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

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ABSTRACT

It is urgently necessary to combine current advancements to work on the cutting edge inrush hour jam the executives, as urban congestion is one of the world's biggest concerns. Existing methodologies, for example, traffic police and traffic lights are neither fulfilling nor viable. Consequently, a traffic management system that utilizes sophisticated edge detection and digital image processing to measure vehicle density in real time is developed in this setting. Computerizedimage processing should be used to detect edges. To extract significant traffic data from CCTV images, the edge recognition method is required. The astute edge finder outperforms other processes in terms of accuracy, entropy, PSNR (peak signal to noise ratio), MSE (mean square error), and execution time. There are a number of possible edge recognition calculations. In terms of reaction time, vehicle the board, mechanization, dependability, and overall productivity, this framework performs significantly better than previous models. Utilizing a few model images of various traffic scenarios, appropriate schematics are also provided for a comprehensive approach that includes image collection, edge distinguishing evidence, and green sign classification. Also recommended is a system with object identification and priority for ambulances stuck in traffic.

I. INTRODUCTION

Today, there is terrible traffic congestion in every big city. The typical speed of a vehicle in Dhaka has diminished from 21 kilometers each hour to 7 kilometers each hour as of late, as per another World Bank study [1]. As indicated by intermetropolitan region studies, gridlock lessens area gross item development or metropolitan work improvement, reallocates monetary action, and subverts local intensity [2]. A brand-new traffic management system that uses cutting-edge technology to make the most of the infrastructures that are already in place is needed right away as more cars enter a system that is already overcrowded . Since building new streets, flyovers, raised motorways, and different designs requires broad preparation, huge load of cash, and a ton of time, the spotlight should be on utilizing the framework that is as of now set up. In the past, infrared-light sensors, induction loops, and other systems with their own set of issues were suggested for gathering traffic data. Social affair

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continuous traffic data from CCTV footage installed at traffic lights has recently yielded intriguing results for image processing. There have been a number of suggestions for how to measure traffic to social events.While some count the number of cars, others count the overall number of pixels. These procedures have shown amazing results as far as get-together traffic gauges.However, the cart or auto-cart, which are common modes of transportation in South Asian nations, may be excluded if the intravehicular dividing is small (two cars next to each other may be considered one vehicle).Image processing has lately shown promising results in getting real-time visitor information using CCTV cameras that were installed next to the traffic light. It had been proposed to use unusual methods to gather information on website visitors. A few of them are dependent on the total number of pixels [3], while the number of automobiles [4-6] is one of the most significant estimates.Counting pixels also makes it hard to count trivial things like people or pathways. Numerous studies indicate that the amount of time allotted should be entirely determined by traffic density. For individuals who are in lanes with less traffic, however, this might not be desired. To extract pertinent traffic data from CCTV images, the edge detection method is required.It could be helpful to separate the important information from the background of the photograph. There should be many different approaches to identify edges. They are recognized by their sound decrease, identification awareness, precision, and different highlights. Prewitt, Shrewd, Sobel, Roberts, and LOG are the directors with the most endorsements, separately [7, 8], [9], and [10]. The Shrewd edge locater has a higher entropy, PSNR (Peak Signal to Noise Ratio), MSE (Mean Square Error), and execution time than Sobel, Roberts, Prewitt, Zero crossing point, and LOG [10-13]. This is a correlation between two ways to deal with edge discernment[14].

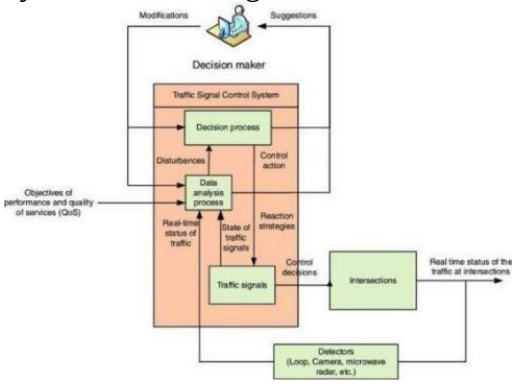

Fig. 1. Example Diagram.

