Minor Research Project Report
on
Image Processing Based Traffic Control System

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Submitted by
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The Deputy Secretary
University Grants Commission
South Western Regional Office
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Certificate

This is to certify that the Minor Project entitled **"Image Processing Based Traffic Control System"** submitted to the UGC by **BABY GIRIJA B.**, Assistant Professor, Department of Electronics, NSS College Rajakumari , Idukki, Kerala, is a bonafide record of research work carried out by her. No part of this work has been submitted for any other purposes.

Place: Rajakumari
Date: 30/04/2018

PRINCIPAL

NSS College Rajakumari

DECLARATION

The materials embodied in the Minor research Project entitled **"Image Processing Based Traffic Control System"**is a bonafide record of research work done by me and that no part of this work has been presented before, for award of any degree, diploma or other similar title from any other university. The work of authors wherever they have been made use of in this study have been duly acknowledged.

Place: Rajakumari
Date: 30/04/2018

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I remember with gratitude…

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Finally, I would like to thank everybody who was important to the successful realization of the project, as well as expressing my apology that I could not mention personally one by one.

Above all there is the God Almighty whose blessings and kindness helped a lot to tide over.

BABY GIRIJA B

BRIEF OBJECTIVE OF THE PROJECT

a. To study about present traffic congestion control in cities.

b. To find a relevant solution for it using a Matlab based Image Processing System.

c. To implement it using an Embedded System unit.

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

Vehicular travel is increasing throughout the world, especially in urban areas. With the increasing use of automobiles in cities , traffic congestion occurs. So there is requirement for optimizing traffic control methods to better accommodate this increasing demand. Here comes the importance of Intelligent traffic control system.Traffic density and queue length are obtained by using image processing techniques. Fuzzy logic has been widely used to develop a traffic signal controller because it allows qualitative modeling of complex systems.

Matlab based image processing system with fuzzy logic and an embedded system unit is used for the function.

1.2 ORIGIN OF THE RESEARCH PROBLEM

The frequent traffic jams at major junctions call for an efficient traffic management system in place. The resulting wastage of time and increase in pollution levels can be eliminated on a city-wide scale by these systems. Old traffic control systems use micro controller based system. it depends on time and not an effective way.The project proposes to implement an intelligent traffic controller using real time image processing. The image sequences from a camera are analyzed using various edge detection and object counting methods to obtain the most efficient technique. Subsequently, the number of vehicles at the intersection is evaluated and traffic is efficiently managed.

The project proposes an image processing based fuzzy logic and embedded system circuit controller to be used at a complex traffic junction. The real parameters such as traffic density and queue length are obtained by using image processing techniques. So the on and off timings for the green, red and orange lights are adjusted as per the actual road conditions. Fuzzy logic has been widely used to develop a traffic signal controller because it allows qualitative modeling of complex systems.

1.3 SIGNIFICANCE OF THE STUDY

Here we use an effective method for control present traffic congestion. We use a Matlab based system for traffic control. This provides an accurate method for traffic control. With the ever increasing number of vehicles on the road, the Monitoring authorities have to find new ways of measures of overcoming such a problem. In this paper we discuss the implementation of an intelligent traffic control system using fuzzy logic technology which has the capability of mimicking human intelligence for controlling traffic lights. The rules and membership functions of the fuzzy logic controller can be selected and changed and their outputs can be compared in terms of several different representations. Fuzzy logic technology allows the implementation of real-life rules similar to the way humans would think. The beauty of fuzzy logic is that it allows fuzzy terms and conditions such as "heavy", "less", and "longer" to be quantized and understood by the computer. Fuzzy control is control method based on fuzzy logic. Fuzzy logic can be described simply as "computing with words rather than numbers" or "control with sentences rather than equations". A fuzzy controller can include empirical rules, and that is especially useful in operator controlled plants. The Collection of rules is called a rule base. The rules are in IF-THEN format, and formally the if side is called the condition and then-side is called the conclusion. The system is able to execute the rules and compute a control a signal depending on the measured inputs error and change in error.

A prototype system for controlling traffic at an intersection is designed using simulink and matlab tool.The a on the duration of the extension is taken using the Matlab tool.This decision is based on the arrival and queue of the vehicles which is imported in Matlab from vb6 environment. The time delay experienced by the vehicles using the fixed as well as fuzzy traffic controller is then compared to observe the effectiveness of the fuzzy traffic controller

1.4 LITERATURE REVIEW

IMAGE ACQUISITION

- Image focused onto a photoconductive target.
- Target scanned line by line horizontally by an electron beam.
- Electric current produces as the beam passes over target.
- Current proportional to the intensity of light at each point.
- Tap current to give a video signal.

By far the most popular two-dimensional imaging device is the charge-coupled device (CCD) camera.

