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A Review: Implementation of Advance Adaptive Traffic Light Control System Using DIP and Embedded

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***Abstract*—**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 grayscale transformation 3) image enhancement and 4) morphological operations. At first, film of highway is captured by a camera has been installed in highway. 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 highways 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.

Keywords: *traffic analysis, image processing, motion vehicle tracking, filteration, morphological operation, gamma correction*

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I. INTRODUCTION

The number of vehicles on the road increases day by day therefore for the best utilization of existing road capacity, it is important to manage the traffic flow efficiently. Traffic congestion has become a serious issue especially in the modern cities. The main reason is the increase in the population of the large cities that subsequently raise vehicular travel, which creates congestion problem. Due to traffic congestions there is also an increasing cost of transportation because of wastage of time and extra fuel consumption. Traffic jams also create many other critical issues and problems which directly affect the human routine lives and sometime reason for life loss. For example, if there is an emergency vehicle like ambulance on the road with the critical patient on board. In that situation if an ambulance gets stuck in a heavy traffic jam then there are high chances that the patient cannot reach the hospital on time. So it is very important to design an intelligent traffic system which controls traffic intelligently to avoid accidents, collisions and traffic jams. The most common reason of traffic congestion in third world countries is an inefficient traffic signal controlling which affects the traffic flow. For example, if one lane has less traffic and the other lane with huge traffic but the duration of green light for both lanes is same then this is the waste of available resources and is inefficient. By considering the above example if the lane with higher traffic density should switch on the green signal light for a longer period than the lane with lesser density.

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 to extract 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 streets.

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 include: (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 Grayscale conversion on received images image enhancement Morphological operations. The rest of the paper has been divided as follows: In Section 2 the main steps of suggested method is proposed. The gamma correction for image enhancement is discussed in Section 3. Section 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. There are lots of techniques proposed to design an intelligent traffic system, for example, fuzzy based controller and morphological edge detection technique are proposed in This technique is based on the measurement of the traffic density by correlating the live traffic image with a reference image. The higher the difference is higher traffic density is detected. In another technique is proposed to design an intelligent traffic system, which is based on four lane system in which time is allocated according to the number of vehicles on the lane. Automatic traffic monitoring and surveillance are important for road usage and management. Traffic parameter estimation has been an active research area for the development of intelligent Transportation systems (ITS). For ITS applications traffic- information needs to be collected and distributed. Various sensors have been employed to estimate traffic parameters for updating traffic information. In another technique is proposed to control the traffic signal by using image processing, in which they first selected the reference image which is the image with no vehicles or less vehicles and every time matching real time images with that reference image.

II. MOTIVATION

As the population of the modern cities is increasing day by day due to which vehicular travel is increasing which lead to congestion problem. Traffic congestion has been causing many critical problems and challenges in the major and most populated cities. The increased traffic has lead to more waiting times and fuel wastages. Due to these congestions problems, people lose time, miss opportunities, and get frustrated. Traffic load is highly dependent on parameters such as time, day, season, weather and unpredictable situations such as accidents, special events or constructional activities. If these parameters are not taken into account, the traffic control system will create delays. To solve congestion problem new roads are constructed. The only disadvantage of making new roads on facilities is that it makes the surroundings more congested. So for that reason there is a need to change the system rather than making new infrastructure twice.

A traffic control system can solve these problems by continuously sensing and adjusting the timing of traffic lights according to the actual traffic load is called an Intelligent Traffic Control System. The advantages of building Intelligent Traffic Control System which reduce congestion; reduce operational costs; provide alternate routes to travelers, increases capacity of infrastructure. One such traffic control system can be built by image processing technique like edge detection to find the traffic density, based on traffic density can regulate the traffic signal light.

III. PROBLEM DEFINITION

As the problem of urban traffic congestion spreads, there is a pressing need for the introduction of advanced technology and equipment to improve the state-of-the-art of traffic control. Traffic problems nowadays are increasing because of the growing number of vehicles and the limited resources provided by current infrastructures. The simplest way for controlling a traffic light uses timer for each phase. Another way is to use electronic sensors in order to detect vehicles, and produce signal that cycles.

We propose a system for controlling the traffic light by image processing. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. A camera will be installed alongside the traffic light. It will capture image sequences. Setting image of an empty road as reference image, the captured images are sequentially matched using image matching and according to percentage of matching traffic light durations can be controlled.

IV. OBJECTIVE

1. Distinguish the presence and absence of vehicles in road images
2. Signal the traffic light to go red if the road is empty;
3. Signal the traffic light to go green in case of presence of traffic on the road and the duration of green light is adjusted according to the traffic
4. The proposed system is very cost effective as it does not require installation of any additional devices, such as RFIDs.

V. DESCRIPTION OF THE 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 done. The density is done using MATLAB software which is installing in to pc.

