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Paper Title: Vehicle Detection And Accident Prediction In Sand/Dust Storms

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ABSTRACT

- **In this era of a smart and modern world that is designed by progressing technology, automated vehicles would become a precious part of it. The first thing that strikes in our minds talking about vehicles is traffic and accidents. Accidents could take place because of several reasons: dense traffic, unfavorable weather conditions, sudden braking, change in speed, etc, and the solution to this is machine learning, computer vision, and deep learning. Our focus is to improve the vision in areas of low visibility and predict the future by analyzing the present.**
- **We introduce a model which would help in dehazing and improving the visibility for a better driving experience in adverse weather especially targeting sandstorms and dust storms which would be quite common in the future because of the afforestation.**

METHODOLOGY USED

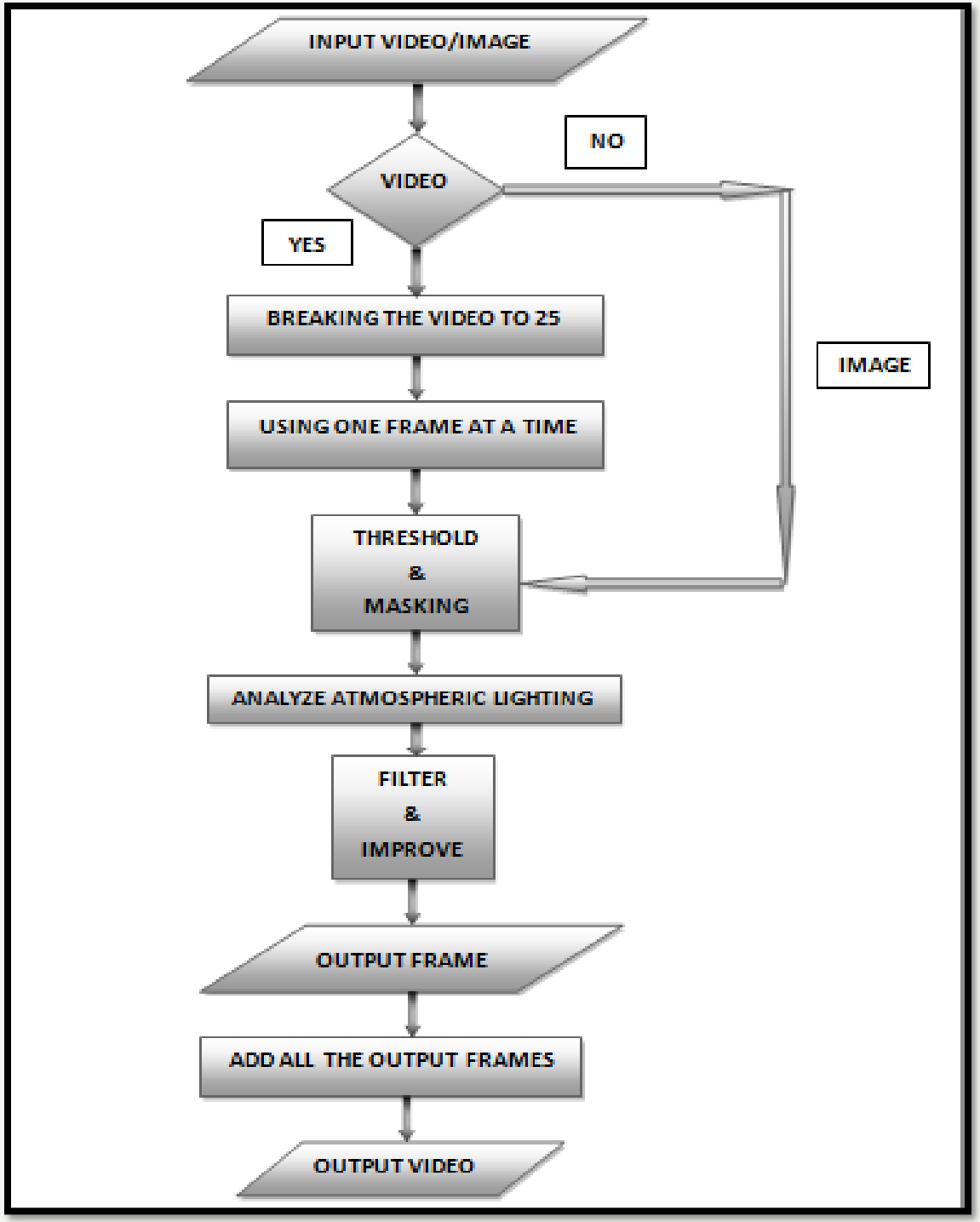
- Our project is divided into 2 parts

1. Dehazing and improving the quality of the blurred video.
2. Detecting the vehicle calculating the traffic density and predicting if there could be a accident or fire.

DEHAZING THE VIDEO

The dehazing consists of 3 parts i.e. image/video manipulation, masking and, the threshold.

1. **Calculates each pixel of the image according to the matrix we have created and this makes it easy for us to manipulate according to our needs. As we have done here is to dehaze, we can simply say it adds a filter to the image.**
2. **Then a threshold value is assigned if the pixel value is greater than the threshold value then an imaginary value is assigned for example 1 if not then 0 is assigned to it, this helps in converting the image to a black and white format for easy modifications on the image. It analyzes the Atmospheric lighting in the image and then gives us a refined and improved image in the output frame.**
3. **If a video is given as input then as we know that a video is a collection of several frames played one after the other in a sorted manner. So, what is done here is segregate the video at 25 fps (frames per second) and apply the same process which we have done for the image dehazing, and then all the frames one after the other in a queue and giving us a new refined video as output.**



