Traffic Analysis Using Artificial Neural Network

Mounica B, Nithya B S, Rakshitha N, Sirisha M

Department of Information Science and Engineering, New Horizon College of Engineering, Bangalore (Dist.), Karnataka, India

ABSTRACT

The vehicle traffic on the road is increasing progressively and managing such traffic on the roads are not stable by conventional method. To remove this traffic issue, we develop a project using machine learning in which we train the testing model as well as trained model of extracted traffic features. Extracted information from image sequences of testing model can give us real information to create the database which is the captured images like accident, foggy places, collision of the vehicles, traffic signal, no traffic jam, treefall etc. Choose any traffic image from the testing model, process and analyze the traffic image and the traffic image which was taken from the testing model is compared with the trained model of traffic images to determine the cause of the traffic. Image processing will be done to determine the cause of the traffic. This project is utilizing image processing methods designed to analyze and determine the cause of the traffic with the accuracy of the traffic caused. Thus, by using this project we can avoid the traffic and the time being wasted.

Techniques proposed to analyze traffic by using image processing algorithms are:

- CNN Algorithm
- Python (Machine Learning)

Keywords: Traffic analysis, Image Processing, CNN Algorithm, Python

I. INTRODUCTION

Traffic monitoring and traffic analysis is developed on the computer visualization techniques, especially traffic analysis and monitoring in a real-time mode raise valuable and complicated demands to computer algorithms and technological solutions. People in today's era usually have the tendency of using their own private vehicles for commutation rather than using public carpooled means of transport and this results in large number of private vehicles on road.

This endless increasing number of vehicles on road gives rise to many problems amongst them, traffic congestion tops in every aspect. In such scenario one can't restrict individual to limit the usage of their private vehicles but what we can do is at least manage the traffic flow in a way that it doesn't all eviate congestion issues. There are more negative impacts of traffic congestion which includes but are not limited to wasting time of motorists, inability to forecast travel time, higher chance of collisions due to tight spacing and constants topping. The

perspective in this article points on methods of image processing, pattern recognition and computer machine learning algorithms to be useful to examine and monitor the road traffic problems. One of the important aspects of these algorithms is to use it in a convenient way to develop the traffic analysis using image processing.

Machine learning (ML) refers to the computer that can figuring out a solution without being correctly programmed. That is, machines are able to constantly learn and deal with big datasets using classifiers and algorithms. Classification and analyzing are considered as the backbone of machine learning. Meanwhile, other Machine Learning algorithms are built models of behaviors and use those models as a basis for making future predictions based on new input data. The power of these tools lies in detecting and analyzing network attacks without having to accurately describe them as previously defined. Machine learning can aid in solving the most common tasks including regression, prediction, and classification in the era of extremely large amount of data and cyber security talent shortage.

Machine learning approaches have been applied in every aspect of the operation and management, where the system performance can be upgraded and resources can be utilized in a better way. However, there are many other applications for analyzing the traffic based on the ML algorithms such as identifying anomalies through discovery-based workbooks or features that describe user behavior. The mixture of machine learning algorithms and traffic analysis is a useful topic due to the power of machine learning tools which lies in detecting and analyzing network attacks.

To develop this project, machine learning algorithms are used to inculcate the cause of the traffic and stating the reason for it. The algorithm mused in the project is CNN algorithm and the open CV tool python. The testing model is trained to extract the traffic image regarding traffic information.

Extracted information from image sequences of testing model can give us real information to create the database which is the captured images like accident, foggy places, collision of the vehicles, traffic signal, no traffic jam, treefall etc. Extracting the image from the testing model and processing the trained model which compares the new image and the trained model and identify the reason for violation or reason for accident. Image processing will be done to extract the traffic features and know the cause of the traffic.

This project is utilizing image processing methods designed to analyze and determine the cause of the traffic with the accuracy of the traffic caused. Thus, by using this project we can avoid the traffic and the time being wasted.

