ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.org

www.ijasem.org

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue.2 April 2024

Congregating Traffic Information Using Canny Edge Detection Algorithm

N.Narahari

Computer Science and Engineering (Data Science)

Sphoorthy Engineering College (JNTUH)

Hyderabad, India

narahari2515@gmail.com

Y.Venkata Jeshwanth Kumar Reddy

Computer Science and Engineering (Data Science)

Sphoorthy Engineering College (JNTUH)

Hyderabad, India

reddyjeshwanth7@gmail.com

B.Pradeep

Computer Science and Engineering (Data Science)

Sphoorthy Engineering College (JNTUH)

Hyderabad, India

pradeepmudhiraj869@gmail.com

A.Sravanthi

Assistant Professor

Computer Science and Engineering (Data Science)

Sphoorthy Engineering College (JNTUH)

Hyderabad, India

sravanthiadimulam237@gmail.com

ABSTRACT

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-the art of traffic control. In this short report a system to control the traffic by measuring the Realtime vehicle density using canny edge detection with digital image processing is proposed. To implement this technique, we are uploading current traffic image to the application and application will extract edges from images and if there is more traffic then there will be more number of edges with white colour and if uploaded image contains less traffic then it will have less number of white colour edges. Empty edges will have black colour with value 0. By counting number of non-zeroes white pixels we will have complete idea of available traffic and based on that we will allocate time to green signal. If less traffic is there then green signal time will be less otherwise green signal allocation time will be more.

INTRODUCTION

Traffic congestion is one of the major modern-day crises 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. Inter-metropolitan 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 .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

ISSN2454-9940

www.ijasem.org

Vol 18, Issue.2 April 2024

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. However, calculating the number of vehicles may give false results if the intra-vehicular 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 works 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. There are several edge detection techniques available. They have distinct characteristics in terms of noise reduction, detection sensitivity, accuracy etc. Among them, Prewitt [7], canny [8], Sobel [9], Roberts and LOG are most accredited operators. It has been observed that the Canny edge detector depicts higher accuracy in detection of object with higher entropy, PSNR(Peak Signal to Noise Ratio), MSE(Mean Square Error) and execution time compared with Sobel, Roberts, Prewitt, Zero crossing and LOG [10-12].Here is a comparison between distinct edge detection techniques [13].

Fig 1: Comparative analysis of distinct edge detection techniques

In this report, a system in which density of traffic is measured by comparing captured image with real time traffic information against the image of the empty road as reference image is proposed. Here, in figure 1, the block diagram for proposed traffic control technique is illustrated.

OBJECTIVES

The project proposed a system for controlling the traffic light by image processing.

In this system the vehicles are not being detected by sensors rather it is detected by images.

In this process initially the system will have picture of the traffic road and the system will continuously will taking pictures of the road and will compare those with traffic ones which will gives signal of the density of the vehicles present on the road.

By detecting the density of vehicles light will glow controlling the traffic. since it will take the actual picture of the road there will be very light changes of glowing the green signal when road is empty.

Traffic Density Monitoring: Utilize canny edge detection to analyse live traffic images or video feeds, enabling the system to assess the density of vehicles on the road.

Congestion Detection: Identify congested areas by analysing the edges of vehicles, allowing for real-time detection of traffic bottlenecks.

Dynamic Signal Control: Adjust traffic signal timings based on the current density and congestion levels, optimizing traffic flow and reducing delays.

Adaptive Timing: Develop a system that can adaptively adjust signal timings based on historical data, weather conditions, and special events to enhance overall traffic management.

Integration with IOT Devices: Connect with Internet of Things (IoT) devices, such as smart sensors and cameras, to enhance data collection and communication capabilities.

User-Friendly Interface: Create a user interface for traffic management authorities to monitor and manage the system effectively.

Energy Efficiency: Implement strategies to optimize energy usage for traffic signal operations, considering environmental sustainability.

Data Analytics: Incorporate data analytics tools to analyze traffic patterns over time, providing insights for further system improvements and urban planning.

LITERATURE SURVEY

M.Sweet," Traffic Congestion Economic Impacts: Evidence from US Metropolitan Regions," Urban studies, vol.no.51, no.pp.2088-2110, oct.2013

Traffic congestion alleviation has long been a common core transport policy objective, but it remains unclear under which conditions this universal byproduct of urban life also impedes the economy. Using panel data for 88 US metropolitan statistical areas, this study estimates congestion's drag on employment growth (1993 to 2008) and productivity growth per worker (2001 to 2007).

