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DENSITY BASED SMART TRAFFIC CONTROL SYSTEM USING CANNY EDGE DETECTION ALGORITHM FOR CONGREGATING TRAFFIC INFORMATION

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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-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.

1.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]. 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 [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

ISSN: 2278-4632
Vol-14, Issue-5, May: 2024

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.

2.LITERATURE SURVEY

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 prioritizing the economically most important trips (perhaps through road pricing) or in providing alternative travel capacity to enable access despite congestion [7].

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 cameras. 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 the 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 [8].

The fact is that the population of the city and the number of vehicles on the road are increasing day by day. With increasing urban population and hence the number of vehicles, the need to control streets, highways and roads is a 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 scenarios, 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 an 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

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 a timer for each phase. Another way is to use electronic sensors in order to detect vehicles, and produce signals that cycle. 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 an 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 the percentage of matching traffic light durations can be controlled [8].

Sensor networks and associated infrastructures become ever more important to the traffic monitoring and control because of the increasing traffic demands in terms of congestion and safety. These systems allow authorities not only to monitor the traffic state at the detection sites, but also to obtain real-time related information (e.g. traffic loads). This study presents a real-time vision system for automatic traffic

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Vol-14, Issue-5, May: 2024

monitoring based on a network of autonomous tracking units (ATUs) that capture and process images from one or more pre-calibrated cameras. The proposed system is flexible, scalable and suitable for a broad field of applications, including traffic monitoring of tunnels at highways and aircraft parking areas at airports. Another objective of this work is to test and evaluate different image processing and data fusion techniques in order to be incorporated to the final system. The output of the image processing unit is a set of information for each moving object in the scene, such as target ID, position, velocity and classification, which are transmitted to a remote traffic control center, with remarkably low bandwidth requirements. This information is analyzed and used to provide real-time output (e.g. alerts, electronic road signs, ramp meters etc.) as well as to extract useful statistical information (traffic loads, lane changes, average velocity etc.) [9].

3.PROBLEM STATEMENT

Previously different techniques had been proposed, such asinfra-red light sensor, induction loop etc. to acquire traffic datewhich had their fair share of demerits. In recent years, imageprocessing has shown promising outcomes in acquiring realtime traffic information using CCTV footage installed alongthe traffic light. Different approaches have been proposed toglean traffic data. Some of them count total number of pixels, some of the work calculate number of vehicles.These methods have shown promising results in collectingtraffic data [10]. However, calculating the number of vehicles maygive false results if the intravehicular spacing is very small(two vehicles close to each other may be counted as one) andit may not count rickshaw or auto-rickshaw as vehicles whichare the quotidian means of traffic especially in South-Asiancountries. And counting number of pixels has disadvantage ofcounting insubstantial materials as vehicles such as footpath orpedestrians. Some of the works have proposed to allocate timebased solely on the density of traffic. But this may bedisadvantageous for those who are in lanes that have lessfrequency of traffic [11].

4.PROPOSED SYSTEM

In this paper, a system in which density of traffic is measuredby comparing captured image with real time trafficinformation against the image of the empty road as referenceimage is proposed. Here, in
Each lane will have a minimum amount of green signalduration allocated. According to the percentage of matchingallocated traffic light duration can be controlled. The matchingis achieved by comparing the number of white points betweentwo images. The entire image processing before edgedetection i.e. image acquisition, image resizing, RGB to grayconversion and noise reduction is explained in section II. Atsection III, canny edge detection operation and white pointcount are depicted. Canny edge detector operator is selectedbecause of its greater overall performance [12]. Percentagematching for different sample images and traffic timeallocation for them are demonstrated in section IV. Thecontent of this paper completely serves the purpose ofdemonstrating the limitations of current traffic controltechniques and the solution of these limitations with detailedexplanation. Image matching by comparing detected edges is anovel approach to identify the vehicular density withpropitious accuracy. As far as we know, matching images bycomparing detected edges has not been used before for smarttraffic control application [13].

