VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"JNANA SANGAMA", BELAGAVI-590018.

A

Project Report

on

"NEURAL NETWORK BASED VEHICLE CLASSIFICATION FOR INTELLIGENT TRAFFIC CONTROL"

Submitted in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE AND ENGINEERING

By

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UNDER THE GUIDANCE OF

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SJB INSTITUTE OF TECHNOLOGY

No. 67, BGS Health & Education City, Dr. Vishnuvardhan Road

Kengeri, Bengaluru- 560060

2016 - 2017

||Jai Sri Gurudev||
Sri Adichunchanagiri Shikshana Trust ®

SJB INSTITUTE OF TECHNOLOGY

No. 67, BGS Health & Education City, Dr. Vishnuvardhan Road
Kengeri, Bengaluru- 560060

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

Certified that the project work entitled **"NEURAL NETWORK BASED VEHICLE CLASSIFICATION FOR INTELLIGENT TRAFFIC CONTROL"** carried out by **SACHIN POKHARIA [1JB13CS130], SMITHA K [1JB13CS155], VAISHNAVI R HEGDE [1JB13CS169], VARUN KUMAR H N[1JB13CS170]** are bonafide students of **SJB Institute of Technology** in partial fulfillment for the award of **"BACHELOR OF ENGINEERING"** in **Computer Science and Engineering** as prescribed by **VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI** during the academic year **2016-2017**. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the Departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Signature of Guide	**Signature of HOD**	**Signature of Principal**
Mrs. Divyashree J	**Dr. Krishna A N**	**Dr. PUTTARAJU**
Assistant Professor	**Professor & Head**	**Principal**
Dept. of CSE	**Dept. of CSE**	**SJBIT, Bangalore**

EXTERNAL VIVA

Name of the examiners	**Signature with date**
1. _____	_____
2. _____	_____



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Regards,

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RESULTS

CHAPTER 7

RESULTS

The outputs of various modules have been documented here. These graphs help us to analyse the performance of the system and to make a decision about the enhancements that can be achieved further.

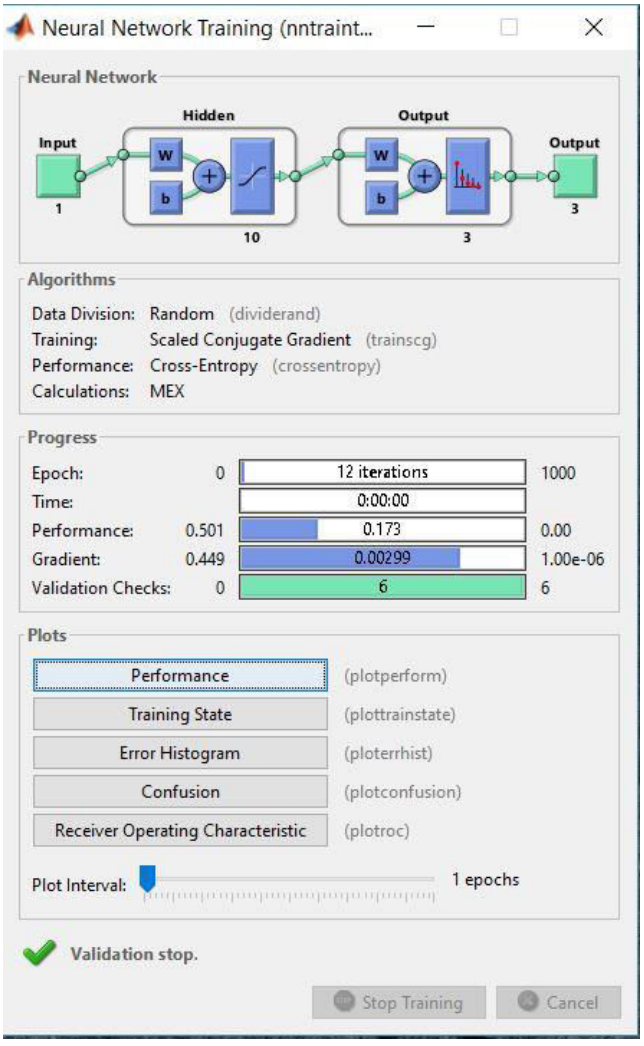

Figure 7.1 Neural network training

The above figure shows the parameters upon which the neural network is being trained. It also shows the progress achieved in the training process.

