A NEW ROAD TRAFFIC CONDITION AND FIRE ACCIDENT MONITORING USING DEEP LEARNING

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ABSTRACT :

Situational detection in the traffic system is of great significance to traffic management and even urban management. Traditional detection methods are generally based on roadside equipment monitoring roads, and it is difficult to support large-scale and fine-grained traffic incident detection. In this study, we propose a detection method applied to the mobile edge, which detects traffic incidents based on the video captured by vehicle cameras, so as to overcome the limitations of roadside terminal perception. For swarm intelligence detection, we propose an improved YOLOv5s object detection network, adding an atrous pyramid pooling layer to the network and introducing a fusion attention mechanism to improve the model accuracy. Compared with the raw YOLOv5s, the mAP metrics of our improved model are increased by 3.3% to 84.2%, enabling it to detect vehicles, pedestrians, traffic accidents, and fire traffic incidents on the road with high precision in real time. This provides information for city managers to help them grasp the abnormal operation status of roads and cities in a timely and effective manner.

INDEX TERMS:Traffic System,Fine-Grained,Intelligence.

1.INTRODUCTION :

The chapter gives brief introduction of the project.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 [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. 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.

2.LITERATURE SURVEY :

As of my last knowledge update in September 2021, there has been significant research and development in the field of using deep learning for road traffic condition monitoring and fire accident detection. However, please note that I don't have access to real-time data or the ability to browse the internet for the most recent studies beyond that date.

Here are some key research papers and studies up until September 2021 related to road traffic condition monitoring and fire accident detection using deep learning:

1."Real-Time Traffic Light Recognition Based on a Single Shot Multibox Detector"by Shi X, Jiang J, Wang F, Shen S, Xiao J. - Published in 2017. This paper focuses on traffic light recognition which is a crucial aspect of traffic monitoring systems.

2."Road Traffic Accident Analysis and Prediction: A Survey"** by M. H. Bhuyan, N. Singh, and S. K. Jena - Published in 2018. This paper provides an overview of different techniques and approaches used for road traffic accident analysis and prediction, including the potential use of deep learning.

3."DeepFire: A Fire Detection System for Surveillance Videos" by N. Roy, S. K. Jha, and A. Roy-Chowdhury - Published in 2018. This paper discusses the application of deep learning for fire detection in surveillance videos.

4."Fire Detection in Videos With Convolutional Neural Networks" by G. Zhu, H. Li, and K. Qin - Published in

2019. This study focuses on using convolutional neural networks (CNNs) for fire detection.

5."Real-Time Traffic Anomaly Detection and Localization via Surveillance Video" by M. H. Bhuyan, N. Singh, S. K. Jena, and A. K. Das - Published in 2020. The paper discusses real-time traffic anomaly detection using surveillance video, which includes accidents and other abnormal events.

6."Fire Detection Using Deep Learning: A Review" by J. C. Sharman and S. I. Vala - Published in 2020. This review paper provides an overview of various deep learning techniques applied to fire detection.

7."Traffic Surveillance System Based on Vehicle Detection and Classification"** by A. B. Patel, V. K. Dabhi, and N. R. Patel - Published in 2021. This paper focuses on vehicle detection and classification for traffic surveillance.

Remember, research in this field is rapidly evolving, and there may have been significant advancements or new studies published after September 2021. To get the latest literature on this topic, I recommend checking academic databases, such as Google Scholar or databases provided by universities and research institutions.

3.EXISTING SYSTEM :

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].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 a greater number of edges with white colour and if uploaded image contains less traffic then it will have less number of white colour edges.

4.PROPOSED STRUCTURE :

In this paper, 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. 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. The entire image processing before edge detection i.e. image acquisition, image resizing, RGB to gray conversion and noise reduction is explained in section II. At section III, canny edge detection operation and white point count are depicted. Canny edge detector operator is selected because of its greater overall performance.

This project consists of following modules

Dataset Collection: To implement this project we have downloaded traffic dataset from GITHUB . Preprocessing Image: Using this module we will read images from dataset and then resize all images and then extract pixels from images and convert all images to CNN compatible format CNN Model Generation: using this module we will train CNN model with above processed images Recognition Module: Using this module we will upload traffic image and then CNN model identify whether image contains heavy traffic, low traffic, fire accident and accident.

ADVANTAGES

It is advantageous to convert RGB images into grayscale for further processing. When converting an RGB image to grayscale, 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 isto take the average of the contribution from each channel:(R+B+C)/3.

