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REAL TIME TRAFFIC LIGHT CONTROLLER

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ABSTRACT

There is enormous increase in population of city and number of vehicles on the road day by day. With this increasing urban population and the number of vehicles, need to control streets, highways and roads become major issue. The main issue behind today's traffic problem is the techniques that are used for traffic management. Today's traffic management system has no prominence on live traffic scenario, which leads to ineffective traffic management systems. These traffic timers just have the preset time. This is similar to using open loop system. The proposed system incorporate a closed loop system using camera, thus making it possible to predict the exact time on traffic light timers. The traffic light timers are showing correct time to regulate the traffic, thus the time wasted on undesired green signals (green signal, when there is no traffic) will be saved. Timer for every lane is the simplest way to control traffic. And if those timers are predicting exact time then automatically the system will be more effective. This project is being implemented by using the Matlab software and it aims to prevent heavy traffic congestion. This project measures the number of vehicles present on the road. Moreover, for implementing this project Image processing technique is used. At first, film of a lane is recorded by a camera. A web camera is placed in a traffic lane that will record 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 computed data from Matlab, the controller will send the command to the traffic LEDs to show particular time on the signal to manage traffic.

KEYWORDS: - Image Processing, Vehicle Count, Lane Density, Traffic Light System, Edge Detection

INTRODUCTION

In modern life everyone has to face with many problems one of which is traffic congestion becoming more serious day after day. It is said that the high tome of vehicles, the scanty infrastructure and the irrational dispersal of the development are main reasons for augmented traffic jam. The major cause leading to traffic jam is the huge number of vehicle which is caused due to the population and the development of economy. To unravel this problem, the government should encourage people to use public transport or vehicles with small size such as bicycles or make tax on personal vehicles. The methods mentioned above is really efficient in fact. That the inadequate infrastructure cannot handle the issue of traffic is also a decisive reason. The public transportation is available and it's quality is very bad, mostly in the establishing countries. Besides, the highway and roads are incapable of meeting the requirement of increasing number of vehicle. Instead of working on roads to house the growing traffic various techniques have been devised to control the traffic on roads like embedded controllers that are installed at the junction.

