Journal of Scientific Research in Science and Technology

Density Based Traffic Signal System Using Image Processing

Prof. Vikram Deshmukh, Shruti Pantawane, Sonali Hajare, Anushree Kale

Electronics and Telecommunication, RTMNU, SRMCEW, Nagpur, Maharashtra, India

ABSTRACT

The work is designed to create a density based traffic signal system. The signal timing is programmed to change depending on the density of the traffic density at the junction .As traffic issues are increasing in the cities at major junctions; it has become a nightmare for the commuters. Conventional traffic light system has a fixed time pattern which doesn't vary as per the current traffic situation at the junction. This project will help sort the problem by capturing and converting the image into gray scale of each lane .threshold value will be calculated which will indicate the number of vehicles present at the particular lane. Denser lane will be given priority and the signal will remain green for longer duration as compared to other lane. The project is based on image processing using MATLAB software and microcontroller AT89S52.

Keywords : Image Processing, Microcontroller-AT89S52, Density Measurement, Traffic Management System

I. INTRODUCTION

Traffic lights play a very significant role in traffic control and regulation on a daily basis. The traffic lights that are used nowadays comprise of three lights: Red for stop, Yellow For wait and Green for go. [1]

Users are made to wait for the signal to change from red to yellow and then from yellow to green. The time that a commuter has to wait for is decided by the traffic signals. The traffic lights used nowadays are pre-programmed to wait for a fixed duration of time after every change in signal. [7]

Sometimes there is a situation where one particular road is very crowded as compared to others. A simple way of decongesting the road is by allocating more time for the vehicles on the densest road. [2] The system should be intelligent enough to decide the priority on a daily basis. In doing so, the images for each lane are taken and processed simultaneously and a decision is passed as to which lane should be given how much amount of time and which should be the highest priority.

A camera is used to take pictures of the roads that connect in a traffic junction. The pictures taken are then processed to determine the density of vehicles on each road at that instant. A list of priority is assigned to each road in one cycle and the waiting time for that road is made to vary according to its density.

Using MATLAB the density of the roads is determined and the microcontroller changes the duration of green light given for each road as per the output after image processing.

II. METHODS AND MATERIAL

A. System Architecture

1. Image acquisition refers to capturing of image by configuring the camera with the help MATLAB tool
2. Thresholding is used to compare the vehicle density of the lanes. [6]
3. Depending on the density the microcontroller AT89S52 controls the Led at the traffic signal.
4. Denser lane will be cleared first and the signal will remain green for longer duration for that lane.
5. The signal will operate in default state when there is no traffic congestion in any lane.

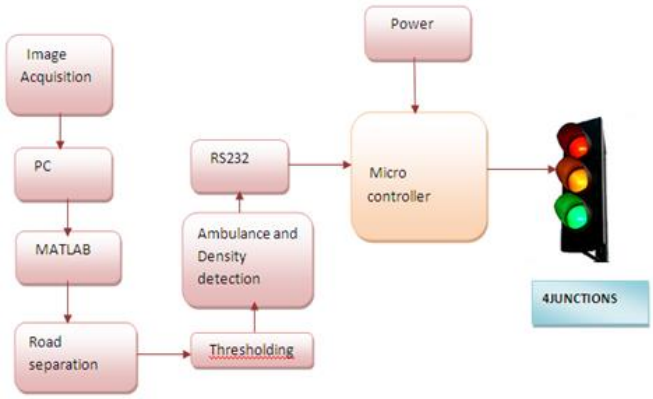

Figure 1. Proposed Architecture

B. Methodology

1. Image Acquisition

The image is captured by a webcam. It is then transferred to the computer via a USB cable. The image acquisition and further processing is done by using MATLAB.

Figure 2. Image acquisition flow diagram

2. Image Processing

The image is captured by using a webcam placed at the road junction. It has the capability of taking images of all the roads meeting at the junction. The webcam is mounted on the DC motor. The motor is responsible for capturing images from all directions in steps of fixed time interval. The speed of rotation of the camera is designed to be such that it is greater than the click-to-capture time of the camera. The acquired image is converted to grey scale image for further processing. The grey scale image is then converted to a binary image that contains only two Colors, black and white. This image is known as the threshold image. The threshold image is then complemented for further image processing.

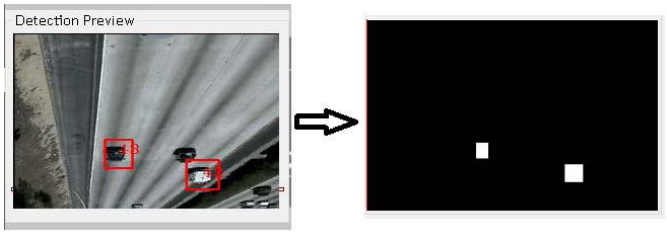

Figure 3. Image Detection

3. Image Enhancement

In this process the images are adjusted in such a way that the results are more suitable for further processing. In this, they obtained image is converted into a grayscale image.

4. Thresholding

Thresholding is transforming the grayscale image into black and white image (binary: white=1, black=0). The main purpose of thresholding is a radical reduction of information in order to simplify further processing. White color is assigned to all the pixels that have luminosity greater than the threshold level and the others as black.

