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## Embedded Based Implementation: Real Time Traffic Load Computation using LabVIEW

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**ABSTRACT:** Traffic queue is one of the biggest issues in developing countries like India. Some traditional methods are existing to avoid traffic congestion. But these methods are tedious and time consuming. This paper presents a new approach for real time traffic light control system using LABVIEW and 8051 microcontroller. The main attraction of this paper is it require minimum blocks, that is using labview some image pre-processing steps can be reduced. It is fast and accurate system compared to that implemented using MATLAB.

**KEYWORDS:** LABVIEW; VISION TOOLKIT; 8051 microcontroller; NI; ROI; PUI.

### I. INTRODUCTION

In developing countries like India traffic congestion is becoming a serious problem. Congestion on roads results in road accidents, and requires a more time for emergency vehicles like ambulance, VIP vehicle and fire truck to reach their destination. The main reasons for traffic congestion are narrow roads, raise in populations and nonlinear growth of vehicles etc. The effective solution for the traffic congestion is to calculate the vehicle count on the traffic roads, and depending upon the value of this count we can control the traffic signal lights effectively. Some traditional methods are used for calculating traffic queue, but all of them have some disadvantages and also it require more man power and cost.

The main attraction of this developed system is to calculate the total traffic queue in the congested area using image processing techniques in LABVIEW environment. Its results are used to control the traffic light system which is implemented using 8051 microcontroller.

For calculating vehicle density, two data source images has to be taken as inputs, one is blank road image without vehicle (reference image) and other is its corresponding real time road image with vehicle or not. The above two samples of images are then compared to count the number of vehicles present in the traffic load image. Depending upon the values of vehicle count the traffic light is controlled by an efficient embedded C program burned in 8051 microcontroller.

Rest of this paper comprises of seven sections. Section II presents literature survey about real time traffic load, Section III gives proposed system with block diagram. Section IV presents the implementation of traffic light system, which is following by experiment results which contain all procedures and figures in Section V. conclusion and future scope in Section VI.

### II. LITERATURE SURVEY

Dharani.S.J et al. [1] discussed the algorithm mainly focused on a ROI area that is it determine the number of vehicles on the road and to control the traffic by calculating vehicle count only on the target area.

Prutha and Anuradha S J [2] have proposed an approach for real time vehicle detection based on background differencing, morphological operations and edge detection also it calculate number of vehicles and speed of the cars.

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M.Y Siyalet al.[3] described the processing of vehicle detection ,vehicle count, and queue parametersthe paper presents a simple approach for vehicle detection that is pixel to pixel comparison of background images of traffic scene(reference image, without vehicle)and real time images.

Nguyen et al.[4] discussed an efficient algorithm for image recognition and feature descriptor tracking in video by minimizing search space .

### III. PROPOSED SYSTEM

Consider a four way traffic road junction with four still cameras placed at the junction of the roads as shown in fig1.Initially each still camera capture the road image without vehicle ,it is then taken as the reference image, after that the camera capture the real time images. Then compare the real time images with reference image one by one.So that we can easily found the congested road by computing the vehicle count. Based on its value the traffic light system can be controlled easily. Block diagram of proposed system is shown in fig2

