

Density Based Traffic Control System Using Image Processing and Embedded System

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I. INTRODUCTION

Traffic lights play a very important role in traffic control & 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]

ABSTRACT- The project is designed to create a density based control signal system. The signal timing is programmed to change depending on the density of the traffic density at the junction because traffic issues are increasing in the cities at major junctions; it has become the 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. This project is based on image processing using MATLAB software & microcontroller AT89S52.

KEYWORDS- image processing, microcontroller- AT89S52, density measurement, traffic management system.

Clients are made to wait for the signal to change from red to yellow & then from yellow to green. The time that the 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 & processed simultaneously and a decision is passed as to which lane should be given how much amount of time & which should be the highest priority.

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

Using MATLAB the density of the path is determined & the microcontroller changes the period of green light given for each path as per the output after image processing.

II. SYSTEM ARCHITECTURE

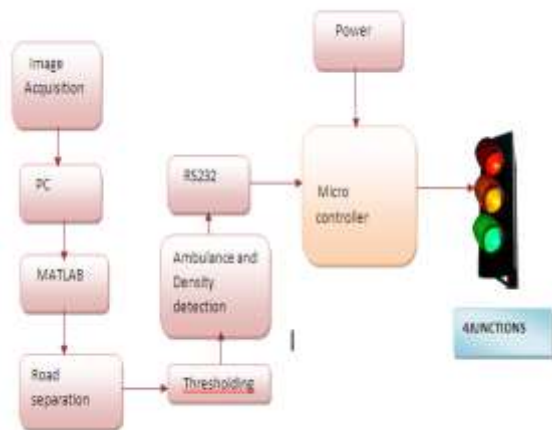


Fig. 1 Proposed Architecture

1. Image acquisition refers to capturing of image for configuring the camera by the use of MATLAB tool
2. Thresholding is used to distinguish 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 out first & the signal will redundant green for longer duration for that lane.
5. The signal will operate in default state when there is no traffic congestion in any lane.

III. METHODOLOGY

IMAGE ACQUISITION

The image will captured by a webcam. It is then transferred to the computer through a USB cable. The image acquisition & further processing is done with the help of MATLAB.



Fig. 2 Image acquisition flow diagram

IMAGE PROCESSING

The image is captured by using a webcam placed at the path junction. It has the ability of getting images of every path meeting at the junction. The webcam is placed 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 required image is converted to grey scale image for further processing. The grey scale image will be converted to the binary image contains only two Colors, black & white. This image is called as the threshold image. The threshold image is then complemented for further image processing.

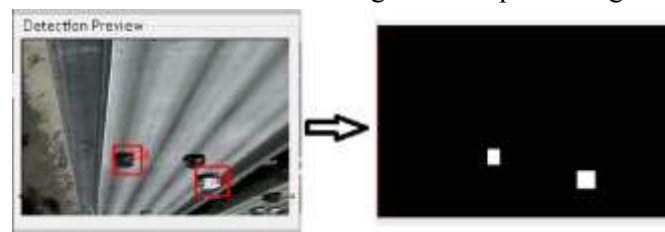


Fig. 3 Image Detection

IMAGE ENHANCEMENT

In this process the images are assessed in such a way that the results are many more matched for further processing. In this way, they obtained image is converted to the gray scale image.

THRESHOLDING

Thresholding is a transforming gray scale capturing image into black & white image (binary: white=1, black=0). The main aim of thresholding is the radical reduction of information in order to simplify further processing. White color is an assigned to every pixels that have luminous factor greater than the threshold level & the others as black colour.



Fig. 4 Thresholding Image

EDGE DETECTION

Edge detection corresponds to the process of identifying & locating sharp discontinuities of the image. The discontinuities are rapidly converted in pixel intensities which characterize the boundaries of objects of an image. [2] It filters out useless information, while keeping the important structural properties of an image. In overall system, canny edge detection technique is applied. The boundaries of individual image are found & the number of objects is calculated



Fig. 5 Edge Detection

DENSITY MEASUREMENT

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

CHANGING THE DURATION OF TRAFFIC LIGHT

The duration of the traffic signal is monitored are as below:

- 1) The camera controlled by AT89S52 Microcontroller rotates in clockwise direction & 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.

CONCLUSION

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

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