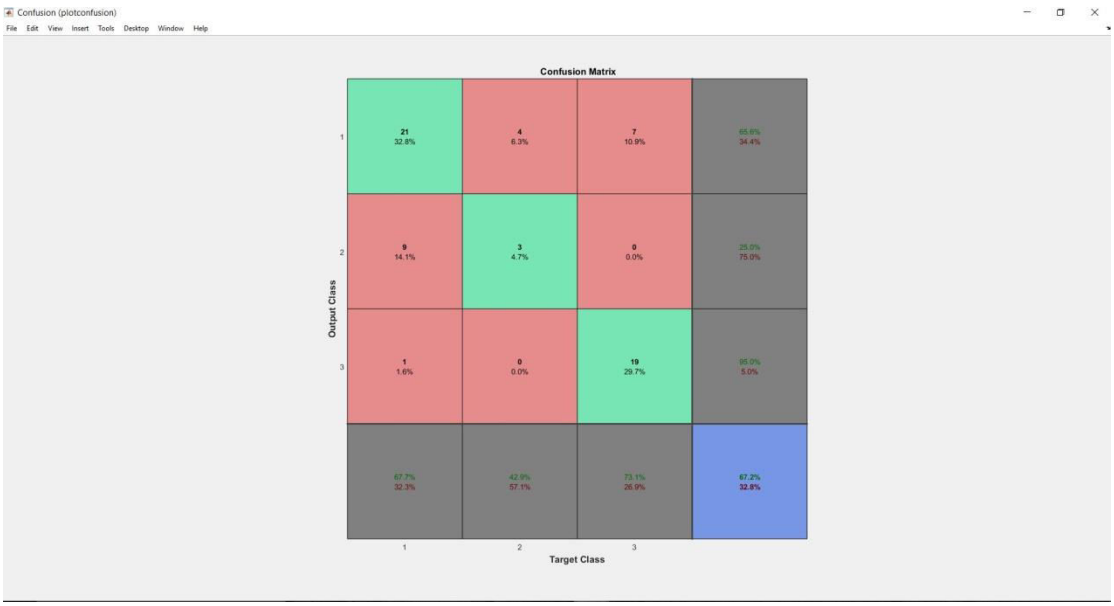

Figure 7.2 Confusion Matrix

In this figure, the first two diagonal cells show the number and percentage of correct classifications by the trained networks. Here 21 vehicles are correctly classified as light vehicles this corresponds to 32.8% of the total database. Similarly 3 are correctly classified as heavy vehicles and 19 are correctly classified as light vehicles.

4 of the light vehicles are incorrectly classified as heavy vehicles and 7 are incorrectly classified as bikes. Similarly the results can be interpreted for the other classes.

Overall 67.2% vehicles are classified correctly and 32.8% are incorrectly classified.