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SYSTEM MODEL

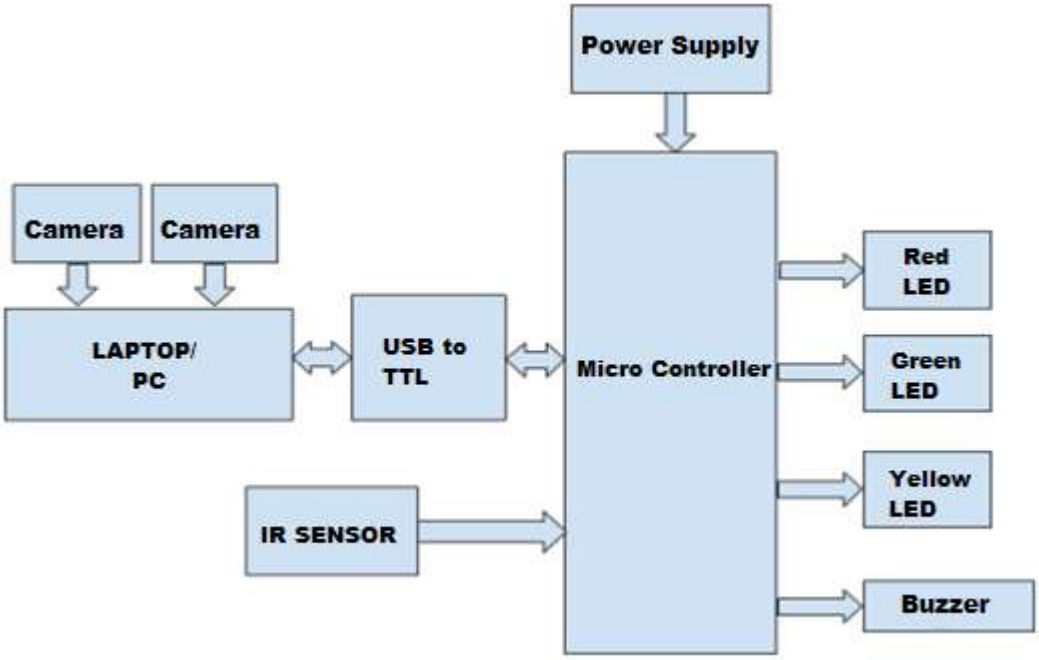

Figure : System Architecture

A system architecture is the conceptual model that defines the structure, performance, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and performance of the system. A system architecture can comprise system components, the expand systems developed, that will work together to implement the overall system. There are six main entity of this system, called Micro Controller, Web Camera, Sensors, PC, USB to TTL and LED.

1. **Micro Controller**: The AT89S52 is a high-performance, low-power CMOS 8-bit microcontroller with 8Kbytes of in-system programmable Flash memory.
2. **Web Camera**: A web-cam captures and recognizes an object in view and tracks the user's hand gestures using computer-vision based techniques. It sends the data to the computer. The camera, in a sense, acts as a digital eye, seeing what the user sees. The camera recognizes objects around you instantly.
3. **IR Sensors**: It work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light.
4. **PC**: Image processor in the proposed system is a personal computer and image analysis tool is MATLAB. So all the features and flow mentioned earlier are been incorporated on PC with help of MATLAB by using various algorithms. The proposed system uses PC screen as output display as to minimize the hardware complexity and to have an easy demo setup. Thus a laptop architecture is used with a web-cam for project demonstration.
5. **USB to TTL**: The cable is easiest way ever to connect to your micro-controller/Raspberry Pi/WiFi router serial console port. Inside the big USB plug is a USB < - >Serial conversion chip and at the end of the cable are four wire – black ground, red power, green TX out of the USB port, and white RX into USB port. The power pin provides the 5V @ 500mA direct from the USB port and the RX/TX pins are 3.3V level for interfacing with the most common 3.3V logic level chipsets.
6. **LED**s offer benefits such as small in size, long-life lamp, low heat output, energy savings and durability.

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PROPOSED SYSTEM

The Image Processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video; the output of image processing can be either an image or a set of attributes or parameters related to the image. Most image-processing techniques involve treating the image as a 2-dimensional signal and applying some standard signal-processing techniques to it. Images are also processed as 3-dimensional signals where the 3rd-dimension being time or the z-axis. Image processing usually refers to digital image processing, but optical and analog processing of image are also possible. Image processing involves issues related to image representation, compression techniques and various composite operations, which can be carried out on the image data. The operations that come under image processing are image enhancement operations such as sharpening, blurring, brightening, edge enhancement. Traffic density of lanes are calculated using image processing which is done on images of lanes that are captured using digital camera. We have chosen image processing to calculate traffic density as cameras are very much cheaper than other devices such as sensors. Making use of the above mentioned virtues of image processing we propose a technique that can be used for traffic control.

METHODOLOGY

In Methodology, different method used in each component of the system will be explained separately. The system can be broken down in four main components. This section is separated into the following subsections:
Following procedures are involved:

1. **Image Acquisition:** Generally an image is 2-dimensional function f(x, y) (here x and y are plane co-ordinates). The amplitude of image at any point say f is called intensity of the image. It is called the gray level of image at that point. We need to convert these x and y values to finite individual values to form a digital image. The input image is a fundus taken from stare data base and drive data base. We need to convert the image from analog to digital to process it through digital computer. Each digital image composed of a finite elements and each finite element is called a pixel.
2. **RGB to gray conversion:** Humans perceive color through wavelength-sensitive sensory cells called cones. There are three different varieties of cones, each has a different sensitivity to electromagnetic radiation (light) of different wavelength. One cone is mainly sensitive to green light, one to red light, and one to blue light. By emitting a restricted combination of these three colors (red, green and blue), and hence restore the three types of cones at will, we are able to generate almost any detectable color. This is the reason behind why color images are often stored as three separate image matrices; one storing the amount of red (R) in each pixel, one the amount of green (G) and one the amount of blue (B). We call such color images as stored in an RGB format. In grayscale images, however, we do not differentiate how much we emit of different colors, we Real time traffic light controller emit the same amount in every channel. We will be able to distinguish the total amount of emitted light for each pixel; little light gives dark pixels and much light is perceived as bright pixels. When converting an RGB image to grayscale, we have to consider the RGB values for each pixel and make as output a single value reflecting the brightness of that pixel. One of the approaches is to take the average of the contribution from each channel: (R+B+C)/3. However, since the perceived brightness is often dominated by the green component, a different, more ”human-oriented”, method is to consider a weighted average, e.g.: 0.3R + 0.59G + 0.11B.
3. **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 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

