Independent Study

Traffic Tracking and Performance

Thyago Carvalho

Dr. Brendan Morris

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Abstract

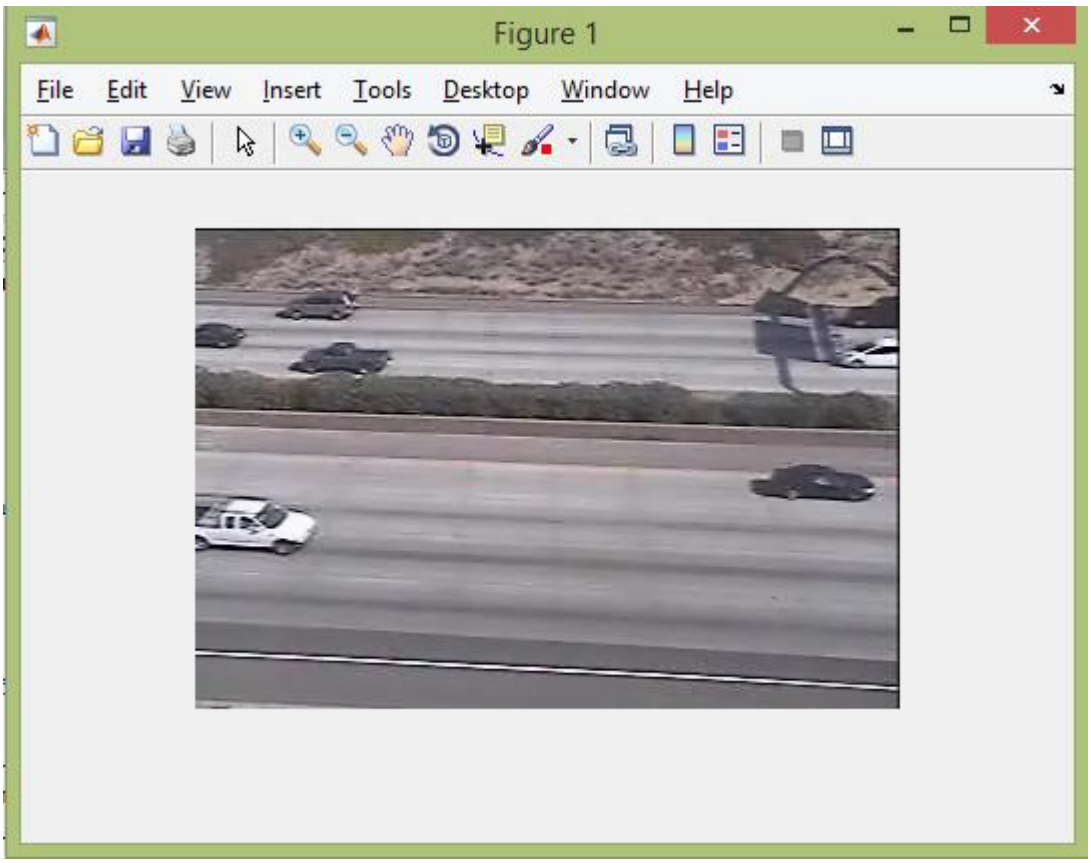
On the independent study we are working on a traffic tracking with the performance calculation of his efficiency using to code MATLAB. We will read a traffic video and using computer vision techniques try to tracking them. Using the background subtraction we will be able to generate a visual output. [Wikipedia] Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.).

Description

When the cars would be identified then we will be able to use this to number to an infinite of utilities such as counting number, speed and classification. We will making the computer tracking after it will be done a manually tracking of the cars and with these two results we will be able to classify the tracking into True Positive, False Positive and False Negative (Miss Detection).

