TRAFFIC LIGHT CONTRLLER SYSTEM AND ROAD CONGESTION DETECTION BASED ON COUTING OF VEHICLE

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ABSTARCT

As the problem of urban traffic congestion intensifies, there is a pressing need for the introduction of advanced technology and equipment to improve the state-of-theart of traffic control. The current methods used such as timers or human control are proved to be inferior to alleviate this crisis. In this paper, a system to control the traffic by measuring the realtime vehicle density using canny edge detection with digital image processing is proposed. This imposing traffic control system offers significant improvement in response time, vehicle management, automation, reliability and overall efficiency over the existing systems. Besides that, the complete technique from image acquisition to edge detection and finally green signal allotment using four sample images of different traffic conditions is illustrated with proper schematics and the final results are verified by hardware implementation.

INTRODUCTION

Traffic congestion is one of the major modern-day crisis in every big city in the world. Recent study of World Bank has shown that average vehicle speed has been reduced from 21 km to 7 km per hour in the last 10 years in Dhaka [1]. Intermetropolitan area studies suggest that traffic congestion reduces regional competitiveness and redistributes economic activity by slowing growth in county gross output or slowing metropolitan area employment growth [2].As more and more vehicles are commissioning in an already congested traffic system, there is an urgent need for a whole new traffic control system using advanced technologies to utilize the already existent infrastructures to its full extent. Since building new roads, flyovers, elevated expressway etc. needs extensive planning, huge capital and lots of time; focus should be directed upon availing existing infrastructures more efficiently and diligently. Previously different techniques had been proposed, such as infra-red light

sensor, induction loop etc. to acquire traffic date which had their fair share of demerits. In recent years, image processing has shown promising outcomes in acquiring real time traffic information using CCTV footage installed along the traffic light. Different approaches have been proposed to glean traffic data. Some of them count total number of pixels [3], some of the work calculate number of vehicles [4- 6].These methods have shown promising results in collecting traffic data. However, calculating the number of vehicles may give false results if the intravehicular spacing is very small (two vehicles close to each other may be counted as one) and it may not count rickshaw or auto-rickshaw as vehicles which are the quotidian means of traffic especially in South-Asian countries. And counting number of pixels has disadvantage of counting insubstantial materials as vehicles such as footpath or pedestrians. Some of the work have proposed to allocate time based solely on the density of traffic. But this may be disadvantageous for those who are in lanes that have less frequency of traffic. Edge detection technique is imperative to extract the required traffic information from the CCTV footage. It can be used to isolate the required information from rest of the image.

LITERATURE REVIEW

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. 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 the mathematical function to calculate the waiting time. The traffic signal system consists of three important parts. • The first part is the controller which represents the brain of the traffic system.

IN "PALLAVI CHOUDEKAR, SAYANTI BANERJEE AND M. K. MUJU, "IMPLEMENTATION OF IMAGE PROCESSING IN REAL TIME TRAFFIC LIGHT CONTROL," IN3RD INTERNATIONAL CONFERENCE ON ELECTRONICS COMPUTER TECHNOLOGY, APRIL, 2011." — As the problem of urban traffic congestion spreads, there is a pressing need for the introduction of advanced technology and equipment to improve the state-of-the-art of 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. Setting image of an empty road as reference image, the captured images are sequentially matched using image matching. For this purpose edge detection has been carried out using Prewitt edge detection operator and according to percentage of matching traffic light durations can be controlled. 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

EXISITING SYSTEM

Traffic congestion is one of the major modern-day crisis in every big city in the world. Recent study of World Bank has shown that average vehicle speed has been reduced from 21 km to 7 km per hour in the last 10 years in Dhaka [1]. Intermetropolitan area studies suggest that traffic congestion reduces regional competitiveness and redistributes economic activity by slowing growth in county gross output or slowing metropolitan area employment growth [2].As more and more vehicles are commissioning in an already congested traffic system, there is an urgent need for a whole new traffic control system using advanced technologies to utilize the already existent infrastructures to its full extent. Since building new roads, flyovers, elevated expressway etc. needs extensive planning, huge capital and lots of time; focus should be directed upon availing existing infrastructures more efficiently and diligently. Previously different techniques had been proposed, such as infra-red light sensor, induction loop etc. to acquire traffic date which had their fair share of demerits. In recent years, image processing has shown promising outcomes in acquiring real time traffic information using CCTV footage installed along the traffic light.

Different approaches have been proposed to glean traffic data. Some of them count total number of pixels [3], some of the work calculate number of vehicles [4- 6].These methods have shown promising results in collecting traffic data.

DISADVANTAGE

However, calculating the number of vehicles may give false results if the intravehicular spacing is very small (two vehicles close to each other may be counted as one) and it may not count rickshaw or auto-rickshaw as vehicles which are the quotidian means of traffic especially in South-Asian countries. And counting number of pixels has disadvantage of counting insubstantial materials as vehicles such as footpath or pedestrians. Some of the work have proposed to allocate time based solely on the density of traffic. But this may be disadvantageous for those who are in lanes that have less frequency of traffic

REQUIREMENT ANALYSIS

The project involved analyzing the design of few applications so as to make the application more users friendly. To do so, it was really important to keep the navigations from one screen to the other well ordered and at the same time reducing the amount of typing the user needs to do. In order to make

the application more accessible, the browser version had to be chosen so that it is compatible with most of the Browsers.

REQUIREMENT SPECIFICATION

Functional Requirements

- Graphical User interface with the User.

