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

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ABSTRACT
Congestion in metropolitan areas is getting worse, therefore it's more important than ever to use cutting-edge technology and equipment as soon as possible to improve traffic management. Time-based or human-driven solutions have failed in the past. In this research, a novel approach is provided for real-time traffic density measurement using cutting-edge edge identification and digital picture processing. The reaction speed, vehicle management, automation, dependability, and overall efficiency are all greatly improved by this cutting-edge traffic control system. Four example photos depicting different traffic circumstances are used to illustrate the results of the hardware implementation, and the whole method is illustrated with appropriate diagrams. This entails taking photos, finding edges, and giving out the "go" indication.
Keywords: Smart Traffic Control; Density based Traffic Control; Edge Detection; Image Processing in Traffic Control.

INTRODUCTION

Statistics from the World Bank [1]. The increase of county GDP or metropolitan employment is slowed by congestion, according to intercity studies, and this has an adverse effect on regional competitiveness. To get the most out of our current infrastructure while the number of cars on the road continues to rise, we need a whole new traffic control system that employs cutting-edge technology. Instead of focusing on building additional roads, flyovers, elevated motorways, etc., we should concentrate on improving the current network. Various systems, such as infrared light sensors and induction loops, have been proposed to gather traffic data. However, there were limitations to each of these approaches. Recently, promising results have been shown when using image processing to extract real-time traffic data from CCTV photos placed along the traffic signal. There are a number of options for gathering traffic data. Pixel counters and automobile counters are two examples [3, 4].The good findings of employing these methods to gather traffic statistics warrant further exploration. Rickshaws and auto-rickshaws are the most common form of transportation in South Asian countries, despite the fact that they are so closely related to one another that they may not even qualify as vehicles. Pixel counting also has the issue of not being able to differentiate between cars and other moving things, such as people and pavements. Scheduling entirely on traffic volume has been recommended by many research. But this might cause problems for motorists in less-crowded sections. Using edge detection methods, the essential traffic data must be retrieved from the surveillance film. It may be used to analyse images and extract relevant details. Edge detection can be accomplished in several ways. They are unparalleled in terms of accuracy, precision, sensitivity to detect noise, etc. The likes of Prewitt [7], canny [8], Sobel [9], Roberts, and LOG are among the most credentialed people in their fields. In terms of entropy, PSNR (Peak Signal to Noise Ratio), MSE (Mean Square Error), and execution time, Canny edge detector has been demonstrated to be superior than Sobel, Roberts, Prewitt, Zero