Implementation

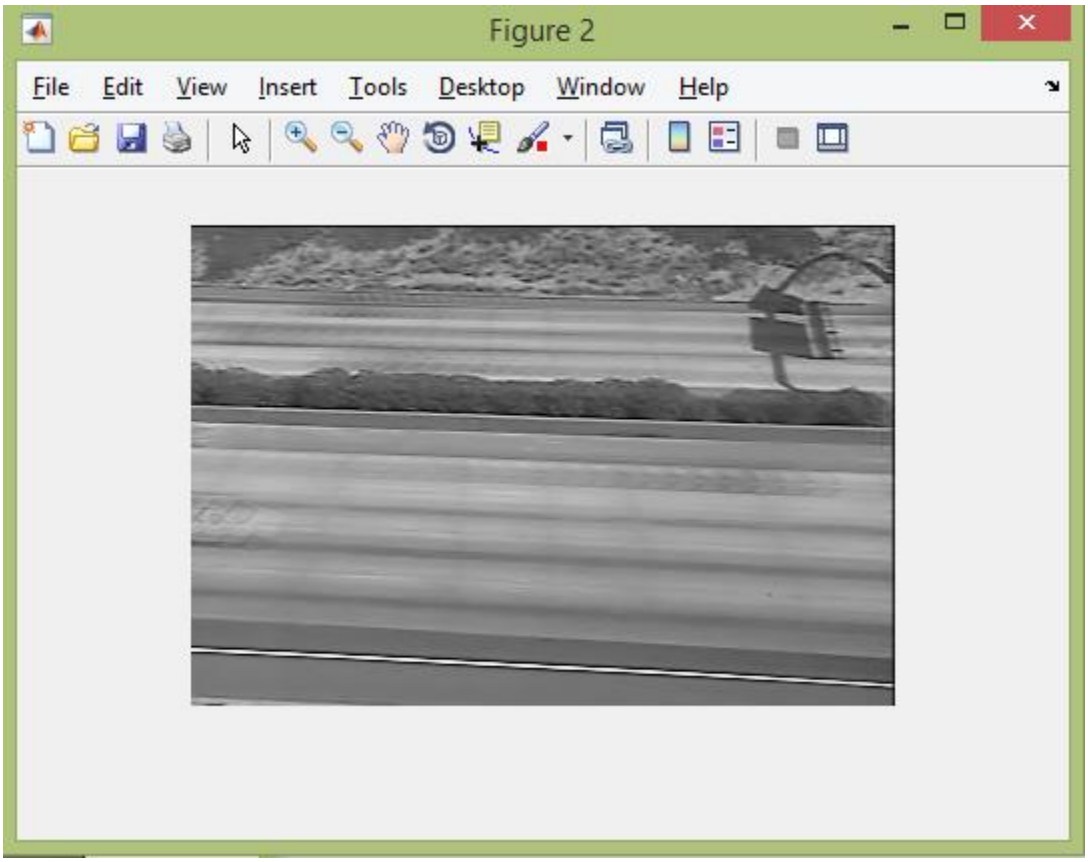
Using MATLAB we Read all the frames of a traffic video. Observe (figure 1) a regular frame of the video (frame number 132).



We used the average background:

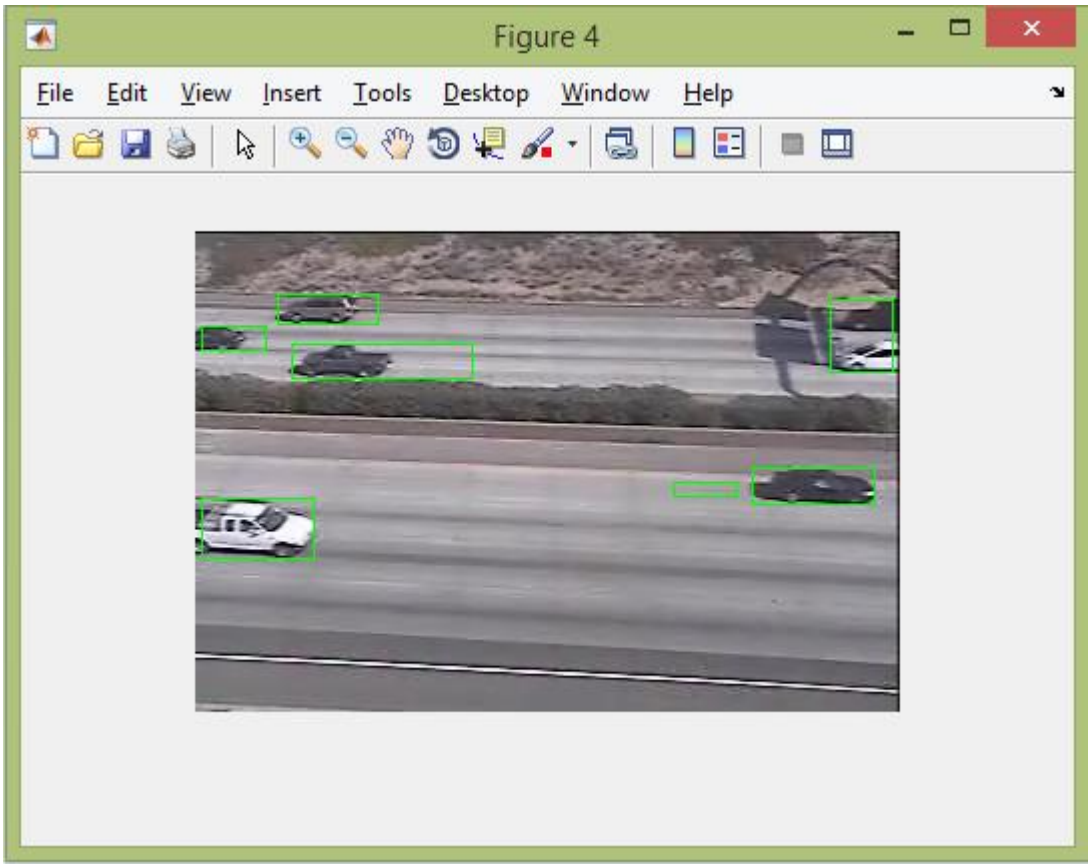
$$B(x,y,t) = (1-\alpha)B(x,y,t-1) + \alpha I(x,y,t)$$