5.SYSTEM ARCHITECTURE :

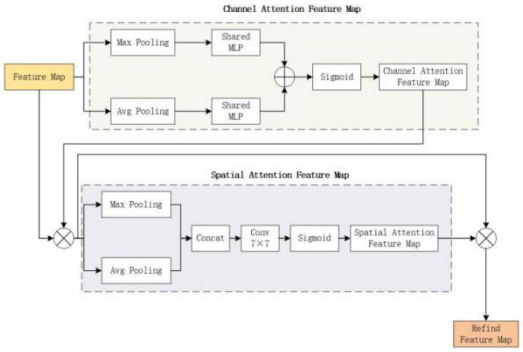
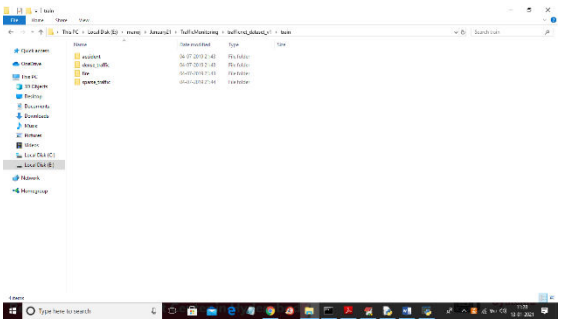


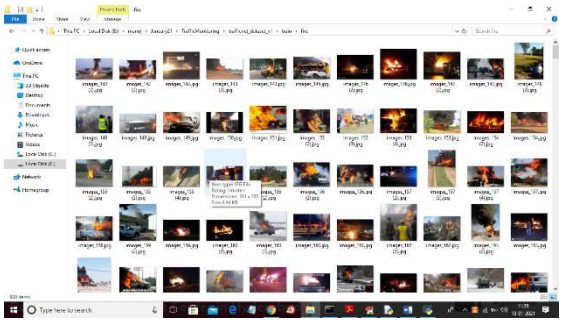
FIG: SYSTEM ARCHITECTURE

6.RESULT :

Below is the dataset screen shots which contains various images



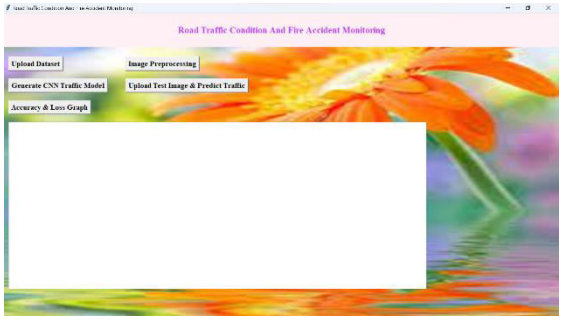
In above screen each folder contains its own images



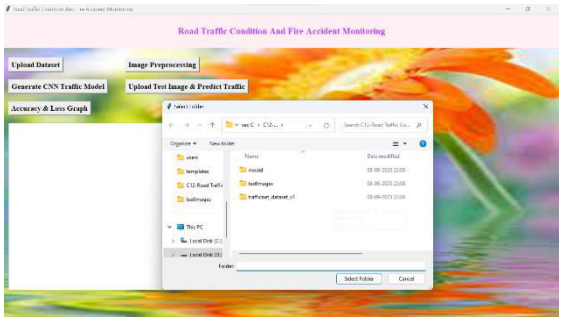
Above screen showing some images from fire accident

SCREEN SHOTS

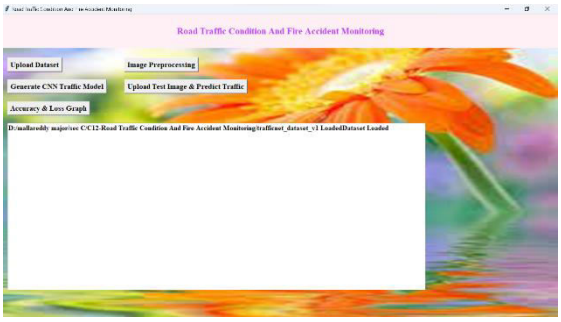
To run project double click on 'run.bat' file to get below screen



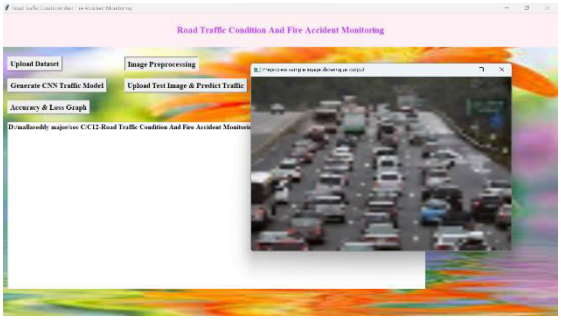
In above screen click on 'Upload Dataset' button to load dataset