II. PROBLEM STATEMENT

Traffic congestion is an ailment in transport characterized by slower speeds, longer trip times and increased vehicular queueing. The highly rising traffic congestion all around the world, and its management by traditional approach are not efficient for smooth commutation purpose hence there is a need to come up with a solution which can be globally accepted and would lead for the better management of traffic. To analyze this traffic, we are making use of image processing technique to control the traffic and detect the cause of it.

III. EXISTING SYSTEM

Traffic congestion increases vehicle emissions and reduces the air quality. Obstacles in the road causes blockage and merger. Over development in areas where the roads are already overcrowded and the road system is not sufficient. It is very important to recognize the type of a detected object(vehicles) in order to track and analyze its activities correctly. As a result, all these are time consuming for the travelers.

IV. PROPOSED SYSTEM

Traffic system plays an important role in this developed world and many characteristics of life that relies on it. To detect the cause for the traffic images are taken i.e., the image present in the data set. These two images are to be compared with trained model to know the reason for the traffic. After processing the above, if the way is clear, it indicates us that there is no traffic jam. RGB to Gray conversion is done and subtracted using absolute difference operation. Techniques

proposed to analyse traffic by using image processing algorithms are: Open CV tool python language and CNN algorithm.

Some features of the project are:

- Image data manipulation
- Image and video I/O
- Matrix and vector manipulation and linear algebra
- Various dynamic data structures
- Basic image processing
- Structural analysis
- Camera calibration
- Motion analysis
- Object recognition

V. METHODOLOGY

Our system proposes a convolution neural network (CNN)-based method that learns traffic as images and predicts reason for the traffic with high accuracy. Convolutional Neural Network (CNN) is applied to the image following two consecutive steps: abstract traffic feature extraction and network-wide traffic prediction. Max pooling and convolution layer is applied to perform the operation to analyze and process the traffic images.

The effectiveness of the proposed method is evaluated by taking two real-world traffic problems that is by comparing traffic images from the testing model with the trained model traffic images. The results displayed is the cause of the traffic with the accuracy of the traffic caused. The CNN algorithm can train the model in reasonable time and thus are suitable for traffic related problems.
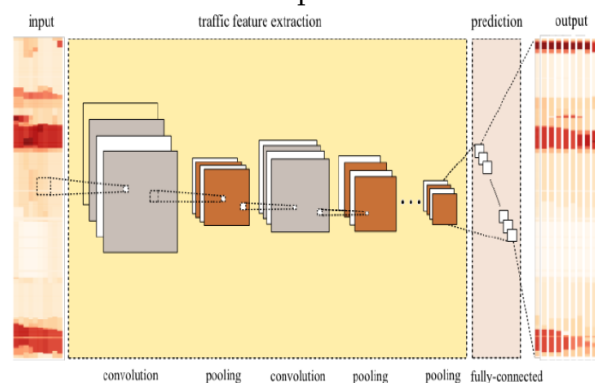

Figure 1: Analysis using CNN

VI. REQUIREMENTS FOR DEVELOPMENT

Hardware Requirements:

Processor: Intel Core i5

Speed: 2.4 GHz

Hard Disk: 500 GB.

Ram: 4 GB

Any desktop system with above configuration or higher level can be used.

Software Requirements:

Operating system - Windows XP / 7 or More

Coding Language - Python

Software - OpenCV

Language - Python (Machine Learning).

VII. IMPLEMENTATION

ALGORITHM:

- Step1: Start
- Step 2: Enter the input image from the system

- Step 3: Click and insert the image through the dataset
- Step 4: Click on analyse image button
- Step 5: Image will be analysed with the dataset created by using CNN model
- Step 6: If the image is matched with the trained dataset, the cause for the traffic will be displayed with the accuracy in front end as output
- Step 7: Finally, graph will also be displayed as output by analysing the different causes for traffic
- Step 8: By this we can mainly predict the cause of traffic and its accuracy based on the input
- Step 9: Exit.