   Power law transformation has been used in this work. The power law transformations have the basic form.
   s = cr^r

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Where S is output gray level, r is input gray level, c and y are positive constants. For various values of gamma applied on an acquired image we obtained the following graph shown in figure 4.1. From this figure it is evident that the power law curves with fractional values of y map a narrow range of dark input values into a wide range of output values with the opposite being true for higher values of input levels. It depicts the effect of increasing values of y>1. The images are shown with y=1,2,3,4,5 as may be seen, the figure with y=1 gives the best results in terms of making fine details identifiable.

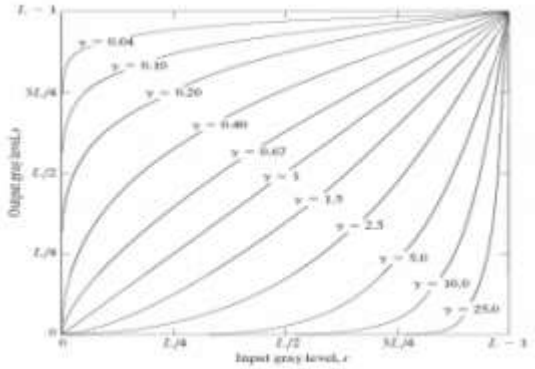

Figure: Input Gray Level

4. Image matching using edge detection

Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or, more technically, has noise. The points at which image brightness alters sharply are typically organized into a set of curved line segments termed edges. The same problem of detecting discontinuities in 1D signal is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is a basic tool in image processing, machine vision and computer envisage, particularly in the areas of feature reveal and feature extraction. Different colors has different brightness values of particular color. Green image has more bright than red and blue image or blue image is blurred image and red image is the high noise image.

CONCLUSION

The study showed that image processing is a fitter technique to control the state change of the traffic light. It shows that it can reduce the traffic congestion and avoids the time wasted by a green light on an empty road. It is also more accurate in detecting vehicle presence because it uses actual traffic images. It visualizes the reality so it functions much better than those systems that rely on the detection of the vehicle's metal content. Overall, the system is good but it still needs improvement to achieve a hundred percent accuracy. In the proposed system, a method for determining 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 individually 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 use of image processing over sensors, low cost, easy setup and relatively good accuracy and speed. Because this project has been implemented using Matlab software and Image Processing, production costs are low while achieving high speed and accuracy.

ACKNOWLEDGEMENT

It gives us nice pleasure in presenting this project report titled "Real Time Traffic Light Controller" and we have a tendency to want to precise our huge feeling to those who provided valuable information and support within the completion of this project. Their guidance and motivation has helped in creating this project a nice success. Thus, we specific deep sense of feeling and satisfaction. We are indebted to our inspiring H.O.D Prof. Kanchan Dabre and Project Guide Prof. John Kenny, who has extended all valuable steerage, help and constant encouragement through numerous tough stages for the development of the project. We specific our sincere feeling to our respected Principal, Dr. J.B.Patil for encouragement and facilities provided to us. Last but not the least we'd prefer to convey

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all direct and indirect identities of the college with whom we have a tendency to took the strides for this successful project.

FUTURE SCOPE

The proposed system uses a single camera for monitoring traffic at an intersection. By using a separate camera for each road at an intersection will allow the system to use video processing which can improve the system effectiveness further. The vehicle objects can also be classified into various classes depending upon the geometrical shape of vehicle for blocking the passage of large vehicles e.g. lorry, trucks during day times. The emergency mode can be refined further by installing a GPS receiver in ambulance so that the base station will keep track of the ambulance location on a continuous basis and clear the road whenever will be required.

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