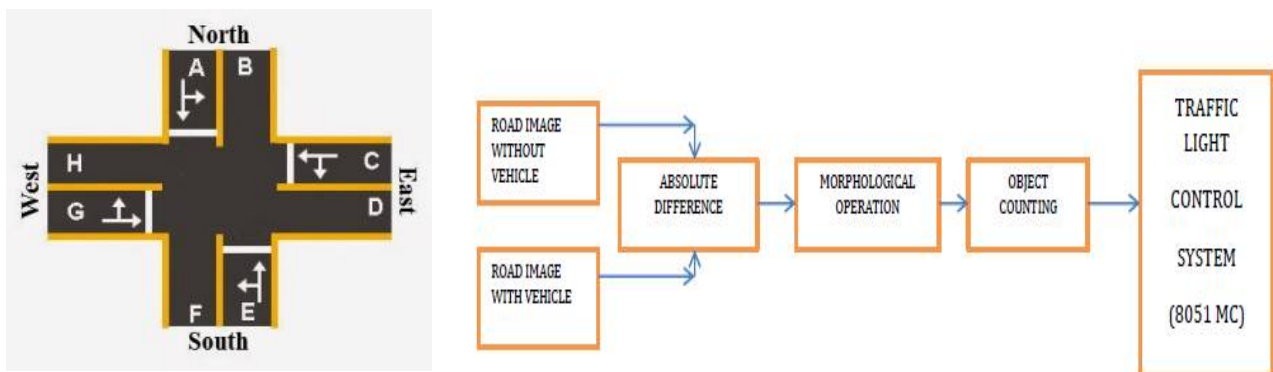


Fig1: simple four way traffic road Fig2 : Block diagram of proposed system

#### LABVIEW:

Labview stands for LABoratory Virtual Instrument Engineering Workbench. labview is a popular measurement and automation programming language developed by National Instruments (NI).It has grown steadily to become a complete programming language in its own right with add-on toolkits. The image based toolkits (called vision)is particularly popular and simplifying complex task like image processing much easier than other packages and languages (Matlab,Python,Scilab etc.).

#### Image acquisition:

The first stage of any image processing operation is the image acquisition stage .image acquisition is often considered a complex task but it can be simplified by using NI labviewand vision toolkits. There are four image acquisition types supported in the vision toolkits Snap, Grab,Sequence and Still color. Depending on the frame rate of the camera, grabbing images from an interface buffer is a very fast method of image acquisition .using IMAQ dx Grab is the best method of acquiring and displaying live images shown in fig3.

#### Image absolute difference:

Image subtraction is used to find the changes between two images of same scene. The mathematical representation of image subtraction is given by

$$Dst(x,y)=SrcA(x,y)-SrcB(x,y)$$

IMAQ SubtractVIperform this function, for this process two images are needed, first one is the reference image and another is real time road image.

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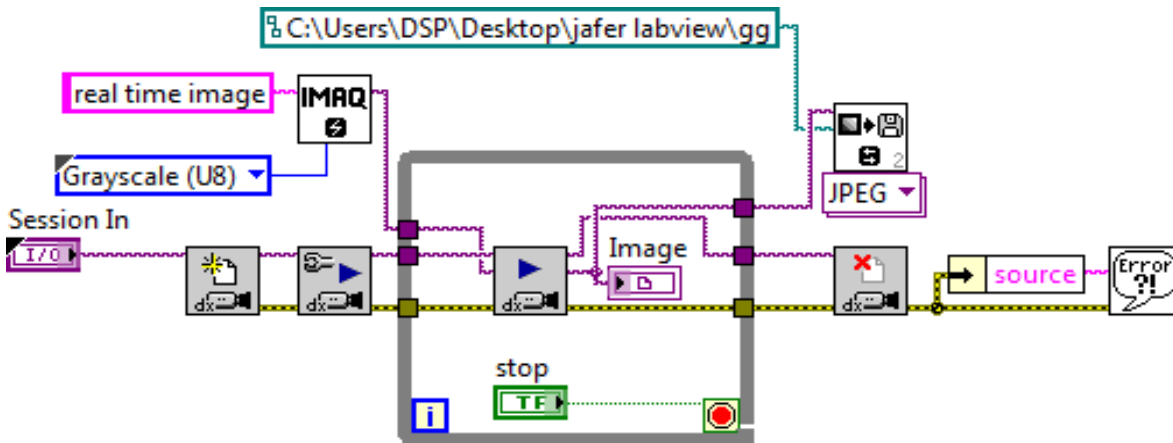


Fig3: Image acquisition wiring diagram

## Morphological Operations:

The term Morphology refers to the alteration of an image using computer routines. Morphology is a set of image processing operations that process the images based on shapes. Morphological operations are neighbourhood based operation similar to filters, except the kernels used are dependent on the original value of the pixel under inspection (PUI). The two main types of binary morphological operations are erosion and dilation, in this proposed system dilation operation are used.

## Dilation:

Dilation is an operation that grows or thickens objects in a binary images. The range of thickening is controlled by structuring elements. In dilation the value of the output pixel is the maximum value of all the pixels in the input pixels neighbourhood. *IMAQ GrayMorphologyVI* perform the dilation operation.