Using instrumental variables, results suggest that congestion slows job growth above thresholds of approximately 4.5 minutes of delay per one-way auto commute and 11,000 average daily traffic (ADT) per lane on average across the regional freeway network.

While higher ADT per freeway lane appears to slow productivity growth, there is no evidence of congestion-induced travel delay impeding productivity growth. Results suggest that the strict policy focus on travel time savings may be misplaced and, instead, better outlooks for managing congestion's economic drag lie in prioritising the economically most important trips (perhaps through road pricing) or in providing alternative travel capacity to enable access despite congestion.

MD.MunirHasan, Gobinda Saha," smart traffic control system with application of image processing techniques," in 3rd international conference on information electronics & vision, Dhaka may 2014.

In this paper we propose a method for determining traffic congestion on roads using image processing techniques and a model for controlling traffic signals based on information received from images of roads taken by video camera. We extract traffic density which corresponds to total area occupied by vehicles on the road in terms of total amount of pixels in a video frame instead of calculating number of vehicles. We set two parameters as output, variable traffic cycle and weighted time for each road based on traffic density and control traffic lights in a sequential manner.

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

In this paper we propose a method for determining traffic congestion on roads using image processing techniques and a model for controlling traffic signals based on information received from images of roads taken by video camera. We extract traffic density which corresponds to total area occupied by vehicles on the road in terms of total amount of pixels in a video frame instead of calculating number of vehicles. We set two parameters as output, variable traffic cycle and weighted time for each road based on traffic density and control traffic lights in a sequential manner.

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.

In this paper we propose a method for determining traffic congestion on roads using image processing techniques and a model for controlling traffic signals based on information received from images of roads taken by video camera. We extract traffic density which corresponds to total area occupied by vehicles on the road in terms of total amount of pixels in a video frame instead of calculating number of vehicles. We set two parameters as output, variable traffic cycle and weighted time for each road based on traffic density and control traffic lights in a sequential manner.

SYSTEM ANALYSIS

By comprehensively analysing these aspects we can develop a robust density – based smart traffic control system that effectively utilize the canny edge detection algorithm for efficient traffic management.

EXISTING SYSTEM:

In present traffic control system, it requires man power to control the traffic. The traffic policies will carry sign board, sign light and whistle to control the traffic. They will be instructed to wear specific uniforms in order to control the traffic. Previously different techniques have 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.

Drawbacks:

In the manual controlling system we need more man power. As we have poor strength of traffic police we cannot control traffic manually in all areas of a city or town.so we need a better solution to control the traffic. On the other side, automatic traffic controlling a traffic light uses timer for every phase using electronic sensors is another way to detect vehicles and produce signal that to this method. The time is being wasted by a green light on empty road. Traffic congestion also occurred while using the electronic sensors for controlling the traffic. All these drawbacks are supposed to be eliminated by using Image processing.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN2454-9940

www.ijasem.org

Vol 18, Issue.2 April 2024

PROPOSED SYSTEM:

To implement this technique, we are uploading current traffic images to the application and the application will extract edges from images and if there is more traffic then there will be a greater number of edges with white colour and if uploaded image contains less traffic, then it will have a smaller number of white coloured edges. In this, a system in which density of traffic is measured by comparing captured image with real time traffic information against the image of the empty road as reference image is proposed. Each lane will have a minimum amount of green signal duration allocated. According to the percentage of matching allocated traffic light duration can be controlled. The matching is achieved by comparing the number of white points between two images. This completely serves the purpose of demonstrating the limitations of current traffic control techniques and the solution.

ADVANTAGES:

It is advantageous to convert RGB images into grey scale for further processing. When converting an RGB image to gray scale, it is pertinent 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.

Block diagram of traffic control system:

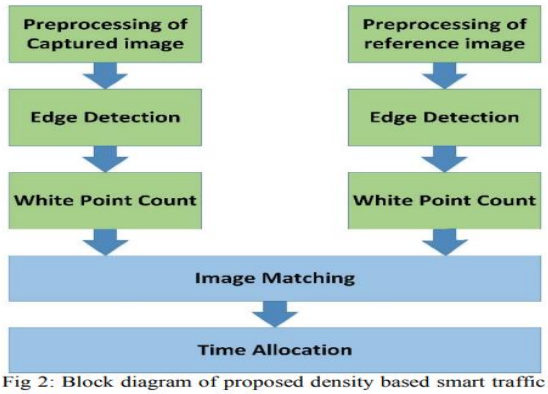
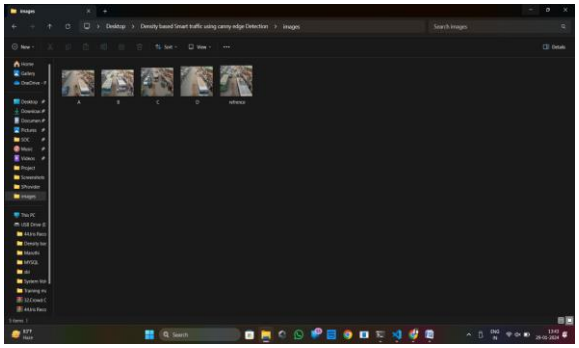