ISSN: 2278-4632
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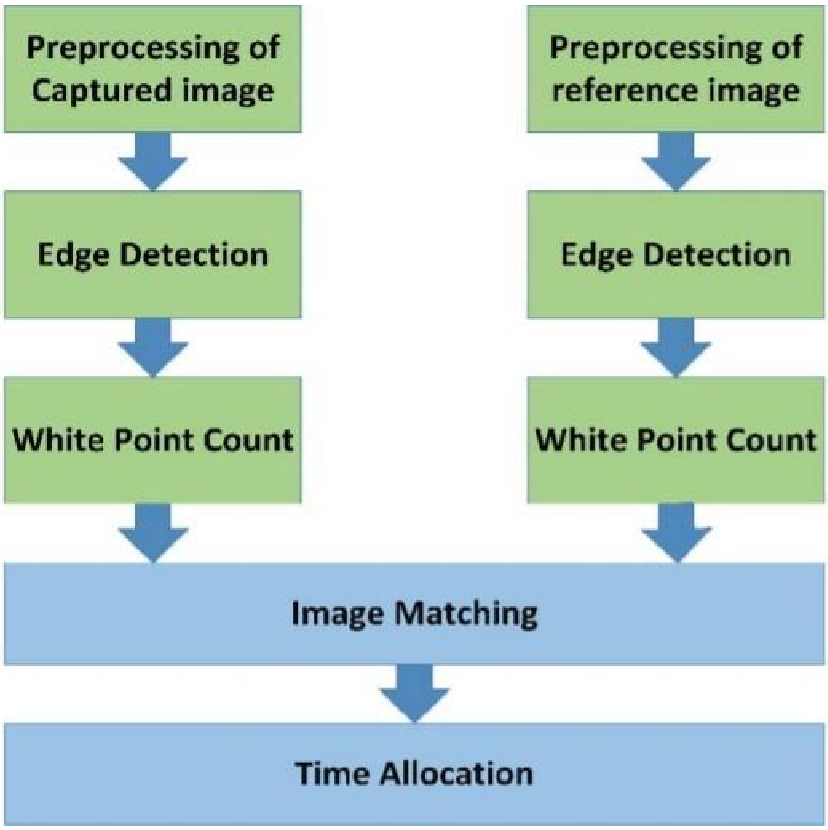
5.SYSTEM ARCHITECTURE



.6.MODULES

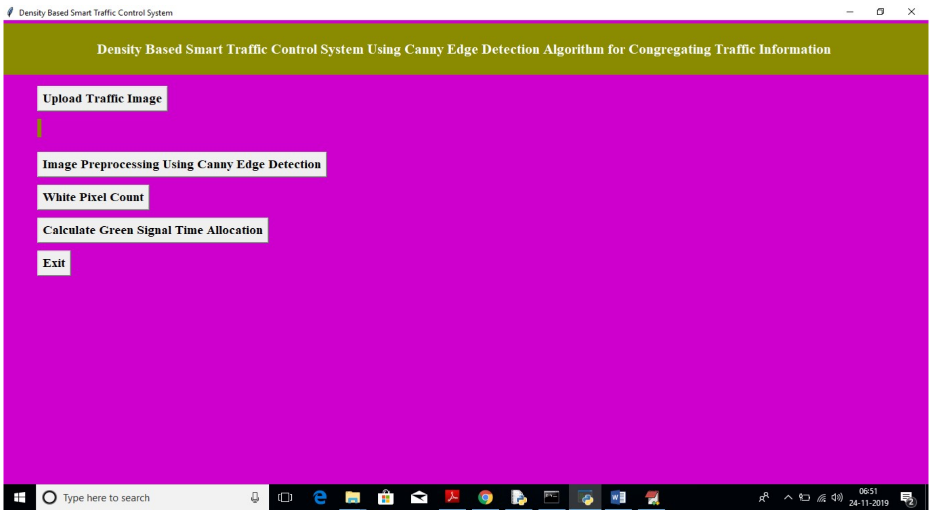
Upload Image Module:
In this module current traffic image will be uploaded to application and then convert colour image into Gray Scale image format to have pixels values as black and white colour.