Single IC device

- Consists of an array of photosensitive cells.
- Each cell produces an electric current dependent on the incident light falling on it.
- Video Signal distortion.
- More linear Video output

Image Acquisition Toolbox enables you to acquire images and video from cameras and frame grabbers directly into Matlab and Simulink. We can detect hardware automatically and configure hardware properties. Advanced workflows let you trigger acquisition while processing in-the-loop, perform background acquisition, and synchronize sampling across several multimodal devices. With support for multiple hardware vendors and industry standards, you can use imaging devices ranging from inexpensive Web cameras to high-end scientific and industrial devices that meet low-light, high-speed, and other challenging requirements.

Video Signal must be digitized.

- Digitises the incoming video signal
- Samples signal into discrete pixels at appropriate intervals -- line by line
- Samples signal into a (8 bit) digital value.
- Stores sample frame own memory.
- Frame easily transferred to computer memory or a file.

To resize an image, use the imresize function. When we resize an image, you specify the image to be resized and the magnification factor. To enlarge an image, specify a magnification factor greater than 1. To reduce an image, specify a magnification factor between 0 and 1.

In photography and computing, a grayscale or grayscale digital image is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-

and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest. In simple words it is “black and “white and shades of grey with no other colours.

Grayscale images are distinct from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called bilevel or binary images). Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the presence of only one (mono) color (chrome).

Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.), and in such cases they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full color image; see the section about converting to grayscale.

In basic terms, we define the background as the stationary portion of a scene. Many applications simply require that there be introductory frames in the sequence which contain only background elements. If pure background frames are available, pixel –wise statistics in color and depth can be computed directly.

Video Tracking is the process of locating a moving object over time using camera. It has a variety of uses., some of which are: human – computer interaction, security and surveillance, video communication and compression.

Fuzzy logic has been used for reasoning. It corresponds to “degrees of truth” while probabistic logic corresponds to “ probability, likelihood.

A GUI is a graphical user interface to a computer. Today’s major operating systems and add their own graphical user interface and ideas.

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CHAPTER 2

BRIEF DESCRIPTION OF THE PROJECT

2.1 IMAGE ACQUISITION

The first step is image acquisition.Image is focused onto a photoconductive target.Electric current produces as the beam passes over the target. CCD camera is used for capturing image .It produces more linear video output.

2.2 VIDEO FRAME

Video frame samples signal to a 8 bit digital value.
Image Acquisition toolbox enables to acquire images and video from cameras and grabbers directly into matlab and Simulink.

2.3 IMAGE RESIZING

For this we use imresize function.To enlarge image, Magnification factor above 1 is used. To reduce image,magnification factor between 0 and 1 is used.

2.4 COLOUR CONVERSION

In computing, grayscale images are used. Grayscale images are digital images in which value of each pixel is a single sample.These are often the result of measuring the intensity of light at each pixel in a single band of electromagnetic spectrum.

2.5 BACKGROUND ESTIMATION

We define the background as a stationary portion of a scene.If pure background frames are available , pixel-wise statistics in colour and depth can be computed directly.

2.6 VIDEO TRACKING

Video Tracking is the process of locating a moving object over time using a camera.

2.7 FUZZY LOGIC

Fuzzy logic is a form of many valued logic.It is similar to human reasoning.It corresponds to degrees of truth.