## Object Counting:

Object counting is a tedious work in matlab but in labview *IMAQ count objectsVI* perform this function, its name suggests that it will return a number of detected objects. By using *IMAQ count objects* we can count the number of vehicles in the traffic road it also return a lot of information including each vehicle's position with respect to the top left corner of the image, its bounding box, and how many holes were detected within it, complete wiring diagram of proposed system shown in fig4.

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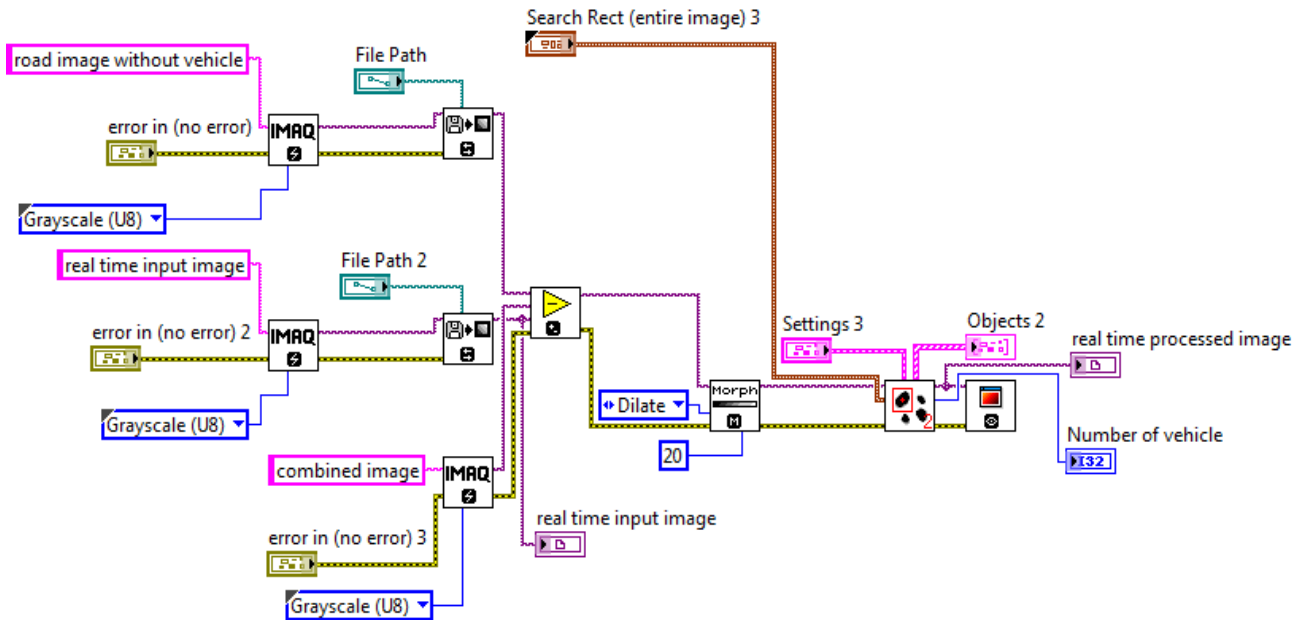


Fig4: complete wiring diagram proposed system.

## IV. HARDWARE IMPLEMENTATION

Our proposed system was implemented using 8051 microcontroller, seven segment display and LED for indication. A simple embedded C code is written in Keil simulation software and burned into 8051 target using some burning tool .Fig5 shows the complete circuit diagram for four way simple traffic light system.