FLOW CHART FOR IMAGE/ VIDEO DEHAZE

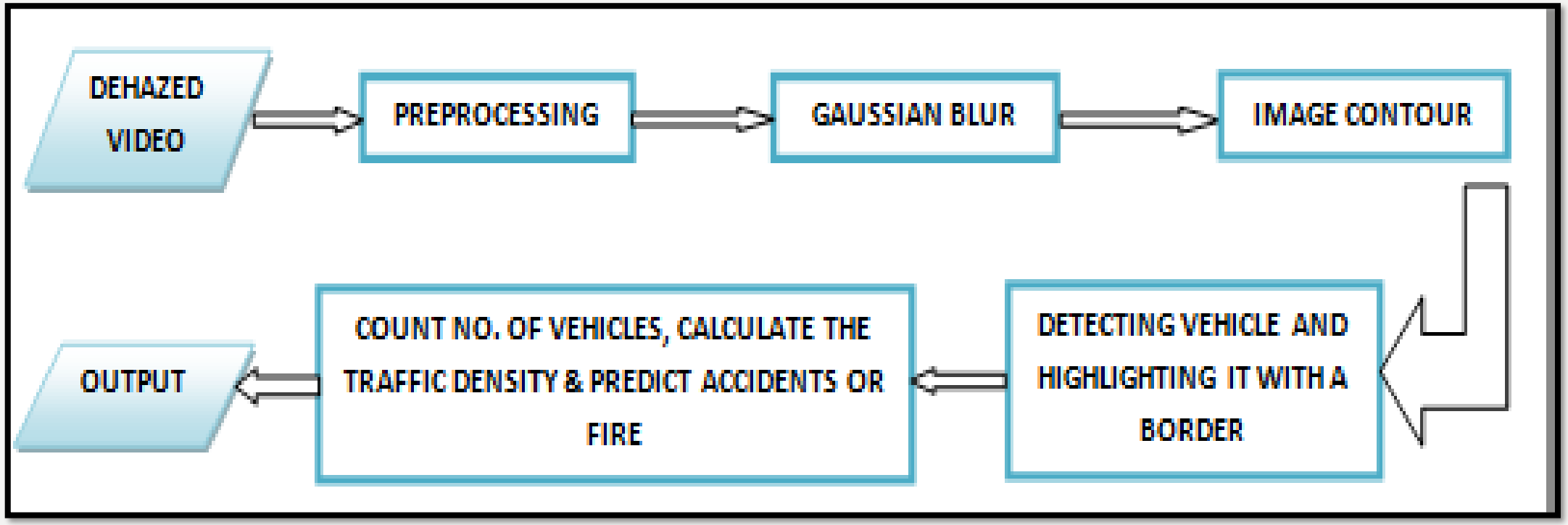
RESULTS

BEFORE & AFTER DEHAZING

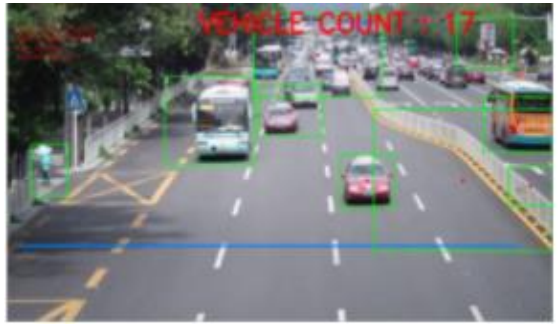
VEHICLE DETECTION, CALCULATING TRAFFIC DENSITY, FORECAST OF ACCIDENTS AND FIRE

- **First, we input the dehazed video which we got as output from the above flow diagram. Then do preprocess on the video and make it adjustable according to our need and size**
- **We apply gaussian blur to the video to reduce the noise and unwanted details in the video to get access to much more accurate results in the outcome. Contour the image which gives us a black and white binary video; these continuous and sharp lines joining all the boundaries help to recognize and identify the moving vehicles in the video.**