Fig 2: Block diagram of proposed density based smart traffic control system.

Results

SCREEN

To implement this project, we are using 4 input images given in paper and on reference image. Below are the images screen shots saved inside images folder.



We can upload above 4 images to application to calculate traffic signal time.

Screen shots

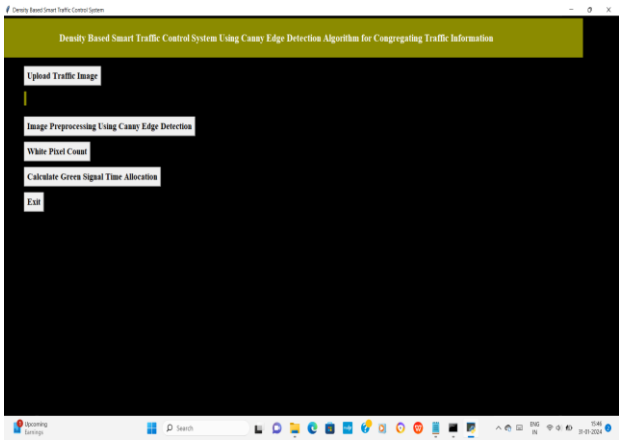
To run this project double, click on ‘run.bat’ file to get below screen.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

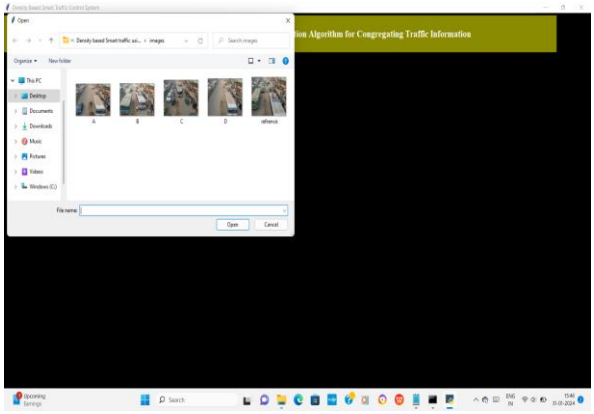
ISSN2454-9940

www.ijasem.org

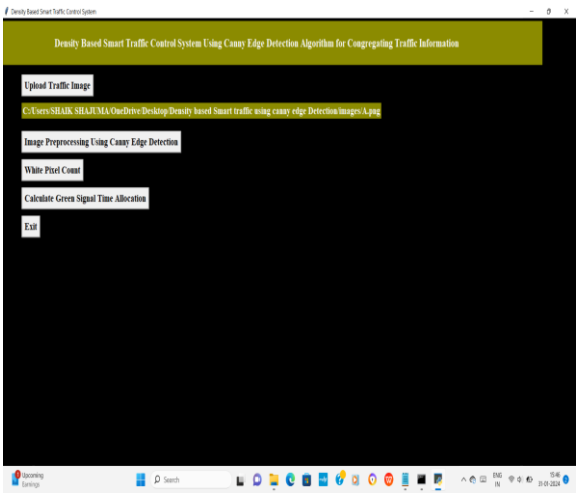
Vol 18, Issue.2 April 2024



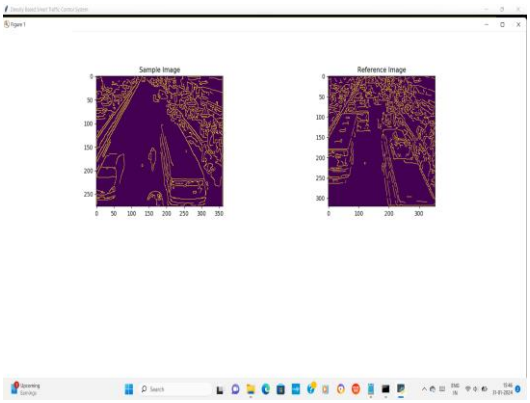
In the above screen click on 'Upload Traffic Image' button to upload image.