crossing, and LOG [10, 12].Thirteen different approaches to finding edges are examined and contrasted here. Fig 1: The suggested density-based smart traffic control system's block diagram. The number of cars per unit of road density is only meaningful when there is no difference in travel times or vehicle sizes [13]. However, even in typical traffic situations, there is a significant gap between the aforementioned two characteristics of autos (speed and size). The density measurement is meaningless because of the wide range of speeds and sizes of vehicles in the traffic flow. The idea of density has to be rethought so that it may be used in traffic situations when automobiles of very different sizes and speeds interact. In countries like India, motorists may pick from a diverse fleet of automobiles, each with its own unique characteristics. Mixedtraffic highways make density an ineffective measure for gauging traffic concentration since vehicles go at different speeds and have different dimensions. The purpose of this research is to provide a supplementary metric for traffic density that may be used in a wide range of situations, including those that occur on Indian roads. It's common knowledge that safer roads may reduce both the number of accidents and the number of lives lost in them. However, it is challenging to deliver world-class roads everywhere at once due to economic and political constraints. This highlights the necessity for efficient transit systems to accommodate the expanding user base and traffic. Variables such as flow volume, flow density, and vehicle class in time series are frequently employed in studies of vehicular traffic. In India's ever-changing environment, a number of factors determine the flow and timing of traffic. Many ITS applications, including planned infrastructure developments and repairs, might benefit from this data. The Highway Capacity Manual [4] is widely used for its description of traffic flow characteristics. Flow is defined as "the number of vehicles passing a point of roadway in unit time (typically one hour)", density as "the number of vehicles on a roadway of unit length (typically one mile)", and average speed as "the average speed based on the average travel time of vehicles to traverse a segment of roadway". Edie explains it another way that's a lot simpler [35,36]. Space-time analysis may be used to all three aspects of traffic flow. The total distance travelled by all vehicles in a region divided by the region's "area," the total amount of time spent in a region divided by the region's "area," and the total distance travelled by all vehicles in a region divided by the total amount of time spent, respectively, define flow, density, and SMS, respectively. Loop detectors are the most prevalent sort of sensor technology used by traffic monitors. Subterranean traffic sensors, when triggered, provide up-to-the-minute information on traffic conditions along a certain stretch of road. It was shown, however, that the cost to set up and maintain such detectors might change with time. Immediately, efforts were made to find more cost-effective alternatives. Video, radar, microwave, ultrasound, and acoustics are just some of the cutting-edge technologies that are finding their way into consumers' hands. Due to the high costs and safety risks associated with lane closures, noninvasive detectors positioned beyond the boundary of the pavement are sought for, while greater traffic intelligence and an increased dependency on traffic monitoring require wide-area detectors for enhanced vehicle detection. Exciting new breakthroughs in video image processing for vehicle monitoring include the ability to expose information such as lane shifts and vehicle trajectories in addition to the more classic traffic metrics of flow and velocity. With the rapidly decreasing cost of imagegathering equipment and the availability of cheap, yet powerful CPUs, there has been a renaissance of interest in the research of computer vision methods for the purpose of traffic monitoring and management[10]. The vast majority of published works, with a few notable exceptions, are set in either a suburban or a highway setting. The increasing diversity of highway intersections, the availability of various traffic flows (some of which require turning actions), and the presence of mixed traffic (including pedestrians, trucks, and automobiles that halt at traffic signals) have all contributed to the difficulty of junction monitoring. Strategies for managing occlusion and classifying content are crucial. Problems with

global light variations, monitoring multiple objects, and managing shadows are also typical in highway and junction environments. The monitoring of traffic environments is notoriously difficult. Besides the contrasting colours of the road lines, most images of roads are boring, flat, and featureless. It is presumed that there are no changes to the path and that it is always clear. A camera's typical viewing distance is 10–20 metres, and it can keep an eye on one–three lanes of traffic. Without a question, the road and the vehicles that use it are the most fascinating things in the world to us. Photographs reveal concealed vehicles among trees, road signs, light poles, bridges, and the like. Shadows might be thrown everywhere in the field of view by these parts, which may or may not be in motion. Commute times are affected by weather conditions such as rain, snow, fog, and changes in sunlight due to sunrise and sunset and cloud cover. Depending on the weather, the picture may turn out any number of ways. Rain creates speckle noise and reduces the perceived intensity of the picture without a step viewing angle. The snow increases the overall brightness and the number of reflections. Last but not least, fog reduces contrast and visibility, which might lead to an issue. There are several kinds of illumination to think about. Because the sun is always moving, the received light's direction and intensity are always changing. Because this alters the hue and intensity of the light reflected by the objects, it also alters the size, form, and direction of shadows. Clouds have a role in modifying the ambient light as they travel through the sky. Nighttime is dark because there is no daylight. In many nighttime traffic scenarios, there is little or no light. The second scenario has an even distribution of light sources at constant distances. Artificial light, in contrast to the diffuse quality of daylight, is directed in a tight beam. The transition from day to night involves all of these and more[11].