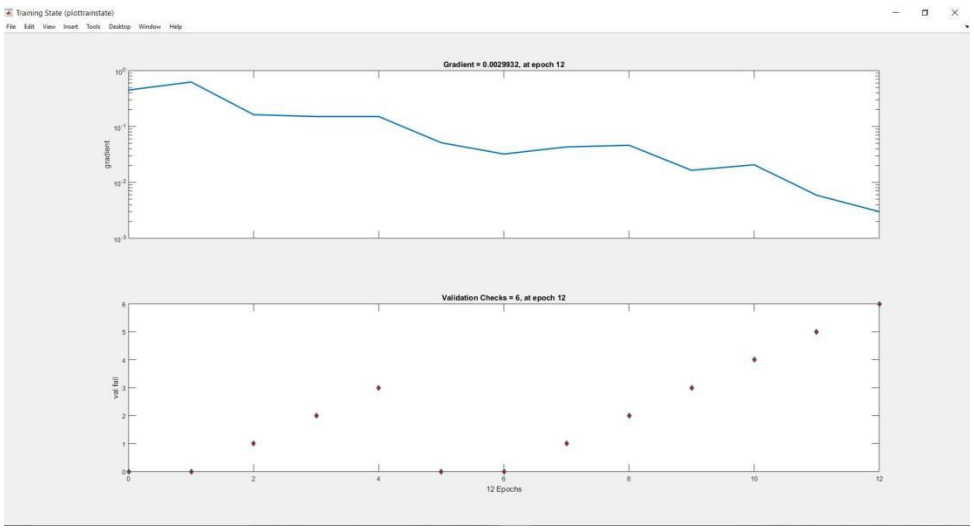

Figure 7.3 Graph to indicate training state

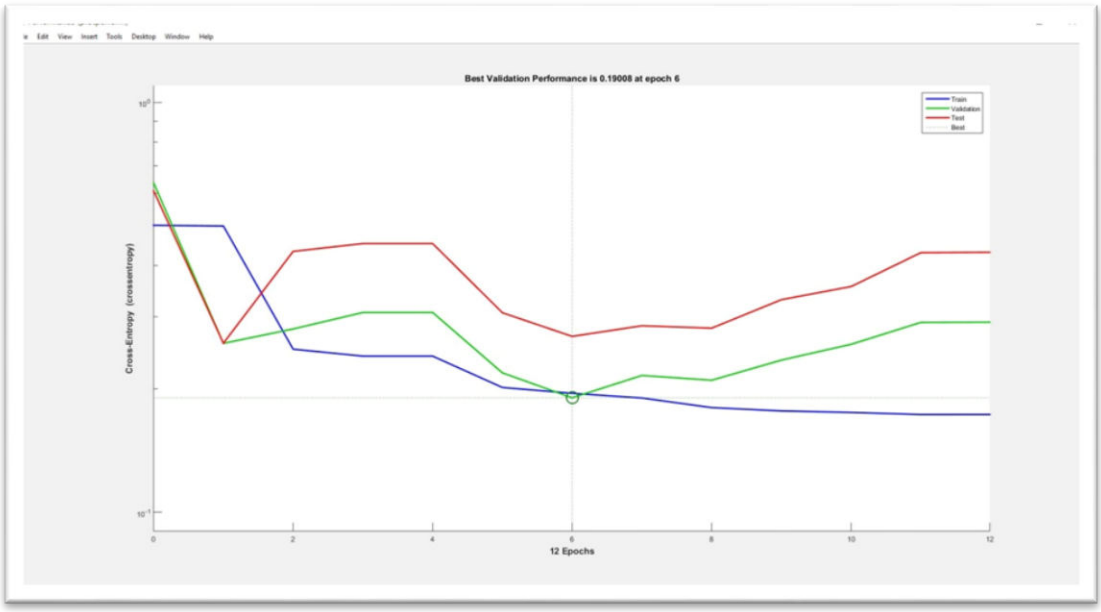

Figure 7.4 Plot to indicate performance

Performance plot shows the means square error dynamics for all the datasets. Gradient is the value of back propagation gradient on each iteration on logarithmic scale.