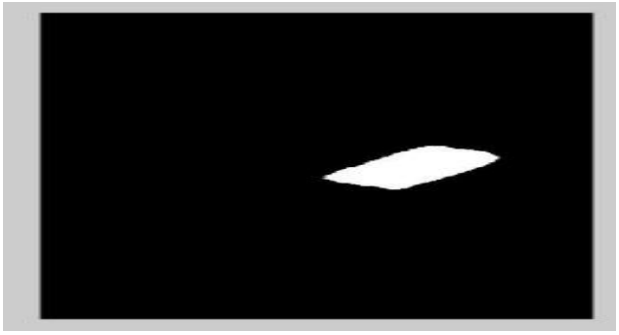

Figure 4. Thresholding Image

5. Edge Detection

Edge detection refers to the process of identifying and locating sharp discontinuities in an image. The discontinuities are abrupt changes in pixel intensities which characterize the boundaries of objects in an image. [2] It filters out useless information, while keeping the important structural properties of an image. In this proposed system, canny edge detection technique is used. The boundaries of each image are found and the number of objects is calculated .

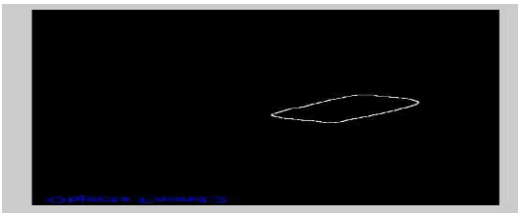

Figure 1. Edge Detection

6. Density Measurement

To maximum density present in the image, the close boundaries of the objects are identified. The exterior boundaries of the objects as well as the boundaries of holes inside these objects in the binary image are counted.

III. RESULTS AND DISCUSSION

A. Changing the Duration of Traffic Light

The duration of the traffic signal is monitored as follows:

1. The camera controlled by AT89S52 Microcontroller rotates in clockwise direction and stops to take pictures of each lane. The clicked pictures are sent to MATLAB for image processing.
2. Then the camera rotates in anticlockwise direction and repeats the above step.
3. The images are processed in MATLAB and the priority of each lane is decided as per its traffic density.
4. The lane with the highest relative traffic density is given the highest priority and the lane with the lowest traffic density is given the least priority.
5. The lanes are arranged in the descending order of their priorities.
6. The duration of green signal of the lane with the highest priority is more as compared to others, so that the traffic in that lane can pass and reduce the congestion. The other lanes have their green signals as per their decreasing priorities.
7. This process repeats and the duration of green signal given to each lane keeps adjusting itself after every rotation of the camera.

B. Communication Between AT89S52 Microcontroller & MATLAB Interface

The procedure for connecting the AT89S52 Microcontroller board to MATLAB via the USB port for serial communication is as follows:

The first step is to establish serial connection between the AT board and MATLAB via the USB port. The code for the AT89S52 Microcontroller board is written in the software AT89S52 Microcontroller and loaded on the board. In MATLAB the COM port is first configured. The configuration settings of serial port should match to that of AT89S52 Microcontroller. Then the data is sent serially from MATLAB to AT89S52 Microcontroller. This data is then processed by the AT89S52 Microcontroller board. After processing the output is given to the traffic light to change its duration as per the priority of the lanes.

IV. CONCLUSION

This project presents an Automatic traffic density control for vehicles and to clear the traffic in case of any emergency preference will be given to that particular vehicle such as Ambulance and automatically the traffic will be cleared by obtaining a green signal on traffic signal such that all the traffic can be cleared automatically. The project is been designed and implemented with Atmel 89S52 MCU in embedded system domain. Experimental work has been carried out carefully.

V. REFERENCES

[1]. G Lloyd Singh, M MelbernParthido, R Sudha "Embedded based Implementation: Controlling of Real Time Traffic Light using Image Processing" ((NCACSA 2012) Proceedings published in International Journal of Computer Applications® (IJCA)), 2012

[2]. George Law "Quantitative Comparison of Flood Fill and Modified Flood Fill Algorithms" (International Journal of Computer Theory and Engineering,), June 2013

[3]. Prof Mrs. Priti Tyagi, Mr. Sandeep Oberoi, Mr.Satish Sonawane, Tejal Rane and Mahip Shrawag"Control of Real Time Traffic with the

Help of Image Processing" IRET Transaction on Image Processing (ITIP), April 2014

[4]. Naeem Abbas Sir Syed, Mu hammadTayyab Sir Syed, M.TahirQadri, Sir Syed, "Real Time Traffic Density Count using Image Processing" (International Journal of Computer Applications), December 2013

[5]. Fahreena Shaikh, Naishataban khan, SaimaZareen Ansari, "Controlling Traffic Light Signals to Implement Traffic Scheduling Using Density Calculation" (ICAET15TR012000), February 2015

[6]. SabyasanchiKanojia "Real time light control and congestion avoid system" (IJERA), March-April 2012

[7]. Payal Gupta, Dhananjay V. Gadre, Tarun Kumar Rawat "Real Time Traffic Light Control System" (Hardware and Software Implementation), April 2014

[8]. R NithinGoutham, J.SharonRoza, M Santhosh, "Intelligent Traffic Signal Control System"(International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering), May 2014