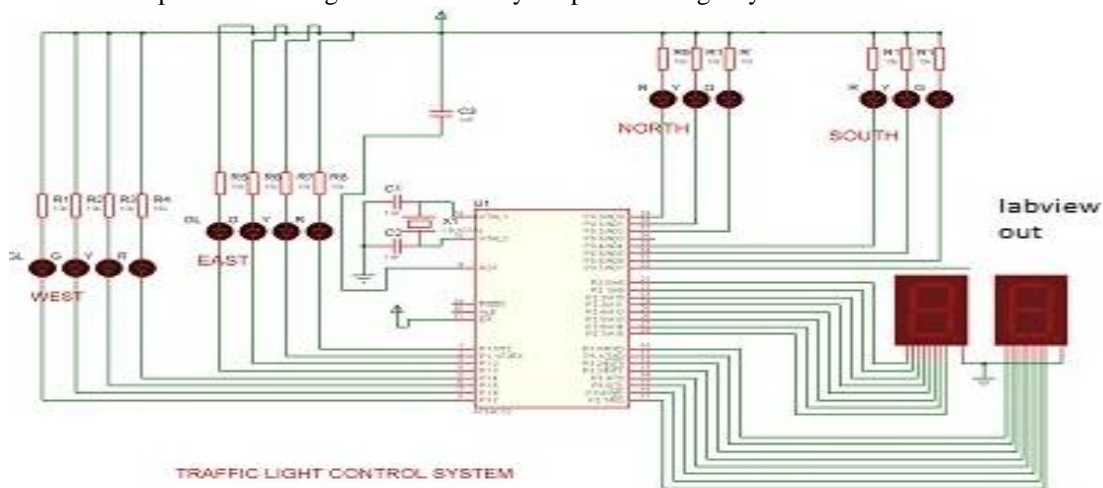


fig5 : Circuit diagram for four way simple traffic light system

## V. SIMULATION RESULTS

Our proposed method was tested on four different traffic road images. Simulation results are shown in following figures. The total number of vehicles visible in Fig 6(a) is one. The Fig 6(b) shows that number of vehicle count as detected by the proposed system is also one.

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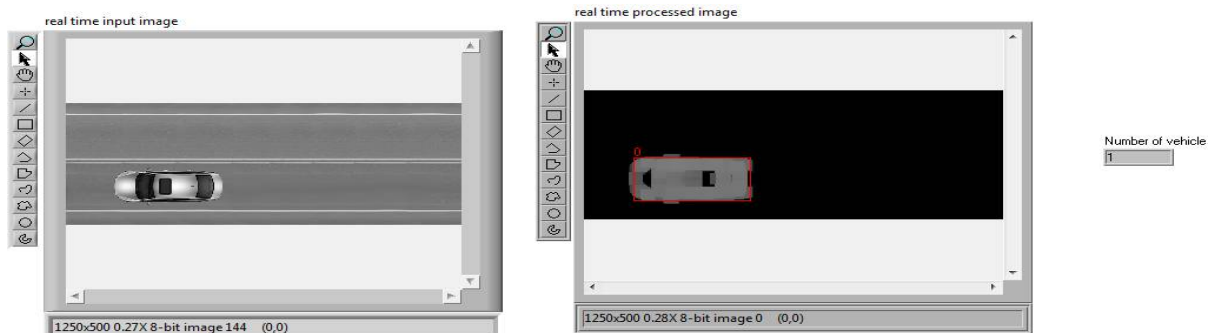


Fig6(a): Traffic road containing 1 vehicle Fig6(b): Real time vehicle count detection

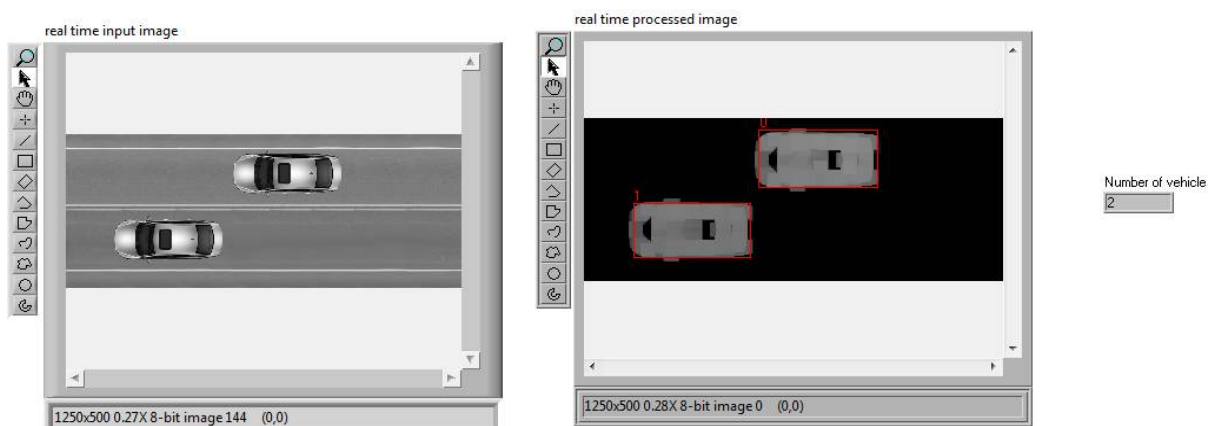


Fig7(a): Traffic road containing 2 vehicles Fig7(b): Real time vehicle count detection