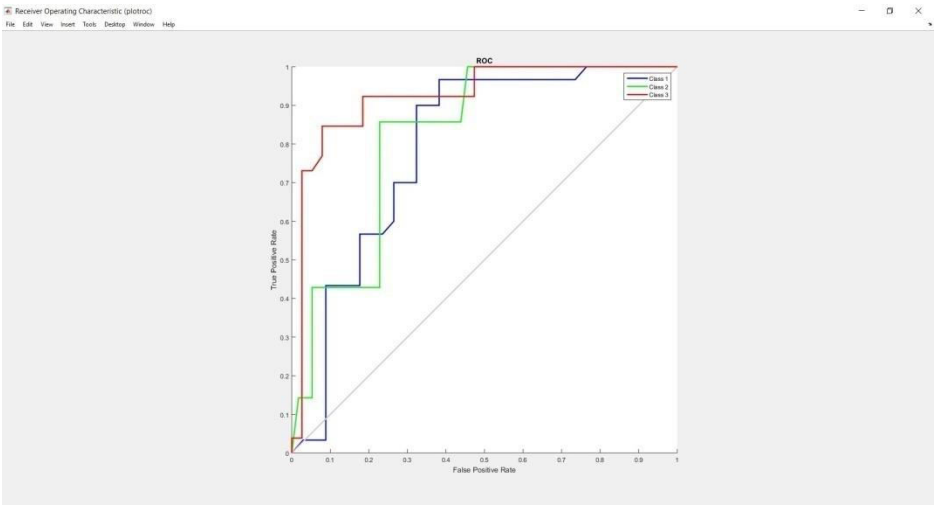

Figure 7.5 Receiver operating characteristics

The receiver operating characteristic is a metric used to check the quality of classifier. For each class of a classifier, ROC applies threshold values across the interval[0,1] to outputs. For each threshold two values are calculated, the True Positive Ratio (TPR) and the False Positive Ratio (FPR). The graph shows the same data as shown in figure 7.2 but in a different representation.

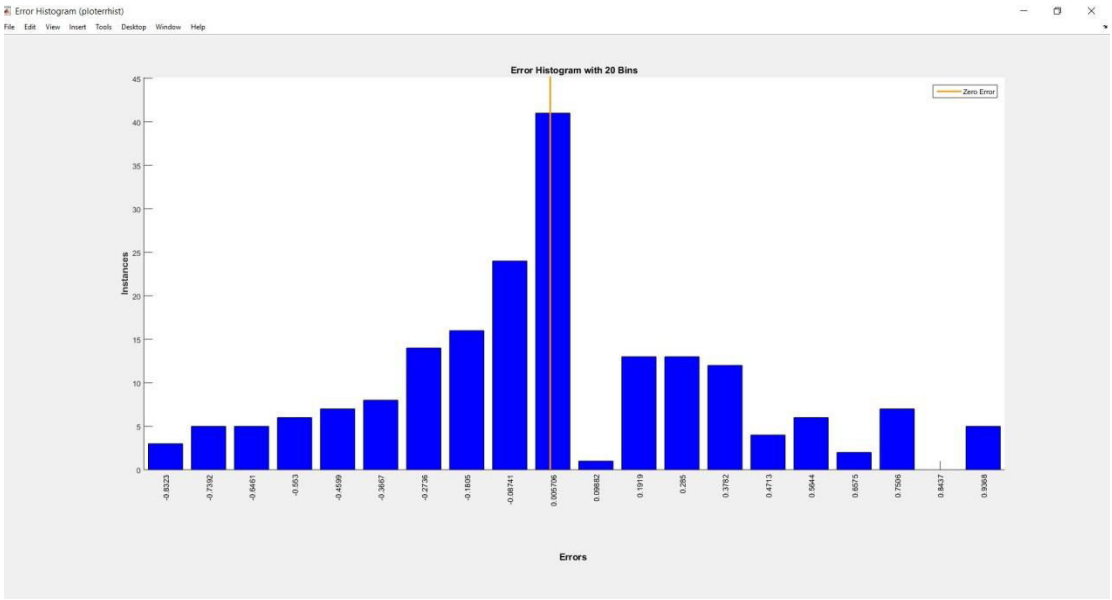

Figure 7.6 Error Histogram

The graph indicates the histogram of error values. It includes the number of bins that is the range of values divided into a series of intervals. The bins are usually specified as consecutive non overlapping intervals of a variable.