II. RELATED WORK

Algorithms

Canny Edge Detection Algorithm

A well-known edge detection approach that may be used to find edges in an image is the Canny Edge Detection approach. Smoothing the image, figuring out the gradient of the image, non-maximum suppression, and hysteresis thresholding are all steps in the multi-stage technique.

PSNR

Peak signal-to-noise ratio (PSNR) is an expression for the ratio of a signal's greatest permissible value (power) to the power of distorted noise that impairs the accuracy of its representation.

MSE

How closely a regression line resembles a set of data points is determined by the Mean Squared Error. It is a risk function that corresponds to the squared error loss's expected value. The average, more particularly the mean, of errors squared from data related to a function is used to determine mean square error.

YOLO

YOLO is a method that provides real-time object detection using neural networks. The popularity of this algorithm is due to its accuracy and quickness. It has been applied in a variety of ways to identifyanimals, humans, parking metres, and traffic signals.

OpenCV

OpenCV (Open Source Computer Vision Library) is a popular computer vision

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library that is used forimage and video processing. It has many built-in functions that can be used to implement edge detection and object detection.

MODULES

1. To finish this project, we utilized the following modules.
2. In step 1,we will import the dataset & then upload the traffic image.
3. In next step, we will detect the image.
4. Image pre-processing is done using Canny Edge Detection Algorithm.
5. Finding out the white pixel count by applying the Gaussian filter.
6. The last step is allocation of the Green signal Time.

III. 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 of traffic control under current regulations.

Disadvantages

1. Predictions of the number of cars, however, may produce inaccurate results if intra vehicular spacingis very narrow (two vehicles close together may be classified as one). It's probable that it excludes common modes of transportation in South Asia like rickshaws and auto-rickshaws.
2. Police officers cannot constantly watch the traffic (for instance, in inclement weather, at midnight, etc.).

Advantages

1. Compared to previous frameworks, this strict traffic light system significantly enhances response times, vehicle the board, robotization, dependability, and general proficiency.
2. Both the benefits of the proposed traffic the board structure and the shortcomings of the current, nearly antiquated traffic signal system have been shown.

IV. SYSTEM DESIGN

SYSTEM ARCHITECTRE

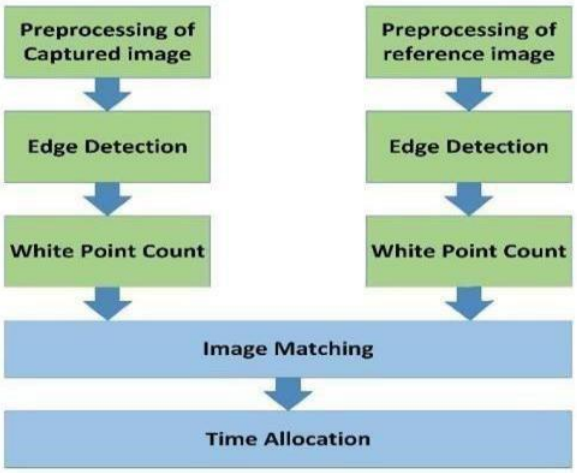

Fig. 2. System Architecture

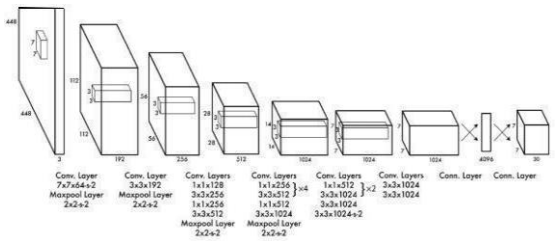

Fig. 3. YOLO Architecture.