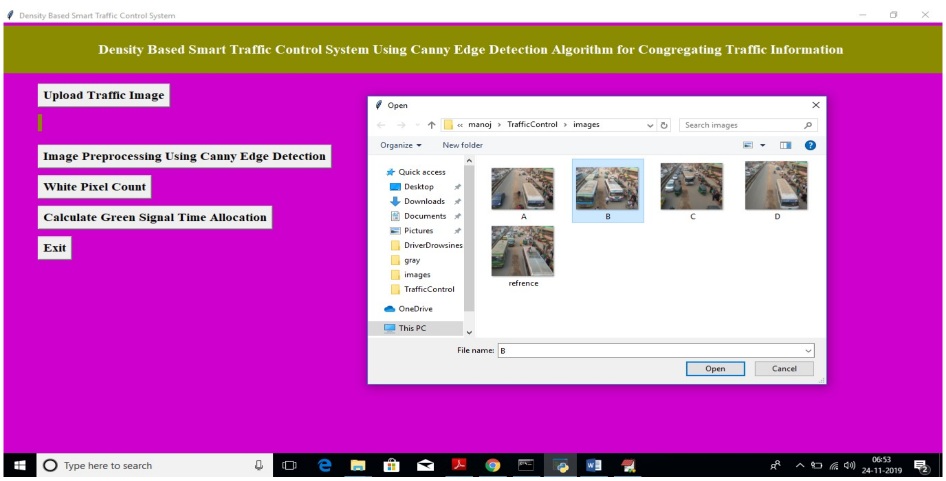
Pre-process module:
In this module Gaussian Filter will be applied on uploaded image to convert image into smooth format. After applying filter Canny Edge Detection will be applied on image to get edges from the image. Each vehicle will have white colour pixels and non-vehicle will have black colour pixels.

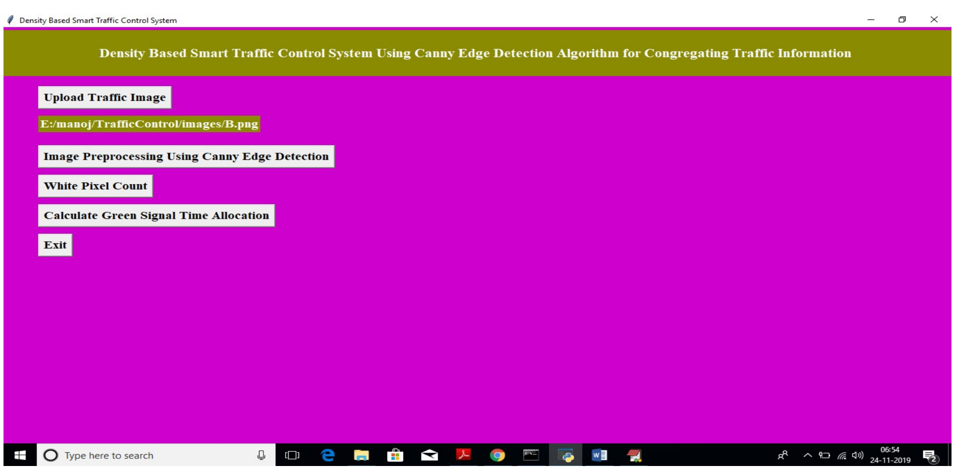
White Pixel Count Module:
Using this module we will count white pixels from canny image to get complete traffic count

Calculate Green Signal Time Allocation Module:
Based on white pixel count traffic signal time will be calculated. How this time will be calculated is already explain in previous page.