- **To count the number of vehicles in the video we have used the method of reference line passing objects; a highlighted reference line is brought up on the screen which help helps us to count the number of vehicles that pass from it and a tracker mechanism is used so that the same vehicle is not detected many times in the continuous ongoing frames of the video**
- **To implement the traffic density and prediction of accidents we need to train the model on several photos and videos first to meet our needs to predict and calculate the traffic as it would save the weights for giving accurate values in the future.**

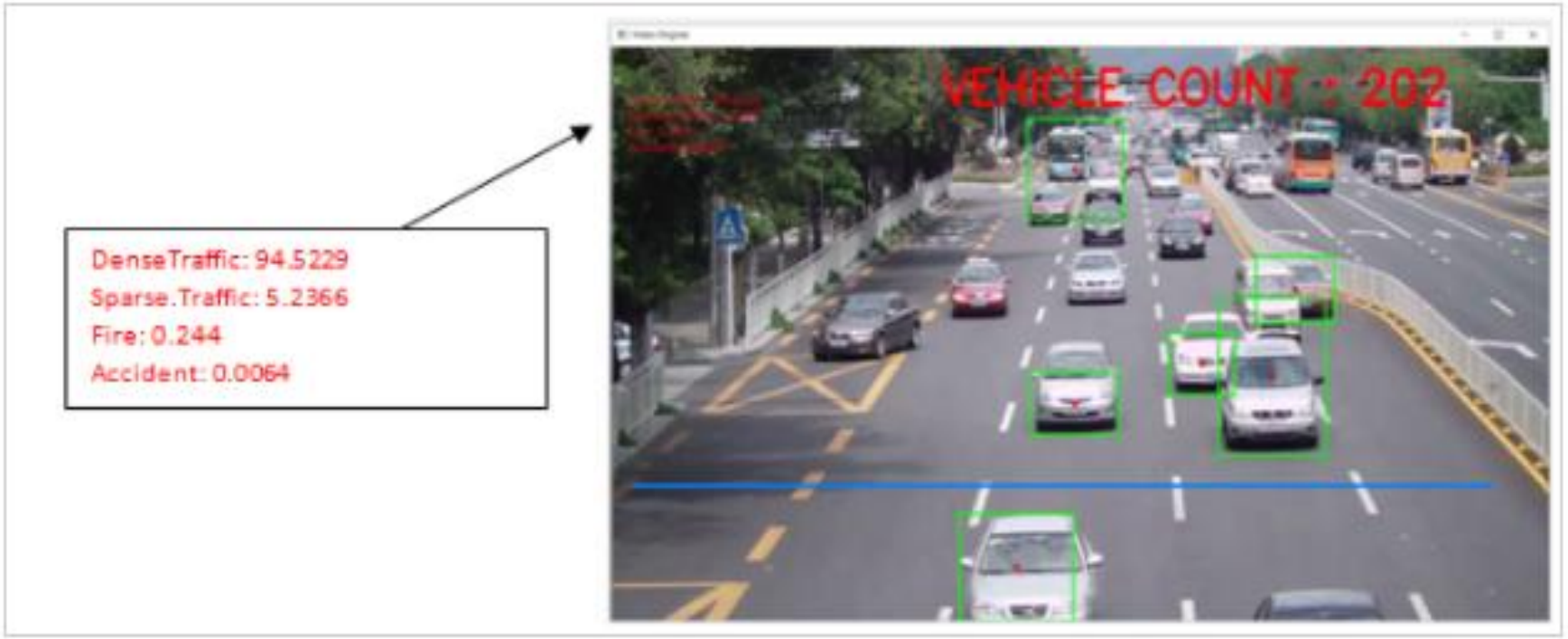
FLOW CHART OF VEHICLE DETECTION, COUNTING, TRAFFIC DENSITY, FORECAST OF ACCIDENTS AND FIRE