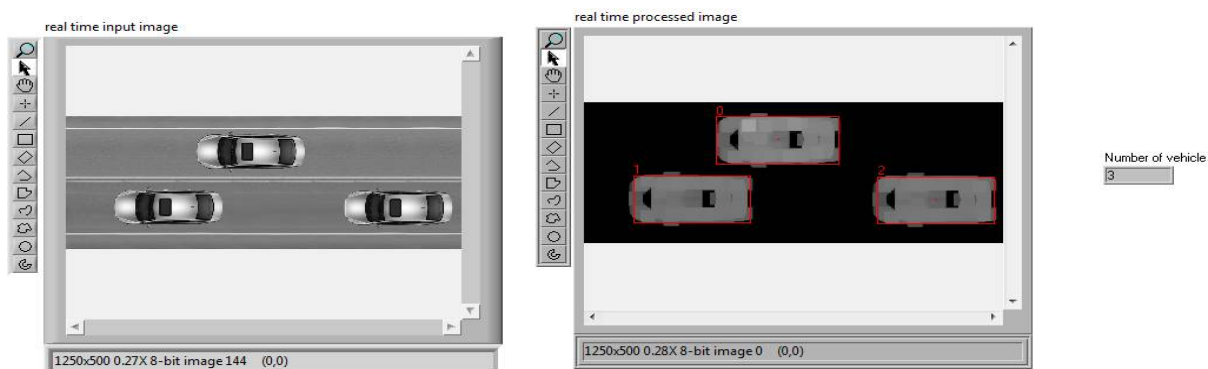


Fig8(a): Traffic road containing 3 vehicles Fig8(b): Real time vehicle count detection

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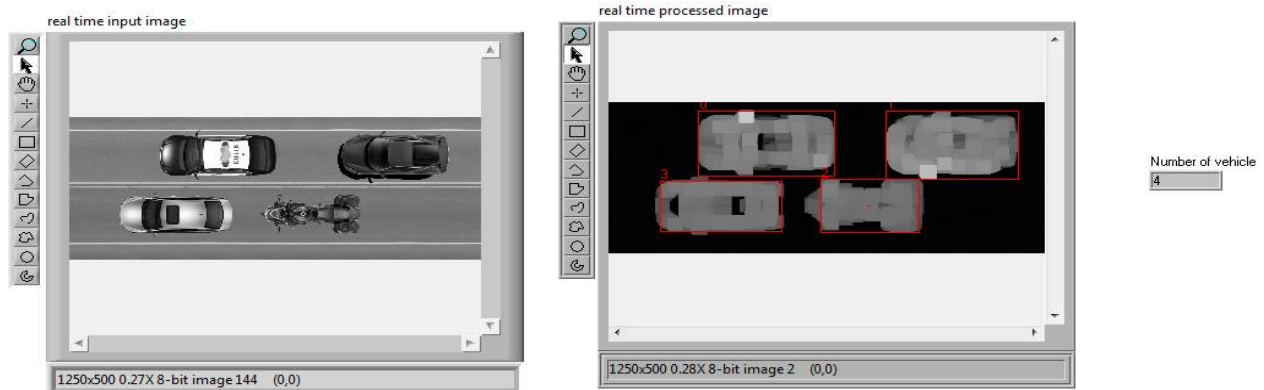


Fig9(a): Traffic road containing 4 vehicles

Fig9(b): Real time vehicle count detection

Similarly Fig 7(a), Fig 8(a) and Fig 9(a) represent the real-time road images and the vehicle count in these are accurately detected by the proposed system as shown in Fig 7(b), Fig 8(b), Fig 9(b). The number of vehicles detected based on the proposed method and manual count are the same. It shows that the proposed method achieved a 100% accuracy in a short time.

## VI. CONCLUSION AND FUTURE WORK

In this work, we developed and implemented a real-time traffic load computation system. The simulation results showed that the proposed system gives a better accuracy. The proposed system deals with image processing techniques so it provides a better visual appearance. In the future, this algorithm can be extended by using some classifiers (SVM classifiers) to classify the emergency vehicles in the traffic road.

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