Software Requirements

For developing the application the following are the Software Requirements:

1. Python
2. Django

Operating Systems supported

1. Windows 7
2. Windows XP
3. Windows 8

Technologies and Languages used to Develop

1. Python

Debugger and Emulator

- Any Browser (Particularly Chrome)

Hardware Requirements

For developing the application the following are the Hardware Requirements:

- Processor: Pentium IV or higher
- RAM: 256 MB
- Space on Hard Disk: minimum 512MB

SYSTEM SPECIFICATION:

HARDWARE REQUIREMENTS:

- ❖ **System**   : Pentium IV 2.4 GHz.

- ❖ **Hard Disk**   : 40 GB.

- ❖ **Floppy Drive**   : 1.44 Mb.

- ❖ **Monitor**   : 14' Colour Monitor.

- ❖ **Mouse**   : Optical Mouse.

- ❖ **Ram**   : 512 Mb.

SOFTWARE REQUIREMENTS:

- ❖ **Operating system**   : Windows 7 Ultimate.

- ❖ **Coding Language**   : Python.

❖ **Front-End** :

Python.

❖ **Designing** :

Html,css,javascript.

❖ **Data Base** :

MySQL.

SYSTEM STUDY

FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are,

♦ **ECONOMICAL FEASIBILITY**
♦ **TECHNICAL FEASIBILITY**
♦ **SOCIAL FEASIBILITY**

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is

also able to make some constructive criticism, which is welcomed, as he is the final user of the system

CONCLUSION

In this paper, a smart traffic control system availing image processing as an instrument for measuring the density has been proposed. Besides explaining the limitations of current near obsolete traffic control system, the advantages of proposed traffic control system have been demonstrated. For this purpose, four sample images of different traffic scenario have been attained. Upon completion of edge detection, the similarity between sample images with the reference image has been calculated. Using this similarity, time allocation has been carried out for each individual image in accordance with the time allocation algorithm. In addition, similarity in percentage and time allocation have been illustrated for each of the four sample images using Python programming language. Besides presenting the schematics for the proposed smart traffic control system, all the necessary results have been verified by hardware implementation

REFERENCES

[1] Siddique, A. (2017). WB: Dhaka's average traffic speed 7kmph. [online] Dhaka Tribune. Available at: http://www.dhakatribune.com/bangladesh/dhaka/2017/07/19/dhakaaverage-traffic-speed-7-kmph/ [Accessed 25 Jul. 2017]. [2] M. Sweet, "Traffic Congestion's Economic Impacts: Evidence from US Metropolitan Regions," Urban Studies, vol. 51, no. 10, pp. 2088–2110, Oct. 2013. [3] Md. Munir Hasan, Gobinda Saha, Aminul Hoque and Md. Badruddoja Majumder, "Smart Traffic Control System with Application of Image Processing Techniques,"in 3rd International Conference on Informatics, Electronics & Vision, Dhaka, May 2014. [4] Vismay Pandit, Jinesh Doshi, Dhruv Mehta, Ashay Mhatre and Abhilash Janardhan, "Smart Traffic Control System Using Image Processing,"International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), Vol. 3, Issue 1, January – February 2014. [5] Pallavi Choudekar, Sayanti Banerjee and M. K. Muju, "Implementation of image processing in real time traffic light control," in3rd International Conference on Electronics Computer Technology, April, 2011. [6] T. Semertzidis, K. Dimitropoulos, A. Koutsia and N. Grammalidis, "Video sensor network for real-time traffic monitoring and surveillance,"The Institution of Engineering and Technology, Volume 4, Issue 2, June 2010, pp. 103 –

112. [7] Lei Yang, Dewei Zhao and Xiaoyu Wu, "An improved Prewitt algorithm for edge detection based on noised image,"in 4th International Congress on Image and Signal Processing, Shanghai, China, October 2011. [8] Weibin Rong, Zhanjing Li and Wei Zhang, "An improved canny edge detection algorithm,"in IEEE International Conference on Mechatronics and Automation, August 2014. [9] Wenshuo Gao, Xiaoguang Zhang and Lei Yang, "An improved Sobel edge detection," in3rd International Conference on Computer Science and Information Technology, July 2010. [10] G.T. Shrivakshan and Dr.C. Chandrasekar, "A Comparison of various Edge Detection Techniques used in Image Processing,"International Journal of Computer Science Issues, Vol. 9, Issue 5, No 1, September 2012.

[10] Radha Krishna Karne and Dr. T. K. Sreeja (2022), A Novel Approach for Dynamic Stable Clustering in VANET Using Deep Learning (LSTM) Model. IJEER 10(4), 1092-1098. DOI: 10.37391/IJEER.100454.

[11] Reddy, Kallem Niranjan, and Pappu Venkata Yasoda Jayasree. "Low Power Strain and Dimension Aware SRAM Cell Design Using a New Tunnel FET and Domino Independent Logic." International Journal of Intelligent Engineering & Systems 11, no. 4 (2018).

[12] Reddy, K. Niranjan, and P. V. Y. Jayasree. "Design of a Dual Doping Less Double Gate Tfet and Its Material Optimization Analysis on a 6t Sram Cells."

[13] Reddy, K. Niranjan, and P. V. Y. Jayasree. "Low power process, voltage, and temperature (PVT) variations aware improved tunnel FET on 6T SRAM cells." Sustainable Computing: Informatics and Systems 21 (2019): 143-153.

[14] Reddy, K. Niranjan, and P. V. Y. Jayasree. "Survey on improvement of PVT aware variations in tunnel FET on SRAM cells." In 2017 International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC), pp. 703-705. IEEE, 2017

[15] Karne, R. K. ., & Sreeja, T. K. . (2023). PMLC- Predictions of Mobility and Transmission in a Lane-Based Cluster VANET Validated on Machine Learning. International Journal on Recent and Innovation Trends in Computing and Communication, 11(5s), 477–483. https://doi.org/10.17762/ijritcc.v11i5s.7109