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Design and development of traffic light retiming using camera based traffic density estimation

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Abstract - As an instantaneous and range concept, "traffic density" was originally defined by looking at a snapshot of the traffic from an aerial camera along a stretch of freeway. The "density" is defined as the number of vehicles divided by the length of the stretch. Average density over lanes is naturally deduced by further dividing by the number of lanes. This concept can be described as continuous in space but discrete in time. However, a practical traffic network system, particularly a freeway network, does not have an aerial camera for continuous monitoring of traffic in real time. Although dense point sensor systems could approximate continuous measurements in space, the cost is generally prohibitive. The proposed system does not actually measure the number of vehicles currently on the road, but measures the area covered by vehicles on the road. Moreover, for implementing this project image processing must be considered At first, film of highway is captured by a camera has been installed in highway. A web camera is placed in a traffic lane that will capture images of the road on which we want to control traffic. Then these images are efficiently processed to know the traffic density. According to the processed data from MATLAB, the controller will send the command to the timer to show particular time on the signal to manage traffic.

Keywords – Density Estimation, Fuzzy Logic Controller

I. INTRODUCTION

As we know the population of city and number of cars is increasing day by day. With increasing urban population and hence the number of cars, need of controlling streets, highways and roads is vital. In this paper, a system that estimates the size of traffic in highways by using image processing has been proposed and as a result a message is shown to inform the number of cars in highway. This project has been implemented by using the Matlab software and it aims to prevent heavy traffic in highways. Moreover, for implementing this project following steps must be considered: 1) image acquisition 2) RGB to gray scale transformation 3) image enhancement and 4) morphological operations. At first, film of highway is captured by a camera has been installed in square.

Then, the film comes in the form of consecutive frames and each frame is compared with the first frame. After that, the number of cars in square is specified. At the end, if the number of cars is more than a threshold, a message is shown to inform the traffic status. By this message we can predict the need to reduce the size of traffic carried. Experiments show that the algorithm will work properly and also we can re-time the traffic green light and maintain the proper traffic management.

Most of the city traffic is controlled by sensors and cameras shall be installed in big highways and streets. But existence of a system for detecting the size of traffic automatically will be felt. Such systems can allow extracting information from the bigger traffic issue and helps us decide to improve the traffic policy. The paper aims to render automate control system for traffic on highways and street. The system using image processing has been implemented where upon it entailed the following results: 1) Density 2) Streets and roads in order to census counted three cars 3) monitor off roads 4) Detect the occurrence of accidents and violations occurred as well as motion detection car is a dangerous spiral. Scientists and other researchers suggested other different ways. Technically, this system is based on computers and cameras. The project components includes: (A) hardware model (B) software model.

A. Hardware model

Image sensors: In this project the images are captured by a USB web camera have been used. PC: a pc as a general purpose central unit for various image processing tasks has been used.

B. Software model

For our algorithm; software Matlab has been used. Some steps for implementing this algorithm are as follows: Receiving video via camera and convert video input to two images RGB to gray-scale conversion on received images image enhancement Morphological operations. Proposed system theory talks about the different types of vehicle tracking and operations. In Section morphological operation has been presented. Rest of the paper shows the suggested algorithm and flowchart in summary and Section deals with the results of experiments. Last section talks about conclusion.

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II. PROBLEM STATEMENT

Through this paper we intend to present an improvement in existing traffic control system at intersection. System is made more efficient with addition of intelligence in term of artificial vision, using image processing techniques to estimate actual road traffic and compute time each time for every road before enabling the signal. System is clever enough to provide priority to authorized emergency vehicles with the help of wireless communication at a particular intersection. This model is resemblance of traditional traffic police man who takes better decision every time and soothes traffic flow. Unpredicted growth of traffic today has created serious problem in metro cities. Existing automatic traffic control system at intersection with preset timing signals is proved to be inefficient for the reason that system is not intelligent enough to make judgment of varying road traffic density and fail to allocate specific time to clear it. Unnecessary waiting till preset time lapse or wait for multiple round of turns to clear the traffic

III.METHODOLOGY / PROPOSED WORK

Our proposed method consists of two phases.

Phase 1:

First images are captured by camera. The first images of highway when there is no traffic will be taken. The first image of highway has been considered as a reference file and stored in a specific location in the program. RGB to Grayscale Conversion in order to achieve image enhancement is

Phase 2:

At first, images are captured from the highway. RGB to Grayscale conversion has done on the hierarchy of images. Then, gamma correction has been applied on each Gray images. At the end, vehicle tracking is done. Generally, vehicle tracking included two parts: 1) Background elimination; 2) lane masking.