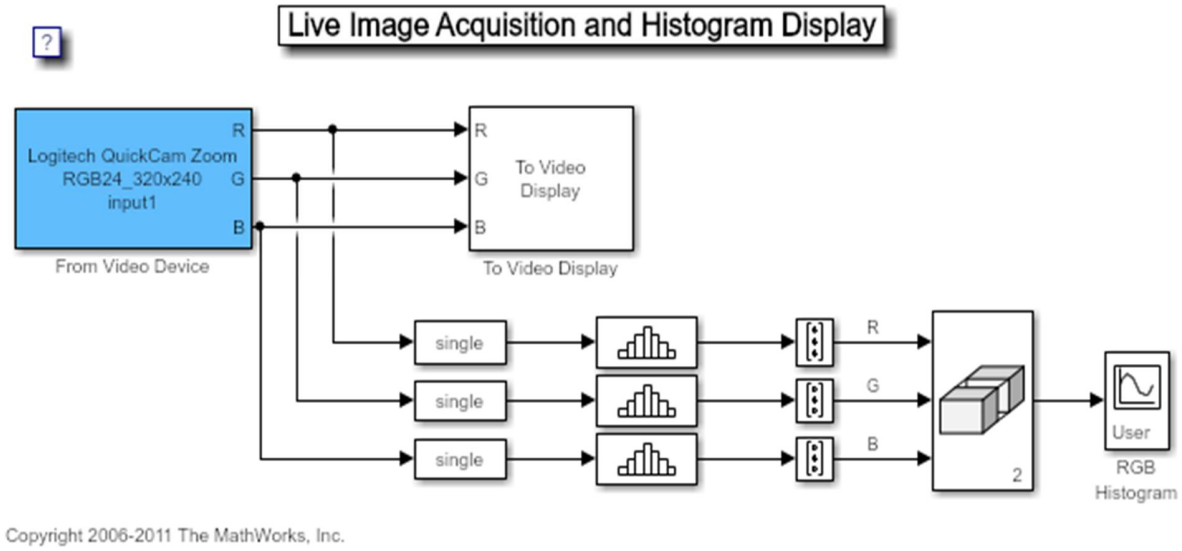
2.8 GRAPHICAL USER INTERFACE

Today's major operating systems provide a graphical user interface.it uses one or more metaphors for objects familiar in real life.GUI along withinput devices is referred to as its"look and feel."

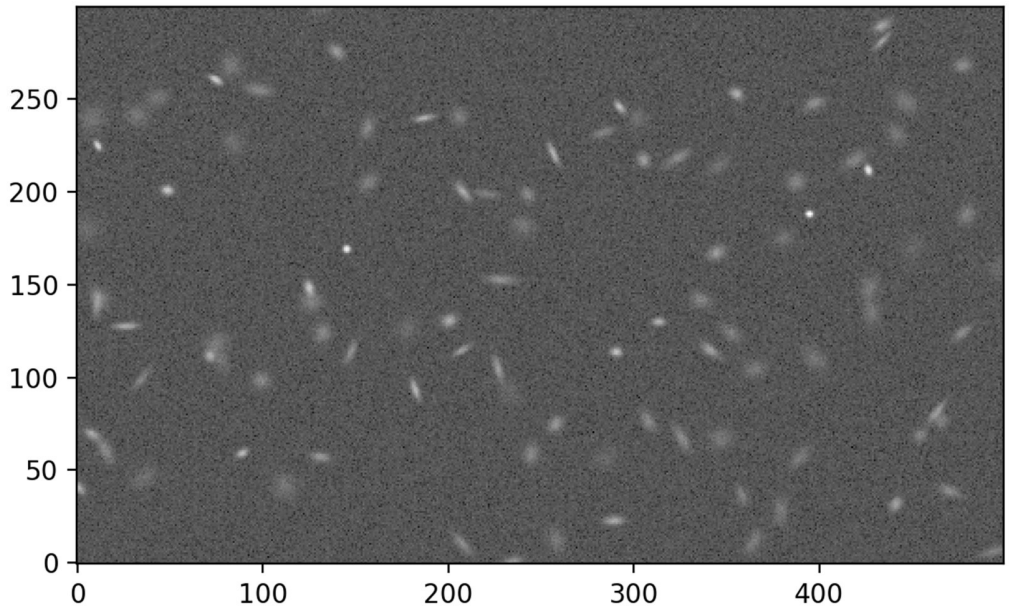
We use Matlab based system to find the volume of vehicles in each side of a junction. The images to be processed are collected from wireless camera mounted above the traffic light control unit.We use the following hardware units for the implementation of the project.

1.HD Cameras
2. Zigbee unit
3.Micro controller System
4.Traffic Light System.
5.PC for Matlab and Simulink operation

1 Image Acquisition



2 Image after Background Estimation



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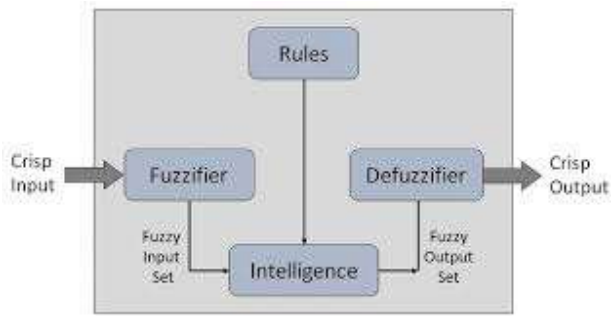
3 Fuzzy Logic



PRACTICAL IMPLEMENTATION

Four vehicle cameras are placedat the junction for collecting the images from four roads.The images are sent to central computer through a set of wireless transmitter and a receiver.The Matlab system analyzes the count of vehicles and using fuzzy logic , the time for each junction is calculated. By using a communication network, this information is sent to a micro controller based embedded system and it is then attached to traffic light.

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FUTURE WORK

The vehicle objects can be categorized into various classes depending on the geometrical shape of the vehicle for blocking passage of large vehicles. High resolution cameras are used for better result.

CONCLUSION

This project discusses the design and implementation of an intelligent traffic control system based on image processing.The single camera system works by measuring the density of vehicles on the roads at anintersection in a round robin fashion and adjusts the signal time accordingly. Four wireless cameras may be used for better result. In the normal working ie if the volume is regular in junction, the controller automatically generate uniform time signals for traffic light.