SNAPSHOTS

SNAPSHOTS

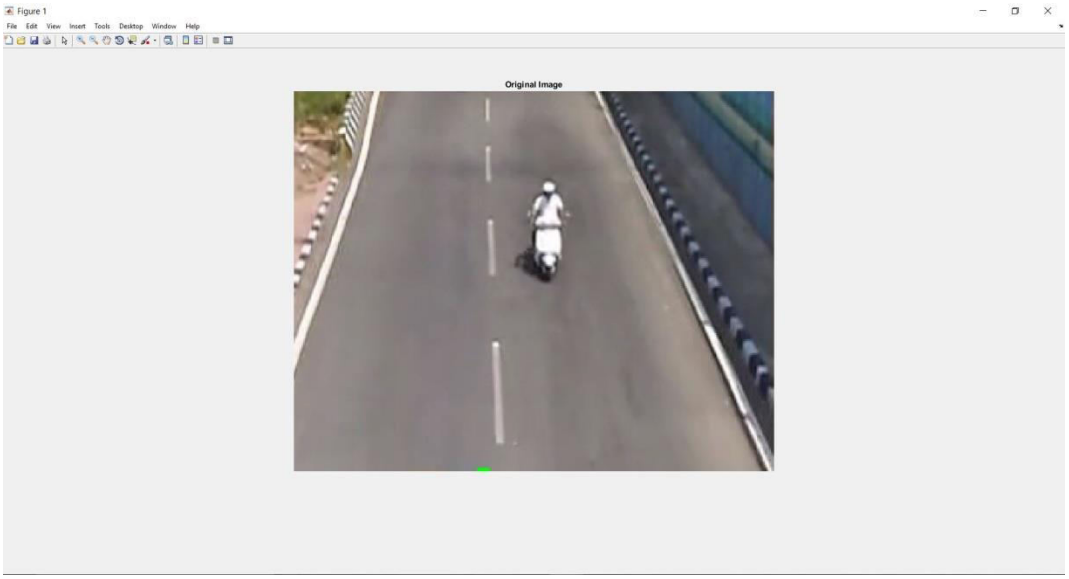

Figure 8.1 Original Image

The above snapshot shows the original image of a vehicle that is obtained from the traffic video sample.

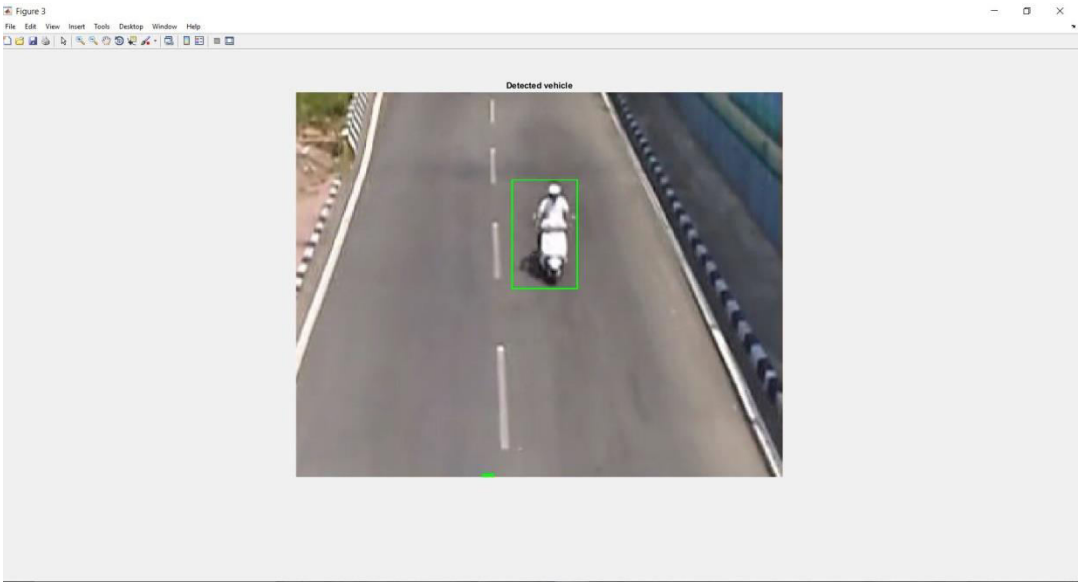

Figure 8.2 Detected Image

The vehicles that are present in the original image are detected. The above image shows the identified vehicle.