FLOWCHART:
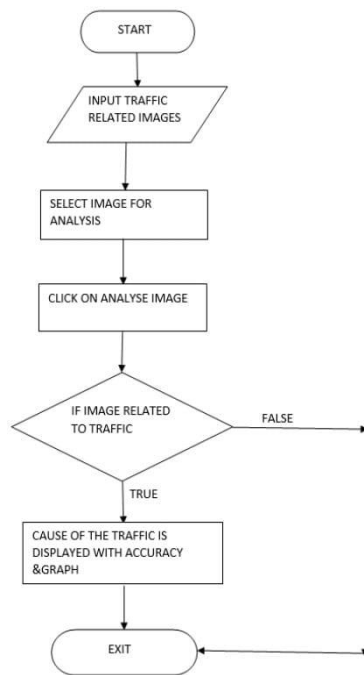
Figure 2: Flowchart

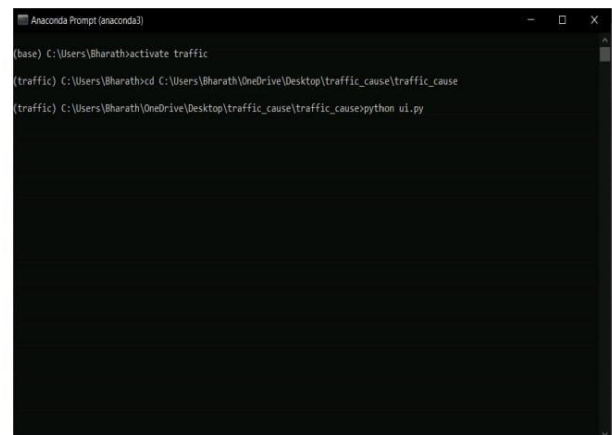## VIII. RESULTS AND OBSERVATION

Figure 3: Causes for the traffic

Figure 4: Activate the traffic database

In the above figure, we need to activate the traffic database and change the directory where the datasets are present and run the program.

Figure 5: Select a traffic which needs to be analysed

In the above figure, traffic causes detection page will be displayed and we need to select the traffic image in the testing dataset to predict and analyse the cause of the traffic.
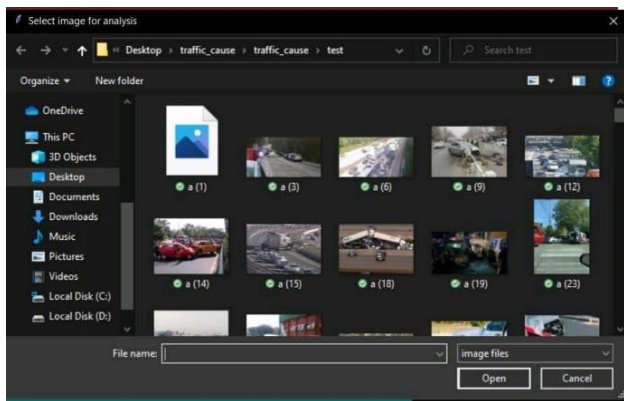

Figure 6: Select image for analysis

In the above figure, we need to select any of the traffic image to check the reason for the traffic. The image gets analysed and display the cause of the traffic with the accuracy.
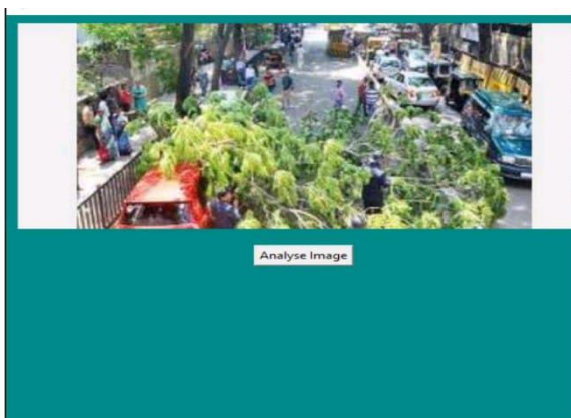

