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# Real-Time Traffic Analysis and Dynamic Passthrough Time for Lanes based on Density of Traffic

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***Abstract*—As the problem of urban traffic congestion spreads, there is a need for the introduction of advanced technology and equipment to improve the 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. The image sequence will be analyzed using digital image processing for vehicle detection, and according to traffic conditions on the road traffic light can be controlled..**

***Keywords—Dynamic traffic control, image processing, dynamic passthrough time, traffic analytics***

## I. INTRODUCTION

The Rapidly growing traffic causes Heavy Traffic Lanes with more traffic causes Congestion and incur more waiting time. The traditional static implementation of traffic signals are not efficient. Traffic congestion occurs when a volume of traffic or model split generates demand for space greater than the available street capacity; this point is commonly termed saturation . There are a number of specific circumstances which cause or aggravate congestion; most of them reduce the capacity of a road at a given point or over a certain length, or increase the number of vehicles required for a given volume of people or goods. Due to occurrence of this traffic people have waiting for a long time. According to the survey most of the people spent their time on waiting in traffic signal. Government has already taken action for this by placing a camera on the signal to avoid accidents and traffic monitoring. For that purpose we created this project. 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. Magnetic loop detectors have been the most used technologies, but their installation and maintenance are inconvenient and might become incompatible with future ITS infrastructure. It is well recognized that vision-based camera system are more versatile for traffic parameter estimation [l,4]. In addition to qualitative description of road congestion, image measurement can provide quantitative description of traffic status including speeds, vehicle counts, etc. Moreover, quantitative traffic parameters can give us complete traffic flow information, which fulfills the requirement of traffic management theory. Image tracking of moving vehicles can give us quantitative description of traffic flow[3]. In the present work the designed system aims to achieve the following.

- Distinguish the presence and absence of vehicles in road images;
- Signal the traffic light to go red if the road is empty;

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- Signal the traffic light to go red if the maximum time for the green light has elapsed even if there are still vehicles present on the road.

## II. COMPONENTS OF THE PROJECT

### *A. Hardware Module*

Image sensors: In this project a USB based web camera has been used. Computer: A general purpose PC as a central unit for various image processing tasks has been used. Platform: consisting of a few toy vehicles and LEDs (prototype of the real world traffic light control system)

### *B. Maintaining the Integrity of the Specifications*

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

### *C. Interfacing:*

The interfacing between the hardware prototype and software module is done using parallel port of the personal computer. Parallel port driver has been installed in the PC for this purpose.

## III. METHODOLOGY

Following are the steps involved

- Image acquisition
- RGB to gray conversion
- Image enhancement
- Image matching using edge detection

### *A. Phase 1*

- Initially image acquisition is done with the help of web camera
- First image of the road is captured, when there is no traffic on the road
- This empty road's image is saved as reference image at a particular location specified in the program
- RGB to gray conversion is done on the reference image
- Now gamma correction is done on the reference gray image to achieve image enhancement
- Edge detection of this reference image is done thereafter with the help of Prewitt edge detection operator

### *B. Phase 2*

- Images of the road are captured.
- RGB to gray conversion is done on the sequence of captured images
- Now gamma correction is done on each of the captured gray image to achieve image enhancement
- Edge detection of these real time images of the road is now done with the help of prewitt edge detection operator

The third method i.e., power law transformation has

### *C. Phase 3*

- After edge detection procedure both reference and real time images are matched and traffic lights can be controlled based on percentage of matching.
- If the matching is between 0 to 10% - green light is on for 90 seconds. If the matching is between 10 to 50% - green light is on for 60 seconds. If the matching is between 50 to 70% - green light is on for 30 seconds. If the matching is between 70 to 90% - green light is on for 20 seconds. If the matching is between 90 to 100% - red light is on for 60 seconds.

### *D. Phase 4*

- This phase uses the LoRa technology to detect any emergency vehicles that are detected on the traffic signals
- When the LoRa receiver senses any signal from the emergency vehicle, the lane in which the emergency vehicle is coming is prioritized and the normal algorithms are paused.
- Once the vehicle is passed, the normal procedures are triggered.

### *E. Phase 5*

- This phase is used to analyse the vehicles that are passed through a particular lane
- By analysing the traffic on each lane, the traffic on each lane can be later accounted and displayed in a graphical manner and this helps us to analyse which lanes has more congestion and further operations can be taken into consideration.
- This phase is based in artificial intelligence techniques and machine learning approaches.

## IV. IMAGE ENHANCEMENT

The acquired image in RGB is first converted into gray. Now we want to bring our image in contrast to background so that a proper threshold level may be selected while binary conversion is carried out. This calls for image enhancement techniques. The objective of enhancement is to process an image so that the result is more suitable than the original image for the specific application. There are many techniques that may be used to play with the features in an image but may not be used in every case. Listed below are a few fundamental functions used frequently for image enhancement.

- Linear (negative and identity transformations)
- Logarithmic (log and inverse log transformations)
- Power law transformations(gamma correction)
- Piecewise linear transformation functions

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I. BLOCK DIAGRAM

been used in this work..

matching:

- Edge detection methods locate the pixels in the image that correspond to the edges of the objects seen in the image.
- The result is a binary image with the detected edge

II. LORA TX/RX

V. EDGE DETECTION AND IMAGE MATCHING

Among the key features of an image i.e. edges, lines, and points, we have used edge in our present work which can be detected from the abrupt change in the gray level. An edge essentially demarcates between two distinctly different regions, which means that an edge is the border between two different regions.

Here we are using edge detection method for image

pixels.

- Common algorithms used are Sobel, Prewitt and Laplacian operators.

We have used gradient based Edge Detection that detects the edges by looking for the maximum and minimum in the first derivative of the image.

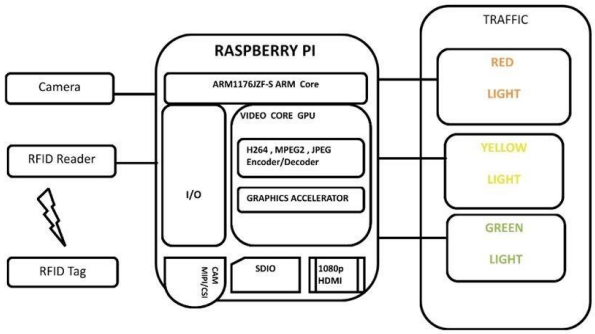
- First derivative is used to detect the presence of an edge at a point in an image.
- Sign of the second derivative is used to determine whether an edge pixel lies on the dark or light side of an edge.

Gradient operators require two masks, one to obtain the X-direction gradient and the other to obtain the Ydirection gradient.

These two gradients are combined to obtain a vector quantity whose magnitude represents the strength of the edge gradient at a point in the image and whose angle represents the gradient angle.

Edge based matching is the process in which two representatives (edge) of the same objects are paired together.

Any edge or its representation on one image is compared and evaluated against all the edges on the other image. Edge




III. TRAFFIC CAMERA

detection of reference and the real time images has been done using Prewitt operator.

Then these edge detected images are matched and accordingly the traffic light durations can be set.

ACKNOWLEDGMENT

Experiments are carried out and depending upon the intensity of the traffic on the road we get the following results regarding on time durations of various traffic lights.

Matching between 10 to 50% - green for 20 seconds

Matching between 50 to 70% - green for 30 seconds

Matching between 70 to 100% - green for 60 seconds

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## IV. RASPBERRY PI

EXISTING SYSTEM OF DRONES

1.Drones are vulnerable to hackers.
2.Weather can easily affect drones.
3.Precise operation is difficult.
4.Drones can be easily diffused.

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