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Edge Detection Based Adaptive Traffic Control System

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Abstract **---**The project is to design and develop an adaptive traffic control system using a digital image processing. Traffic is the one of the major problem which world faces day by day because of the increase in human population and number of vehicles on the road. Conventional traffic control system is allotted fixed timing to traffic light at road intersection which cannot be varied as per traffic situation or density. But we need an improvement in traffic control system. Automatic and efficient traffic control is used for management of critical situation. Through this paper we developed an improvement in conventional traffic control system at road intersection. We can develop a system with the help of image processing to control the traffic at road intersection. The above paper discuss about traditional traffic control system and the drawback which will cause by that system. We can place a camera which will capture the image of the road where we want to control the traffic. Then that image will convert in Grey scale image and then black and white image and then compared the captured image with the reference image i.e. empty road and we will used edge detection techniques that help to finding density of traffic. Some edge detection technique will be discussed in this paper that is gradient based and Laplacian based edge detection technique. The image matching is done and adequate timing is given to the lane depending on density with the help of micro controller to the display.

Index Terms **-***Image processing, Edge detection, MATLAB, GUI.*

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1. INTRODUCTION

The incommensurate infrastructure and the unreasonable distribution of the development are major cause for increasing the rapidly traffic jam that we have face serious problem day after day. The main cause leading to traffic congestion is the increasing number of cars and vehicles which happen due to population and development of the economy of the urban person. The number of road users constantly increases and resources provided are limited. So that Intelligent control of traffic will become a very important issue in the upcoming year. However, some limitations to the usage of smart traffic control exist. Avoiding traffic conjunction there are several models for traffic performance. We focus on development of traffic control in a city using image processing. The traffic control system based on vehicle density calculation tries to decrease possibilities of traffic jams. The system includes camera and micro controller to process image for traffic density assessment which is mounted on road intersection. Micro controller controls the image processing system and counts number of vehicles passing on road. Based on different vehicles count, the micro controller takes decision and updates the traffic light delay. The algorithm is Background Extraction & Analysis (BEA) involves an image processing procedure that withdraws the background from the image with objects and uses the withdraw background image as a reference against images with objects.

2. LITERATURE REVIEW

Chandrashekhar, Shrikrishna [1] proposed the basic edge detection operators with their mat lab syntax along with the Graphical user Interface (GUI) of mat lab.

Dhananjay V. Gadre, Tarun Kumar Rawat [2] proposed the image processing algorithm and image enhancement filtering.

Arif A, Bookseller, Rupali R. Jagtap [3] proposed the hardware implementation along with functioning algorithm.

3. INTRODUCTION TO IMAGE PROCESSING

Image processing is a process to convert an image into digital form and perform some operation on it in order to extract some useful information on it. Digital image processing deals with manipulation of digital images through a digital computers. It is a subfield of signal and system but focus particularly on images. The input of the system is digital image and the system process the image using efficient algorithm.

3.1 IMAGE ACQUISITION

Image acquisition is the action of retrieving an image from some source. Usually a hardware-based source, so it can be passed through whatever process need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence. The acquired image is unprocessed and is the result of whatever hardware was use to generate it. A major factor involved in image acquisition in image processing is the initial setup. The initial setup may be may be a hardware device can be anything from the desktop. If the hardware is not properly configured and aligned, the visual artifacts can be produce that can complicate the image processing.

3.2 RGB to GREY CONVERSION

In RGB image the intensities of three primary colours red, green and blue are present. In the colour image each colour pixel have a different intensities of primary colour. It is difficult to distinguish the two neighbouring pixel intensities of colour pixel in the edge detection, so performing edge detection on colour image is difficult, thus colour image is convert into grey scale image required for edge detection. The grey scale image have only two colour intensities. Distinguishing the two neighbouring pixel intensity in grey scale image is easy than colour image, thus generally grey scale image is used.

3.3 EDGE DETECTION

Edge detection is used for finding the boundaries of objects within an image. It detects the discontinuities in brightness. In edge detection edges are calculated by using difference between the corresponding pixel intensities of an object in the image. The mask used for edge detection are known as the derivative masks. Depending on the derivative mask the edge detection are grouped into two categories, Gradient and Laplacian. The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image. The laplacian method searches for zero-crossings in the second derivative of the image to find edges.The algorithms which are commonly used for edge detection are gradient and laplacian. Gradient are Prewitt, Robert, Sobel and laplacian is Canny.