7.EXPECTED RESULTS







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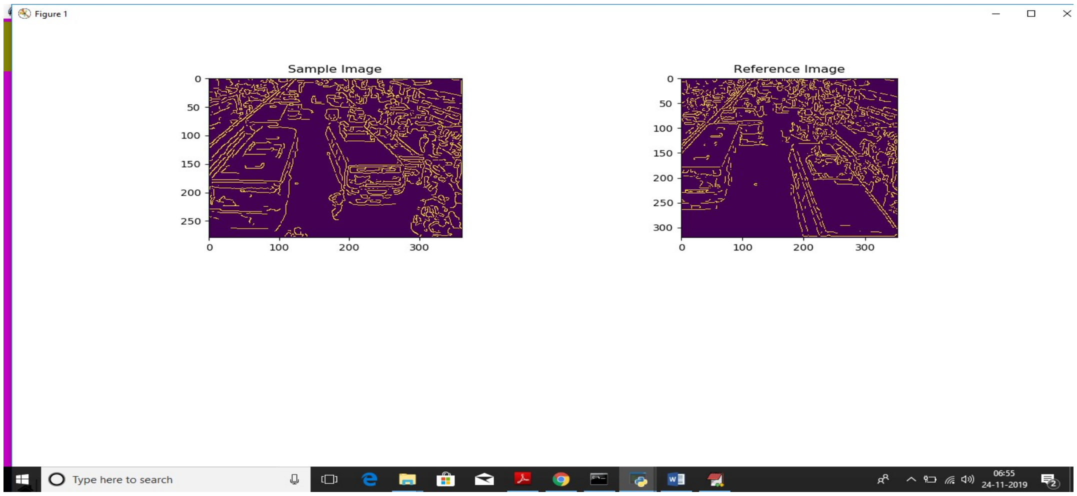
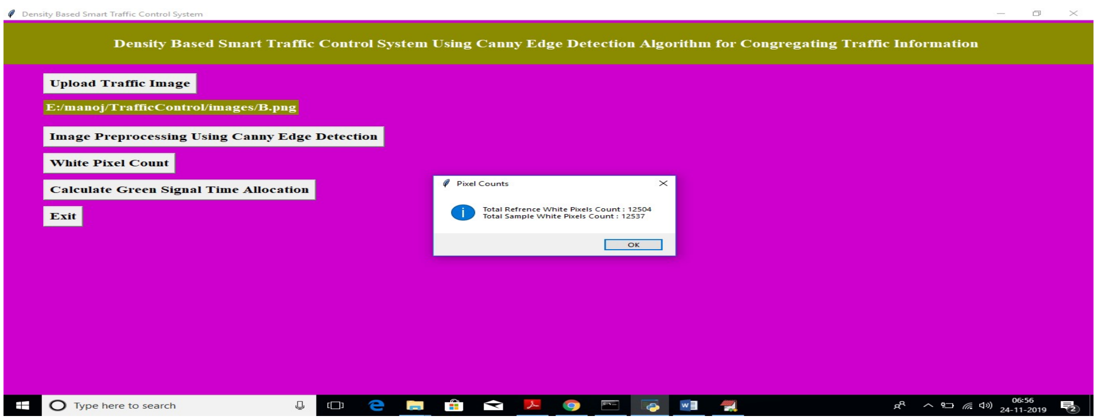
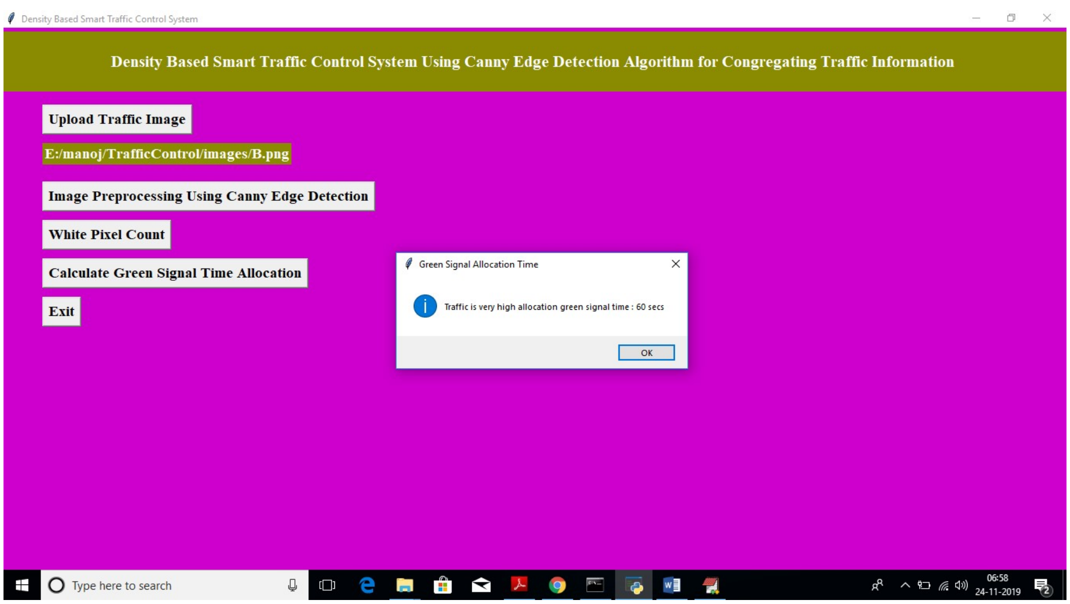
Vol-14, Issue-5, May: 2024







