Smart Traffic Control System Using Image Processing

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Abstract –The fact is that, the population of city and numbers of vehicles on the road are increasing day by day. With increasing urban population and hence the number of vehicles, need of controlling streets, highways and roads is major issue. The main reason behind today's traffic problem is the techniques that are used for traffic management. Today's traffic management system has no emphasis on live traffic scenario, which leads to inefficient traffic management systems. This project has been implemented by using the Mat lab software and it aims to prevent heavy traffic congestion. Moreover, for implementing this project Image processing technique is used. At first, film of a lane is captured by a camera. A web camera is placed in a traffic lane that will capture 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 processed data from mat lab, the controller will send the command to the traffic LEDs to show particular time on the signal to manage traffic

Key words - Population of city, Traffic congestion, Image processing, Traffic density, Adaptive Signal Controlling

1.INTRODUCTION

Fast transportation systems and rapid transit systems are nerves of economic developments for any nation. Mismanagement and traffic congestion results in long waiting times, loss of fuel and money. It is therefore utmost necessary to have a fast, economical and efficient traffic control system for national development. The monitoring and control of city traffic is becoming a major problem in many countries. With the ever increasing number of vehicles on the road, the Traffic Monitoring Authority has to find new methods of overcoming such a problem. One way to improve traffic flow and Safety of the current transportation system is to apply automation and Intelligent control methods. As the Number of road users constantly increases, and resources provided by current infrastructures are limited, intelligent control of traffic will become a very important issue in the future [1].

Traffic congestion may result due to heavy traffic at a junction. To avoid congestion there are so many traffic management techniques available. But no technique is

perfect by itself as the real time situations are generally continuously changing and the system has to adapt itself to change in the continuously changing circumstances. We have made an attempt to provide some traffic management strategy which is self-changing in nature, so as to fit into continuously changing real time traffic scenarios. In this system time is assigned to traffic light of particular lane according to the traffic density on the road with priority given to ambulance. Also we can indicate signal break in a particular lane. If there is an obstacle LCD is used to display the message of obstacle detection to avoid inconvenience.

Objective of proposed system is to improve efficiency of existing automatic traffic signalling system. The system will be image processing based adaptive signal controlling. The timing will be calculated each time change automatically depending upon the traffic load. Proposed system will be functioning based on traditional system along with automated signalling. System will have artificial vision with the help of digital camera mounted on motor for its rotation to face lanes and sense the traffic on the road. The camera is controlled by PC through microcontroller to change its direction in steps of 90 degree to face each lane and capture image. This single image of lane will be processed using image processing techniques to estimate traffic load. Estimated traffic load on particular road will be used to calculate the required time duration for controlling of signal lights based on in comparison with experimental results. System will be intelligent and will calculate the time every time and operate in a cyclic clockwise signal lights control. Maximum and minimum time limit will be maintained to prevent over waiting of vehicle in queue of other lanes which would be found out experimentally. Controls of the signal will be routed through the microcontroller. MATLAB programming will be used for simulating and developing the proposed system. The signal will be controlled by interrupting the normal functioning. The emergency will set the priority and the requested lane will be open closing all others. After emergency is removed the system starts normal functioning

The main aim in designing and developing of the Smart Traffic Signal Simulator is to reduce the waiting time of each lane of the cars and also to maximize the total number of cars that can cross an intersection given themathematical function to calculate the waiting time.

- The first part is the controller which represents the brain of the traffic system. It consists of a computer that controls the selection and timing of traffic movements in accordance to the varying demands of traffic signal as registered to the controller unit by sensors.
- The second part is the signal visualization head provided for controlling traffic in a single direction and consist of one or more signal sections. These usually comprise of solid red, yellow, and green lights.

PROPOSED SYSTEM ARCHITECTURE

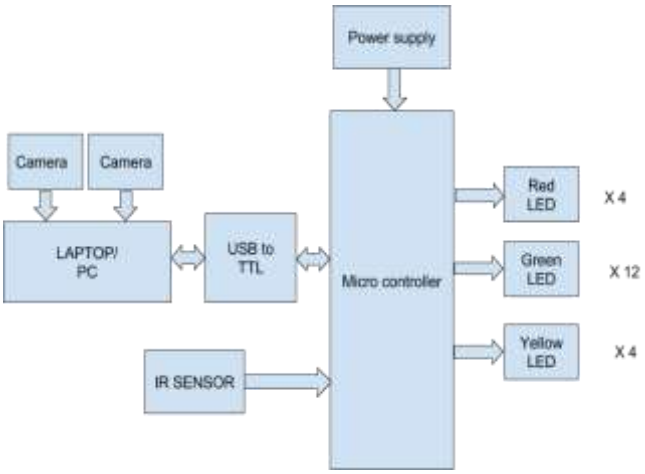

Fig-1: Block diagram of proposed system architecture

Hardware Module:

- MicrocontrollerAT89S52
- USB to TTL
- IR sensor
- Camera
- LED

Software Module:

- Embedded C language for microcontroller
- Diptrace- PCB layout
- MATLAB for image processing
- Prolific driver for USB to TTL

Blob Detection:

Much of the proposed methods used to extracted traffic condition information are based on vehicle detection and tracking techniques. In these systems, robust and reliable vehicle detection and tracking is a critical step. In this paper, we describe a computer vision system to count vehicles moving on roads.[2, 3] The system involves analyzing a sequence of road images which represent the flow of traffic for the given time period and place. The
approach utilized to analyze traffic videos using the following module pipeline:

- Background Subtract
- Blob Detection
- Blob Analysis.
- Blob Tracking.
- Vehicle Counting.

The system works by detecting the entering objects to the scene, and tracking them throughout the video. The input to the algorithm is the raw video data of a site. The algorithm then performs the following steps: First, a statistical background model of the scene is populated using the first few frames of the video. This background model collects the statistics of the background of the recorded scene such as road, trees, buildings, etc. This model is then used to distinguish the objects of interest (vehicles) from the surroundings. In the next step, the detected foreground parts of the scene are grouped together by a neighbourhood analysis, and a filtering process is applied to remove noise and misdetections. The objects of interest obtained at the end of this step are then tracked throughout the video until they leave the scene.

Optical Character Recognition (OCR) :

Optical Character Recognition (OCR) is widely used technology which converts scanned images of printed text, handwritten text characters into machine encoded text information such as ASCII. Number plate recognition is a form of automatic vehicle identification. A number plate is the unique identification of vehicle. It is an image processing technology used to identify vehicles by their own number plates. Real time number plate recognition plays an important role in maintaining law enforcement and maintaining traffic rules. Automatic number plate recognition has three major parts: vehicle number plate extraction, character segmentation and Optical Character Recognition (OCR). Number plate extraction is that stage where vehicle number plate is detected. The detected number plate is pre-processed to remove the noise and then the result is passed to the segmentation part to segment the individually characters from the extracted number plate. The segmented characters are normalized and passed to an OCR algorithm. At last the optical character information will be converted into encoded text. The charactersare recognized using Template matchingThe final output must be in the form of string of characters.

Number Plate Extraction

The captured image is in capital RGB format. It is converted into grayscale image and into binary image.

Character Segmentation

The character segmentation part further segments the character individually from the extracted number plate. From input image the first process will be to crop out the number plate characters from starting to the ending point leaving all the extra wide spaces from top to below and from right to left as it is. Characters are equally fit in the plate region. For easy comparison of the input character with the character in the data base the result is normalized into the character set as the size of the images in the database.

Optical Character Recognition

The optical character recognition is a recognition method in which the input is an image and the output is string of character. OCR is a process which separates the different characters from each other taken from an image. Template matching is one of the approaches of OCR. The cropped image is compared with the template data stored in database. OCR automatically identifies and recognizes the characters without any indirect input.

Priority based traffic clearance:

Fig-2: Preview window

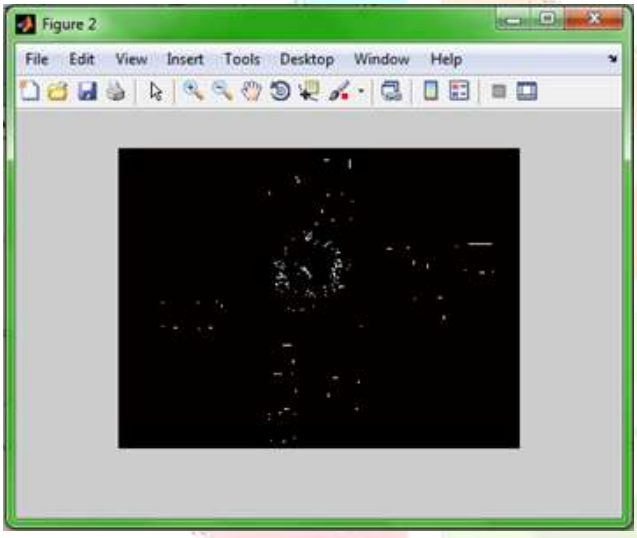

Fig-3: Gray scale conversion

Fig-4: Command window output

Red Signal break (Number plate detection):

- We required two cameras, one to capture the top view to the road and to capture the number plate of the vehicle which will attach to the parallel of the road.
- Switch is used to press red signal.
- If vehicle pass through IR plate during red signal on condition then camera will get on (which place parallel to the road) to capture the number plate.

Fig-5: Waiting for signal break

Fig-10: Signal break

CONCLUSION

In this project, 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 use of image processing over sensors ,low cost, 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.

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