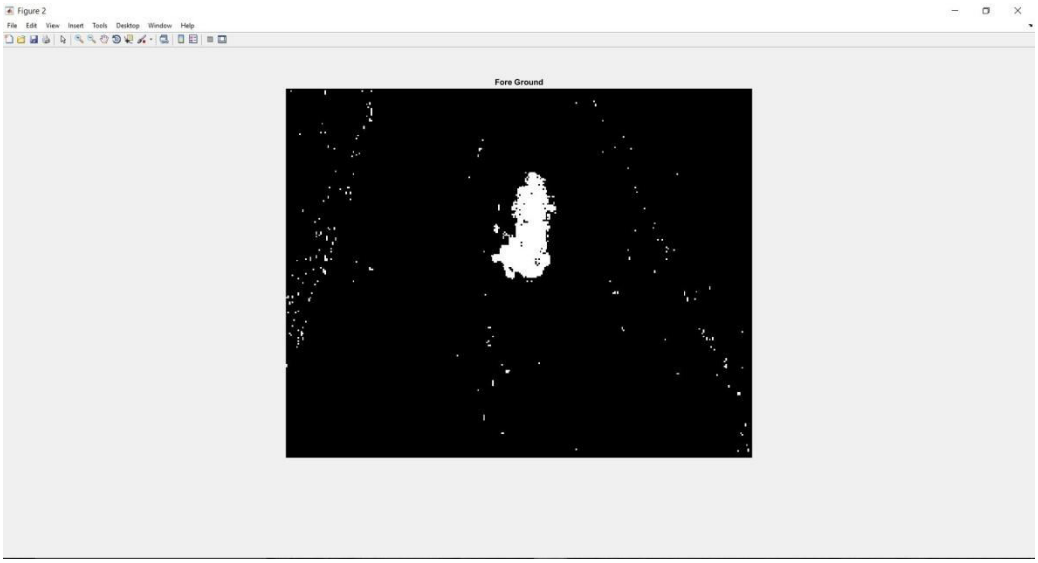

Figure 8.3 Foreground image

After the identification of the vehicle from the original video, the background subtraction is done and the foreground image is produced as shown in the above figure.