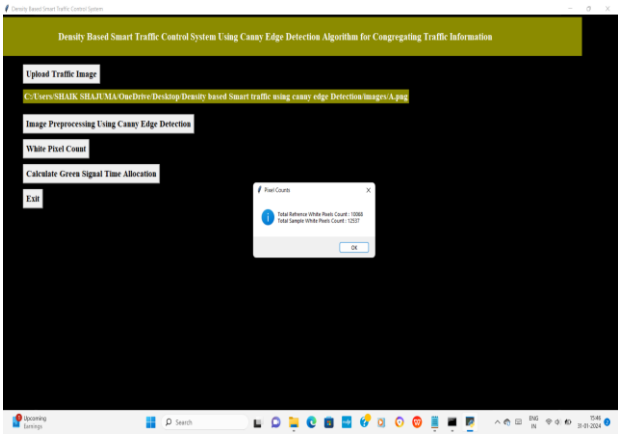
In above screen I am uploading image B and now click on 'Open' button to load image.



In above screen we got message as input image loaded. Now click on 'Image Pre-processing Using Canny Edge Detection' button to apply Gaussian filter and to get canny edges, after clicking button wait for few seconds till you get below screen with edges.



In above screen left side image is the uploaded image and right side is the 'Reference Image', now close this above screen and click on 'White Pixel count' button to get white pixels from both images.



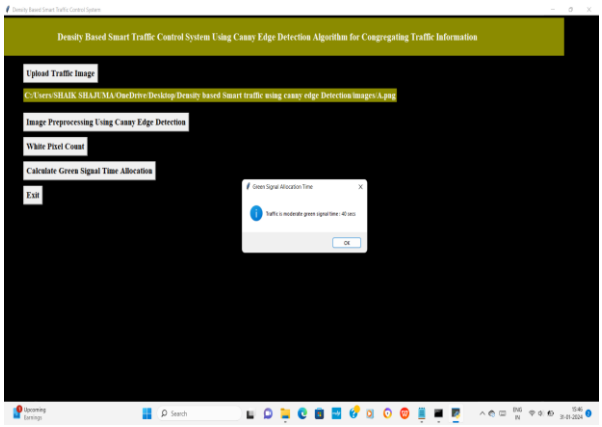
In above screen dialog box we can see total white pixels found in both sample and reference image. Now click on 'Calculate Green Signal Time Allocation' button to get signal time.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

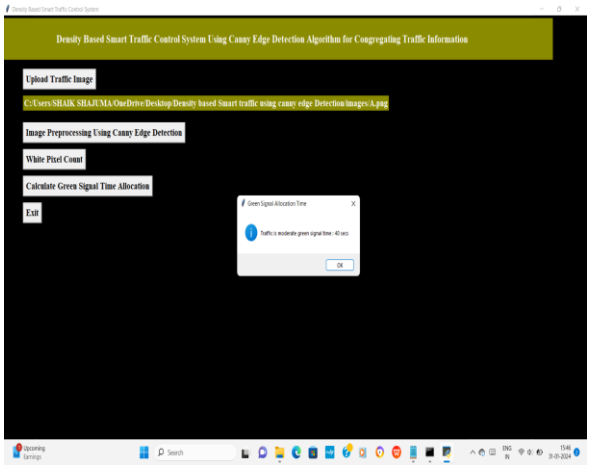
ISSN2454-9940

www.ijasem.org

Vol 18, Issue.2 April 2024



For that uploaded image we got message as it contains high traffic and signal time must be 60 seconds. Similarly you can upload any image and get output. Below is the output for image A.



Above time for image A.

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 has 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.

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.

[11] Pinaki Pratim Acharjya, Ritaban Das and Dibyendu Ghoshal, "Study and Comparison of Different Edge Detectors for Image Segmentation,"Global Journal of Computer Science and Technology Graphics& Vision, Volume 12 Issue 13 Version 1.0 Year 2012.

[12] Jiaqiao He, Liya Hou and Weiyi Zhang, "A Kind of Fast Image Edge Detection Algorithm Based on Dynamic Threshold Value,"Sensors & Transducers, Vol. 24, Special Issue, August 2013, pp. 179-183.

[13] S.K. Katiyar and P.V. Arun, "Comparative analysis of common edge detection techniques in context of object extraction,"IEEE Transactions on Geoscience and Remote Sensing, Vol.50 no.11b.