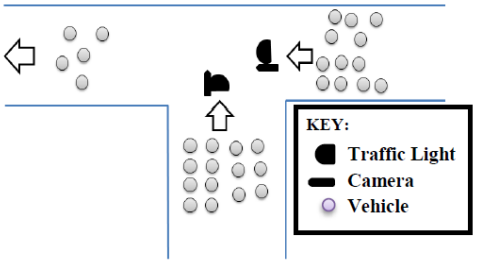

Figure 1. General outlook of proposed system

In this project two traffic signals are set in a T-junction configuration as shown in Figure 1. Intelligence governed by the fuzzy logic controller has been linked to image processing which acts as a superior mode of data acquisition. The final stage comprises role of a microcontroller which recognizes and drives the traffic signals accordingly.

The inputs regarding the number of vehicles at each participating signal are obtained through vision sensors. Coloured vision provides maximum amount of information regarding the subject which proves to be quite beneficial most of the times. The same goes in the current set up in which each vehicle is detected regardless of its colour, shape and location within the work space of the vision camera.

The logic uses the background estimation for filtering each vehicle from the background along with its recognition as an independent variable. The initiation of the system is accompanied by acquisition of the base frame which is then compared with all the preceding frames. To be more precise, the base frame pixel values are compared with all the following frames. Pixel values of base frame are compared with all the following frames and difference in pixel values form the basis of vehicle recognition. Areas with different pixel values are highlighted by a rectangular frame.

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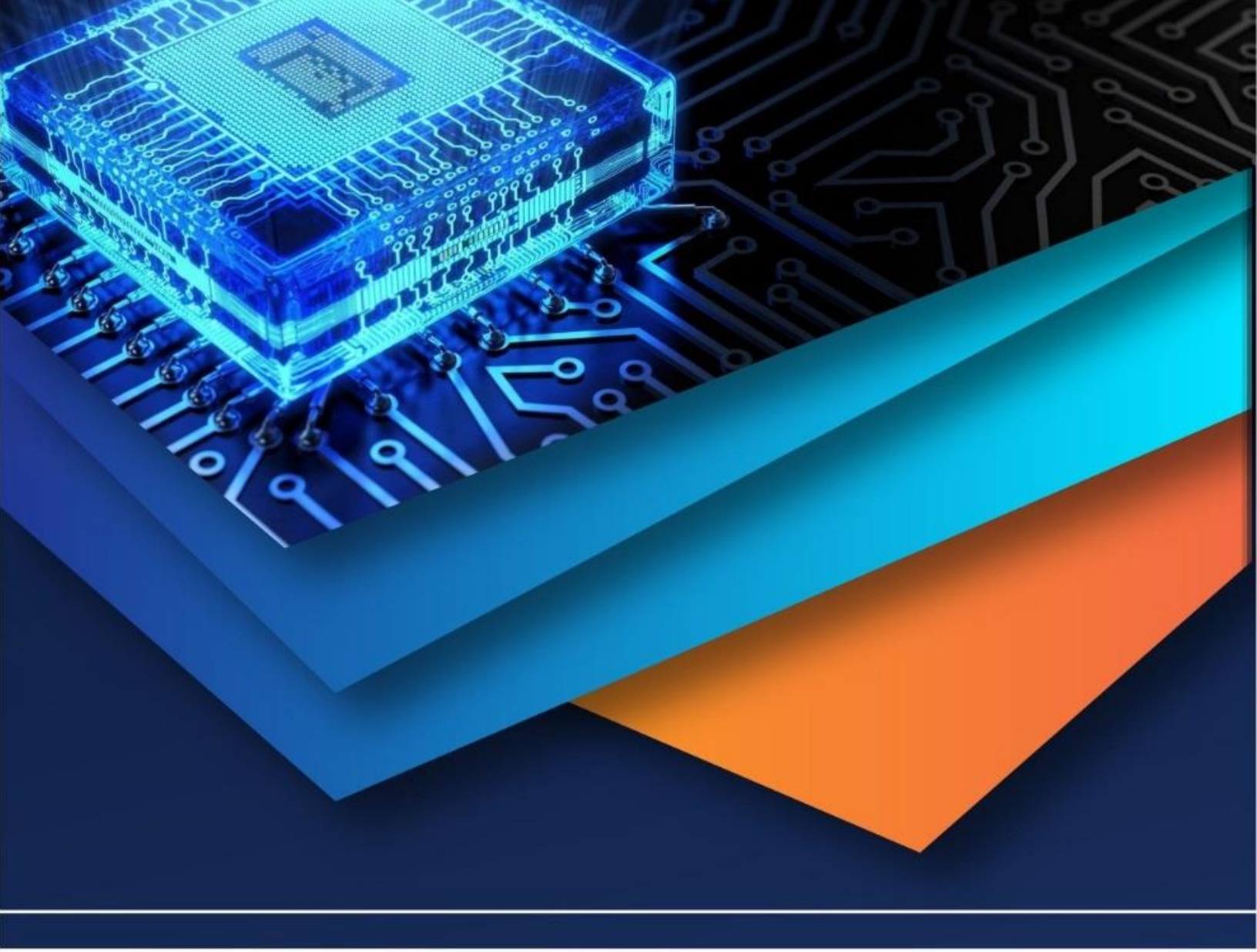

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