4. MATLAB GUI

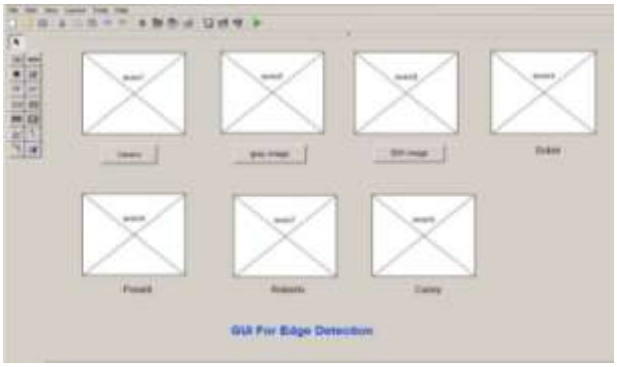

Fig.1 Designed GUI for edge detection

For edge detection operation we have designed graphical user interface with the help of the MATLAB toolbox. In the GUI there are seven axis are taken. The first axis is for the image capturing purpose, below of the first axis there are one push button after pressing the push button the camera will turn on and give delay of one second and captured the input image and that image will be displayed on axis one. Respectively second and third axis are for grey image and black and white image in which both the axis there are one push button after pressing the switch the captured image will be converted into grey and black and white image. The next four axis are for the edge detection operation after pressing push button the captured image will be converted into different edge detector operator.

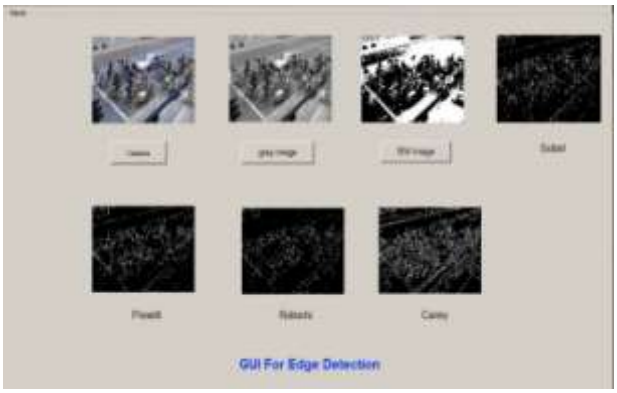

Fig. 2 Output of Designed GUI

The above GUI shown the captured the image and convert the image into grey scale and black and white image. The next four axis are for the different edge detector operator such as sobel, prewitt, Robert and canny. After finding the edge, and compare the various edge detector operator the canny edge detector was found best among all the four edge detector, so the canny edge detector will be used for further operation of detecting the density of the road traffic.

5. BLOCK DIAGRAM

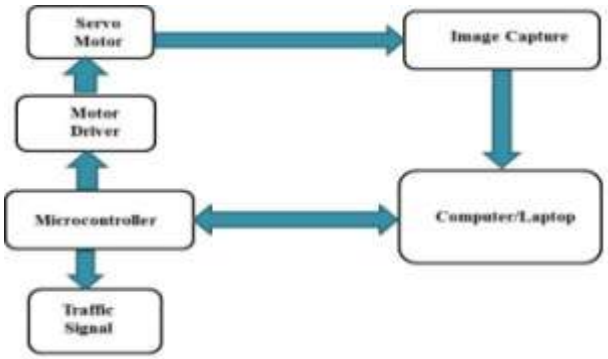

Fig. 3 block diagram of traffic control system

The signalling is cyclic in clockwise direction starting from first road, through fourth sequentially. The timing is set after the calculation of estimated density with the help of image processing technique on the captured image. Digital monochrome or colour camera is used. The timing calculated is passed on to Microcontroller, DIP with necessary interface. Microcontroller operates and controls the signal lights with the help of necessary driver circuitry. We are using single camera at present, which is placed at the centre of intersection mounted on rotary platform at sufficient height to get enough elevation for vision. The camera is rotated by a servo motor driven by microcontroller via driver circuit.

6. CONCLUSION

We conclude that canny operator for the edge detection has a various advantages over other edge detection operators and it is most commonly used edge detection operator tool for edge detection in matlab. We used canny operator because it has low error rate, edge points are well localized and single edge point response. The method of vehicle detection from image has been implemented using mat lab and vehicle counting and AVR development board to design a system has been implemented in future.

7. FUTURE WORK

The high speed AVR microcontroller is used for implementing the hardware that's manipulating all the necessary function of hardware and traffic signalling.

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