Phase 2:

In First phase traffic density which is calculated in MATLAB software after signal transmitted to

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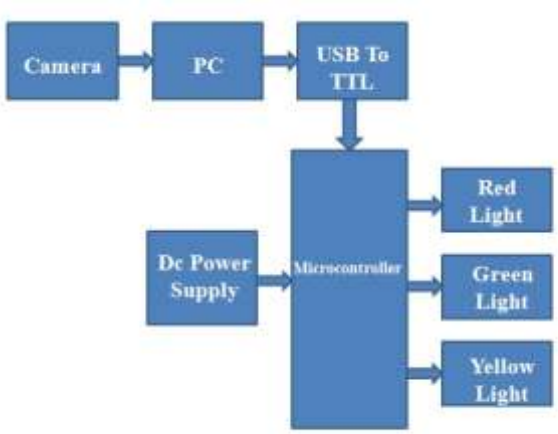
microcontroller using usb to ttl converter. According to intensity of traffic the time duration of traffic light calculated by microcontroller.



Block diagram of proposed system

Hardware

In this project the hardware used are:

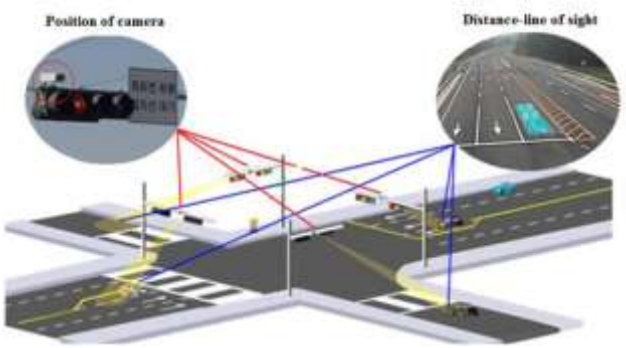
- USB web camera: To capture images,
- PC: For all the image processing work,
- MCU: Atmega16 board for signal prioritizing,
- Toy cars for the prototype of a road junction and traffic model.

Software Model:

MATLAB version 7.8 as image processing software comprising of specialized Modules that perform specific tasks has been used.

VI. ARCHITECHTURE FOR THE CONTROL SYSTEM

In this architecture camera is placed on the top of the signal to get the clear view of traffic on the particular side of the signal so that it will capture the image and analyze the traffic in that particular side and get the count of the number of vehicle. With this count the density of that particular side will be determined and corresponding signal will be provided. Fig 1



VII. DENSITY MEASUREMENT

A. Source Image

In this system the source image is the RGB image which can be given by the users for getting the contour image and the vehicle count in output screen. The following code can be used to auto size of the output screen .Fig 2

The grayscale image can be used to display the objects in the format of black and white. In this system the output will be display the grayscale image after getting the source image only, because source image only converted into the grayscale image.

Fig 3 Gray Scale Image

C. Threshold Image

The threshold image brightness or contrast of the grayscale image. In this system we can convert the grayscale image to threshold image.

Density Based Traffic Signal System

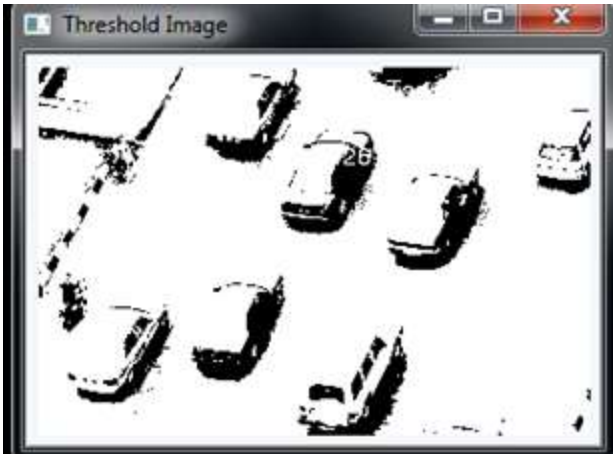
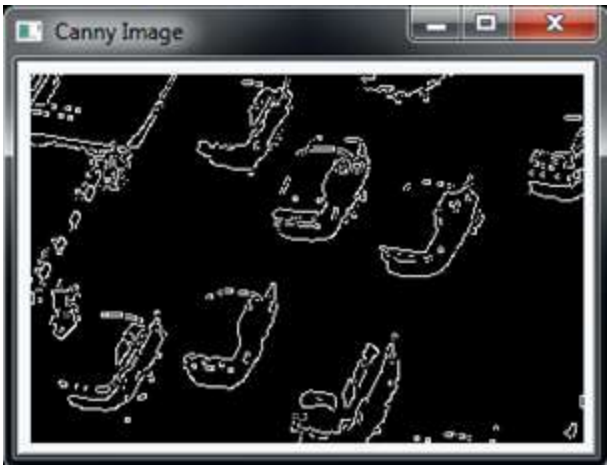


Fig 4 Threshold Image



VIII. CONCLUSIONS

A method for estimating the traffic using Image Processing is presented. This is done by using the camera images captured from the highway and videos taken are converted to the image sequences. Each image is processed separately and the number of cars has been counted. If the number of cars exceeds a specific threshold, warning of heavy traffic will be shown automatically. The advantages of this new method include such benefits as: 1) Non-use of sensors 2) Low cost and easy setup and relatively good accuracy and speed. Because this method has been implemented using Image Processing and Matlab software, production costs are low while achieving high speed and accuracy.

Extra hardware such as sound sensors or RFID tags can be eliminated. In this respect, the method is superior to previously published designs. The method presented in this paper is simple and there is no need to use sensors that have been commonly used to detect traffic in the past.

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