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V. RESULTS

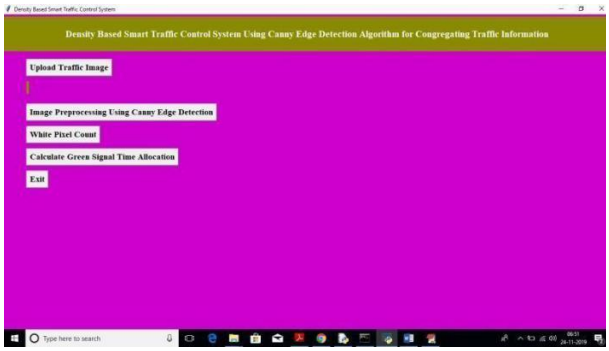

Fig. 4. Uploading the Traffic Image

Fig. 5. Image Pre-Processsing Using Canny Edge Detection

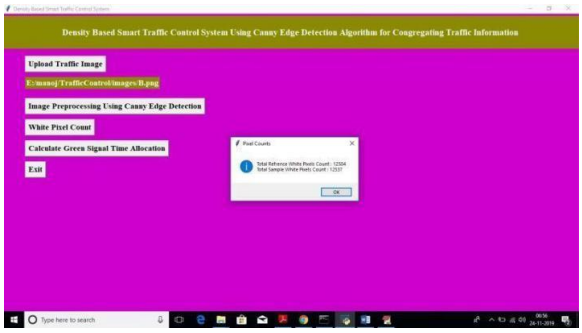

Fig.6. White pixel count

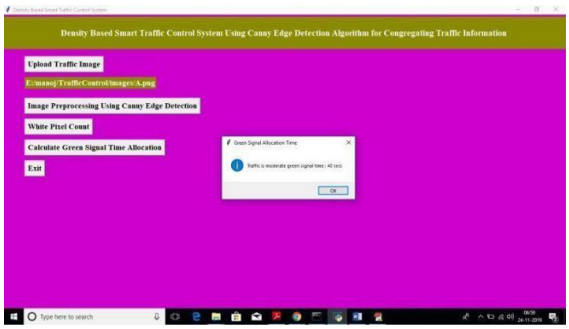

Fig.7. Allocation of Green Signal Time

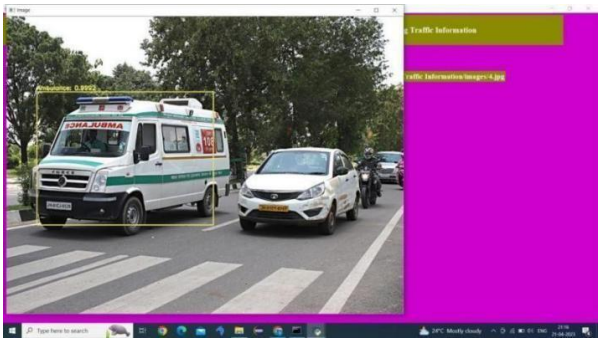

Fig.8. Detection of Ambulance by using YOLO algorithm

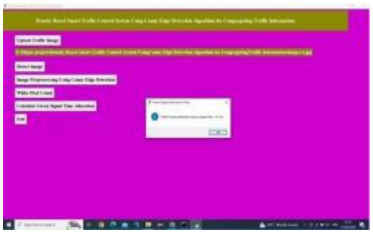

Fig.9. Less green signal time for Ambulance.

VI. CONCLUSIONS & FUTURE SCOPE

In this study, a smart traffic control system that analyses images to determine density is proposed. Along with talks of the drawbacks of the outmoded present traffic management system, the benefits of the proposed traffic control system have been shown. For this reason, several actual traffic events have been captured on camera. The degree of similarity between the sample pictures and the reference image was calculated after edge detection. The time allocation for each individual picture was decided using this similarity and the time allocation strategy. Additionally, Python has been utilised to show how each of the sample images have comparable percentage and time allocations. Additionally, object detection was available, which cuts down on the time spent waiting for an ambulance.

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