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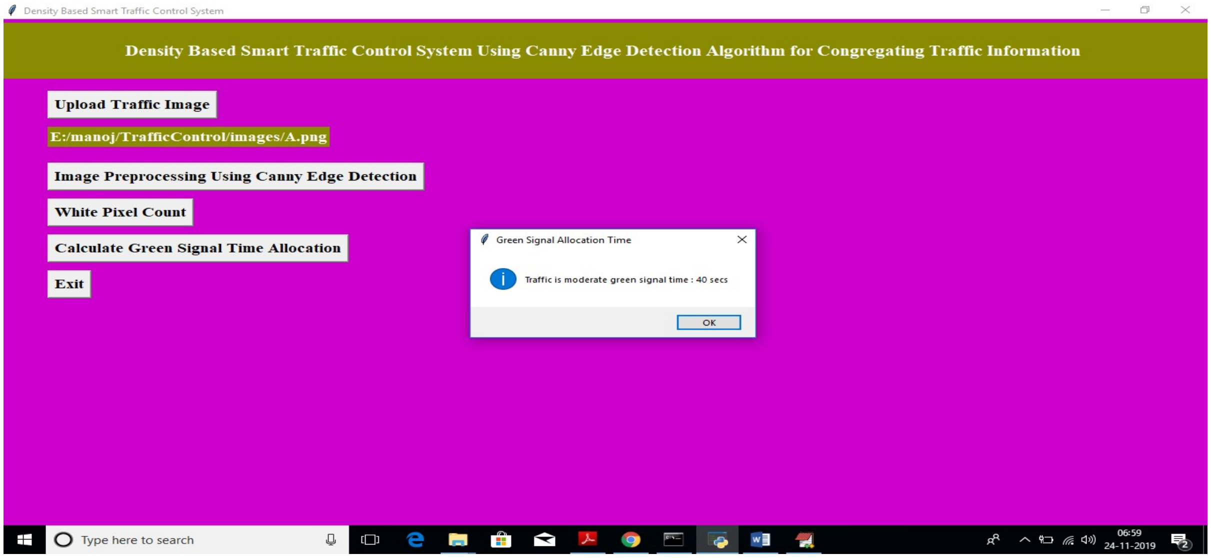

8.CONCLUSION

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.

9.FUTURE SCOPE

A smart traffic management system that measures density through image processing. The advantages of the suggested traffic control system have been illustrated, along with discussions of the shortcomings of the outdated current traffic management system. Several real-world traffic situations have been photographed for this reason. After edge detection, the degree of similarity between the sample images and the reference image was computed. This resemblance and the time allocation approach were used to determine the time allocation for each individual photo. The Python computer language has also been used to show similarities in percentage and time allocation for each of the example photographs. Object detection was also accessible which reduces the time needed to wait for an ambulance

10. 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.

ISSN: 2278-4632
Vol-14, Issue-5, May: 2024

[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.