Figure 7: Analyse image with the dataset

In the above figure, any traffic image is selected from the testing dataset and should click on analyse image to analyse and detect the cause of the traffic.
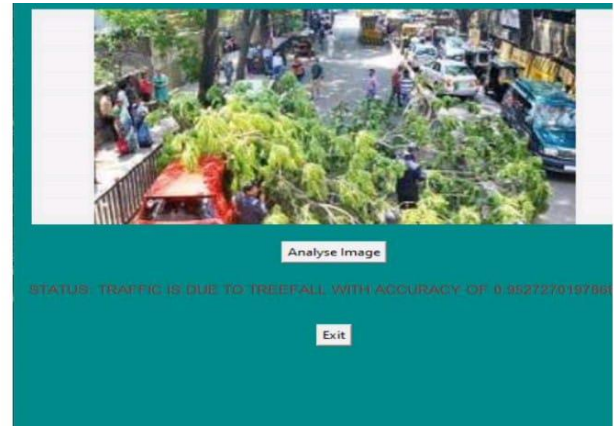

Figure 8: Cause of the traffic is displayed

In the above figure, the traffic image selected from testing dataset gets analysed with the trained dataset and with the help of extracted traffic features, the cause of the traffic will be displayed with the accuracy of the traffic caused.
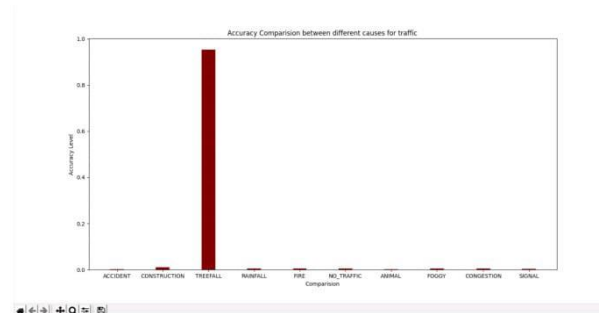

Figure 9: Accuracy comparison between causes for traffic

In the above figure, the traffic image selected was caused due to treefall on the road so the accuracy level for treefall is more which is plotted in the form of graph. The graph is plotted to compare the accuracy between different causes of the traffic.

IX. CONCLUSION

Real Time Traffic Analysis aims to fix the problem of traffic which most of the cities in urban as well as rural areas are dealing it. The paper discusses the using of machine learning techniques in traffic analysis. It gives a brief outline and comparison among some existing Machine Learning techniques approaches used in traffic analysis. It is more consistent in detecting the vehicle presence as it envisages the actual traffic frames. This project is utilizing image processing methods designed to analyze and determine the cause of the traffic with the accuracy of the traffic caused. Thus, by using this project we can avoid the traffic and the time being wasted. Our project depicts and analyze the traffic images and states the cause for the traffic. After processing the images, if the path is clear, it indicates us that there is no traffic jam. The proposed method is technically feasible to implement with low cost and with optimum accuracy. This project is more efficient and time saving. It helps drivers about routes with residual capacity. Also, informs about which on-ramp to use if options are available.

X. LIMITATIONS

- Supervised training: need huge amount of labeled data, but label is scarce
- Optimization: highly nonconvex objective
- Parameter tuning is hard: the parameter space is so large.

XI. FUTURE SCOPE

Traffic analysis of the future needs to be especially flexible, cooperative and proactive. It is more flexible in handling changes in supply and demand. Future scope can be used for the system of detections, tracking and counting of moving vehicle which can be extended to real-time images feeds. Process of recognition can also be done. Traffic analysis is a proactive and it can be used to attain a range of policy objectives. Private sector and research/education institutes should work together and collaborate more closely. The hardware implementation enables the project to be used in the real-time practical conditions. We propose a system to identify the vehicles as they pass by and assisting in surveillance on a large scale. Various traffic related technologies can be used for the advance version of the traffic congestion.

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