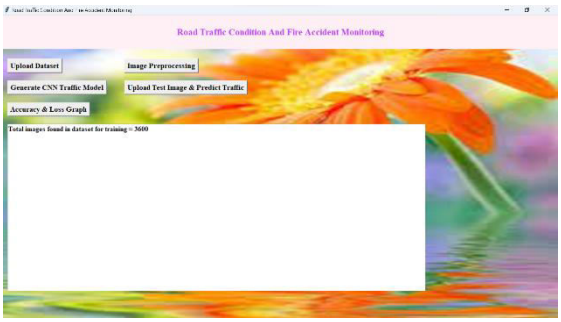
In above screen selecting and uploading 'trafficnet_dataset' folder and then click on 'Select Folder' to load dataset and to get below screen



In above screen dataset loaded and then click on 'Image Preprocessing' button to read all images and then convert it CNN compatible format

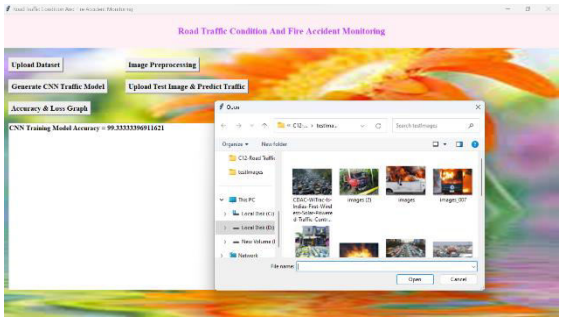


In above screen displaying sample image from processed images and now close above image to get below screen

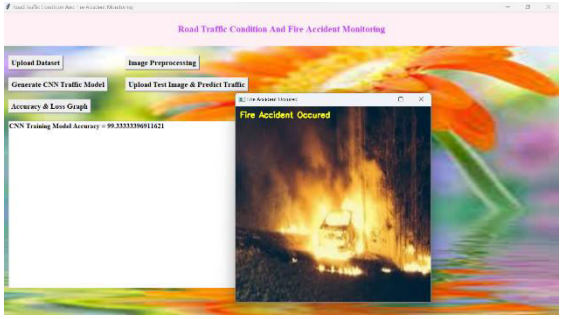


In above screen total processed images showing as 3600 and now click on 'Generate CNN Traffic Model' button to generate CNN model and to get below screen In above screen CNN model generated with prediction accuracy as 99% and in below black console we can see CNN layer details In above screen showing all layers of CNN model and each

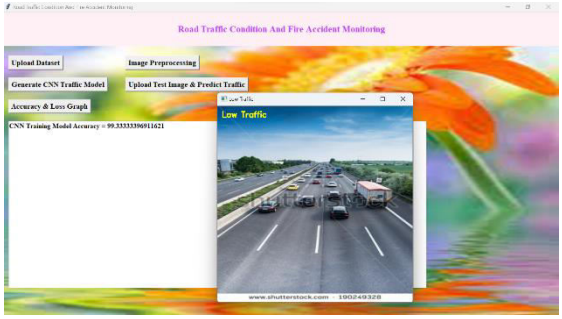
layer filtering images with different sizes such as 62 X 62, 31 X 31 etc. Now model is ready and now click on 'Upload Test Image & Predict Traffic' button and upload image to identify traffic condition

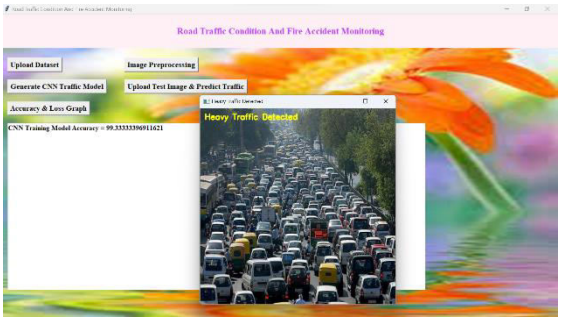


In above screen selecting and uploading 'images.jpg' file and then click on 'Open' button to get below result

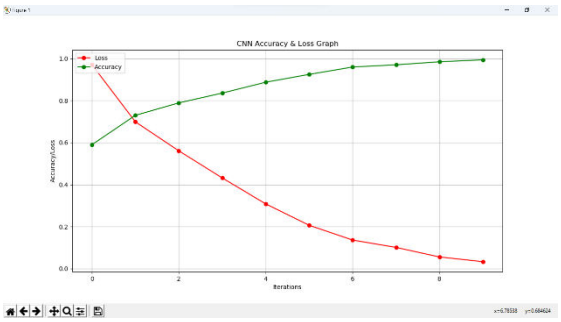


Test another image





Now click on 'Accuracy & Loss Graph' button to get below graph



In above graph red line indicate LOSS and green line indicates accuracy and x-axis represents number of iterations or EPOCH and y-axis represents accuracy/loss. In above graph we can see in each iteration accuracy get increase and loss/error rate decrease which means in every iteration CNN model get better

7.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.

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