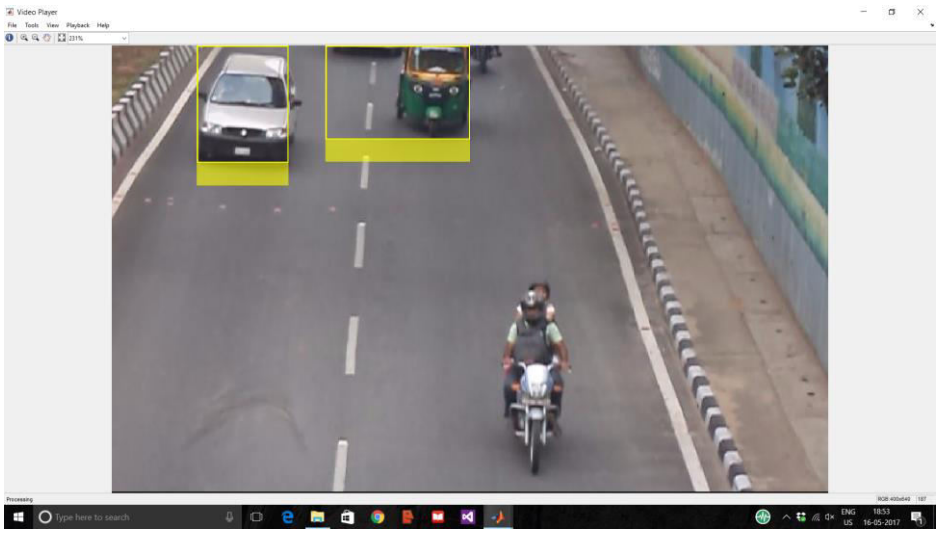

Figure 8.4 Identified vehicles

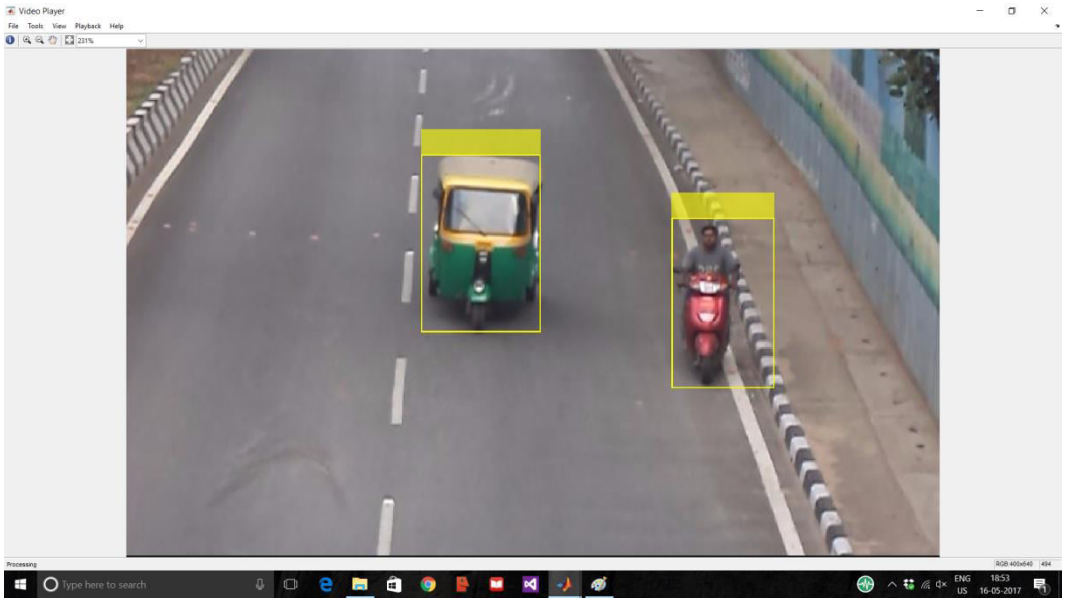

Figure 8.5 Bounding box around vehicles

The figures 8.4 and 8.5 shows the identification of multiple vehicles and the bounding box that has been drawn around the identified vehicles. This helps in keeping track of the vehicles and hence avoids multiple detection of the same vehicle.

Figure 8.6 Foreground image with bounding box

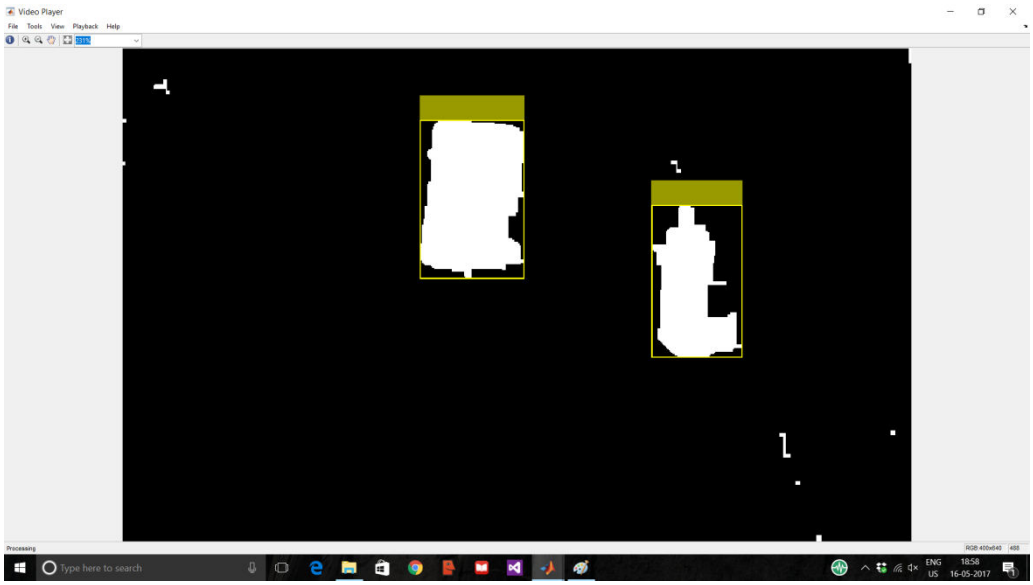

Figure 8.7 Foreground image with bounding box

The figures 8.6 and 8.7 shows the foreground image of the identified vehicles along with their bounding boxes around them.