2.SYSTEM ANALYSIS

EXISTING SYSTEM:

Major traffic jams are a common occurrence in today's major cities. The average speed of cars in Dhaka has decreased from 21 km/h to 7 km/h during the previous decade, according to new statistics from the World Bank [1]. The increase of county GDP or metropolitan employment is slowed by congestion, according to intercity studies, and this has an adverse effect on regional competitiveness.To get the most out of our current infrastructure while the number of cars on the road continues to rise, we need a whole new traffic control system that employs cutting-edge technology. Instead of focusing on building additional roads, flyovers, elevated motorways, etc., we should concentrate on improving the current network[4].

PROPOSED SYSTEM:

In order to measure traffic density in real time, this research proposes using cutting-edge edge recognition and digital picture processing. Automation, vehicle management, and quicker responses, dependability, and overall efficiency are all greatly improved with this advanced traffic management system. The entire procedure is outlined with appropriate diagrams, from picture acquisition through edge identification and finally green signal allocation, and the results are demonstrated by hardware implementation using four sample photographs of varied traffic circumstances[5].

Objectives:

Malicious attacks are increasing day by day though many techniques are used to avoid them.
DDoS attacks are the major threats these days.
We are proposing an approach to detect those attacks by using co-clustering algorithm[6].

Problem Definition

In the past, induction loops and infrared light sensors were two examples of various systems for collecting traffic data, each with its own set of limitations. Combining continuous traffic data from CCTV footage captured near traffic lights has recently yielded promising results for image processing. There are a lot of different ways to measure how many people attend social events. Others count the number of cars, while some count the overall amount of pixels. These methods have produced excellent

outcomes in terms of the traffic metrics associated with social events. Regardless,
handling countless vehicles might neglect to merge truck or auto-truck as vehicles,
which are famous methods of transportation in South Asian nations, and may bring
about misdirecting results if intra vehicular apportioning is little (two vehicles near one
another might be considered to be one). Furthermore, a traffic officer (Cop) is in charge
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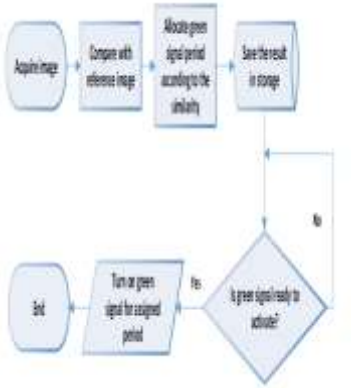
4. SYSTEM DESIGN



1.1 Proposed time allocation algorithm for autonomous traffic control

System

However, I can offer you some general insights into the concepts mentioned in the title and how they might be relevant to a smart traffic control system:

Density-Based Traffic Control System:

A density-based traffic control system typically relies on data from various sensors (such as cameras, radars, and loop detectors) to measure the density of vehicles on roads or at intersections. By analyzing this density information, the system can make intelligent decisions about traffic signal timings, lane management, and more, in order to optimize traffic flow and reduce congestion[9].

Canny Edge Detection Algorithm:

The Canny edge detection algorithm is a popular image processing technique used to detect edges in images. In the context of a smart traffic control system, it might be used to process images or video feeds from cameras placed at intersections. By detecting edges of vehicles and other objects, the system can track the movement and flow of vehicles, which can then contribute to the density-based control strategy[10].

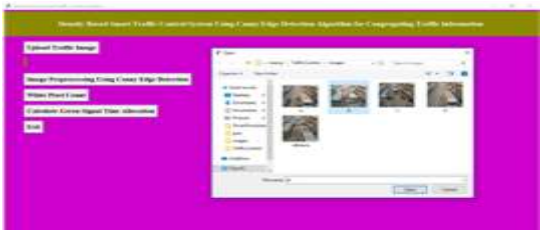
Congregating Traffic Information:

"Congregating traffic information" likely refers to the data collected about vehicles that are clustered or gathered together, potentially causing congestion. This information could include the number of vehicles in a certain area, their speeds, directions, and more. This data is crucial for making informed decisions in a smart traffic control system[12].

5. RESULTS

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

In 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

6.CONCLUSION

In this project, 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.

7. REFERENCE

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