RESULTS


VEHICLE COUNT : 17


VEHICLE COUNT : 202

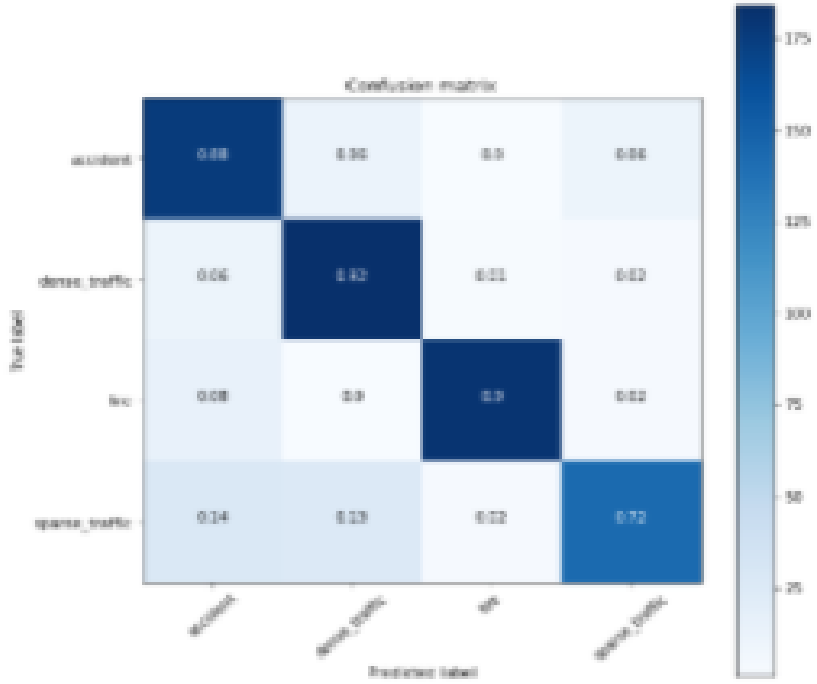

DenseTraffic: 94.5229
Sparse.Traffic: 5.2366
Fire: 0.244
Accident: 0.0064
VEHICLE COUNT : 202

MODEL ACCURACY & RESULTS

```
Confusion Matrix
[[176  12   1  11]
 [ 11 184   2   3]
 [ 15   1 181   3]
 [ 28  26   3 143]]
Classification Report
              precision    recall  f1-score   support

           0       0.77      0.88      0.82       200
           1       0.83      0.92      0.87       200
           2       0.97      0.91      0.94       200
           3       0.89      0.71      0.79       200

    accuracy                           0.85       800
   macro avg       0.86      0.85      0.85       800
weighted avg       0.86      0.85      0.85       800
```



- The proposed model (image classification) gave us a accuracy of 85-90%