the result of this we can see at Figure 2 with this kind of update background we are able to identify little changes on the video such as shadow which is always changing with time.

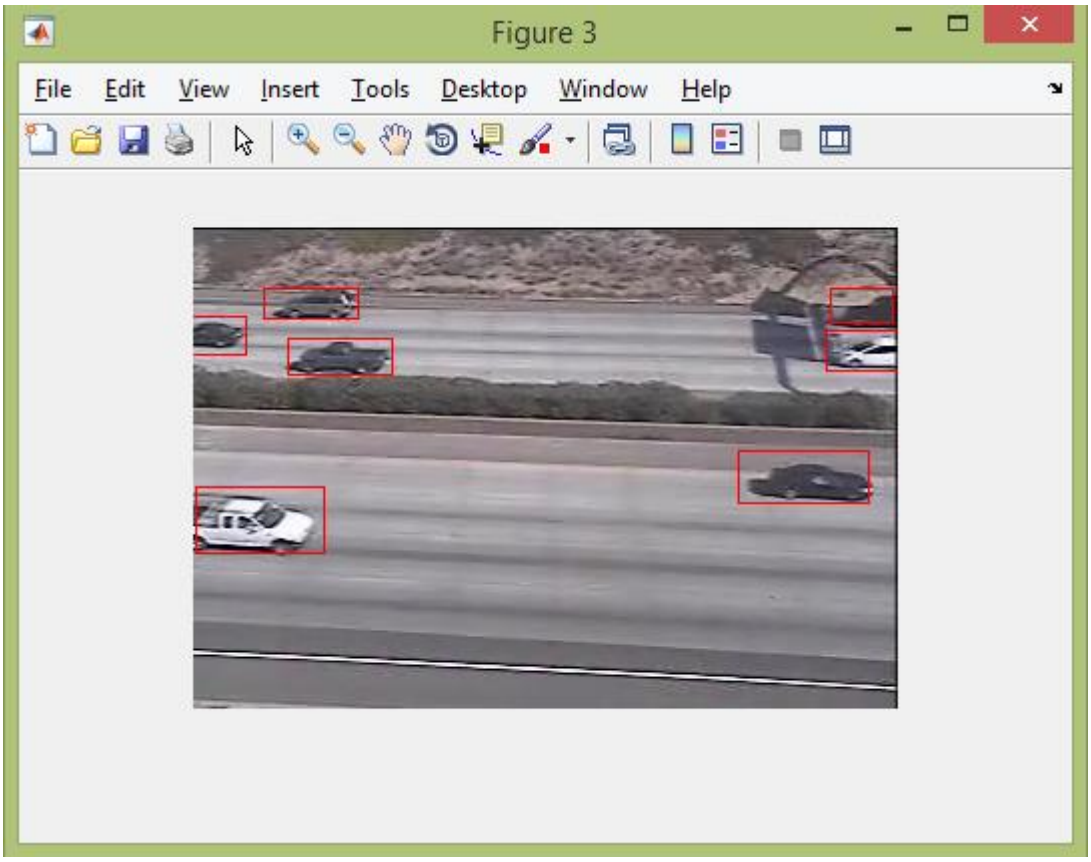


The results of the background subtraction made us able to tracking the cars with bounding boxes. Figure (4) show the computer detection. We can notice some singularities such as:

- on the top right two cars are tracking by only one bounding box.
- There is a bounding box that is not detecting any car.

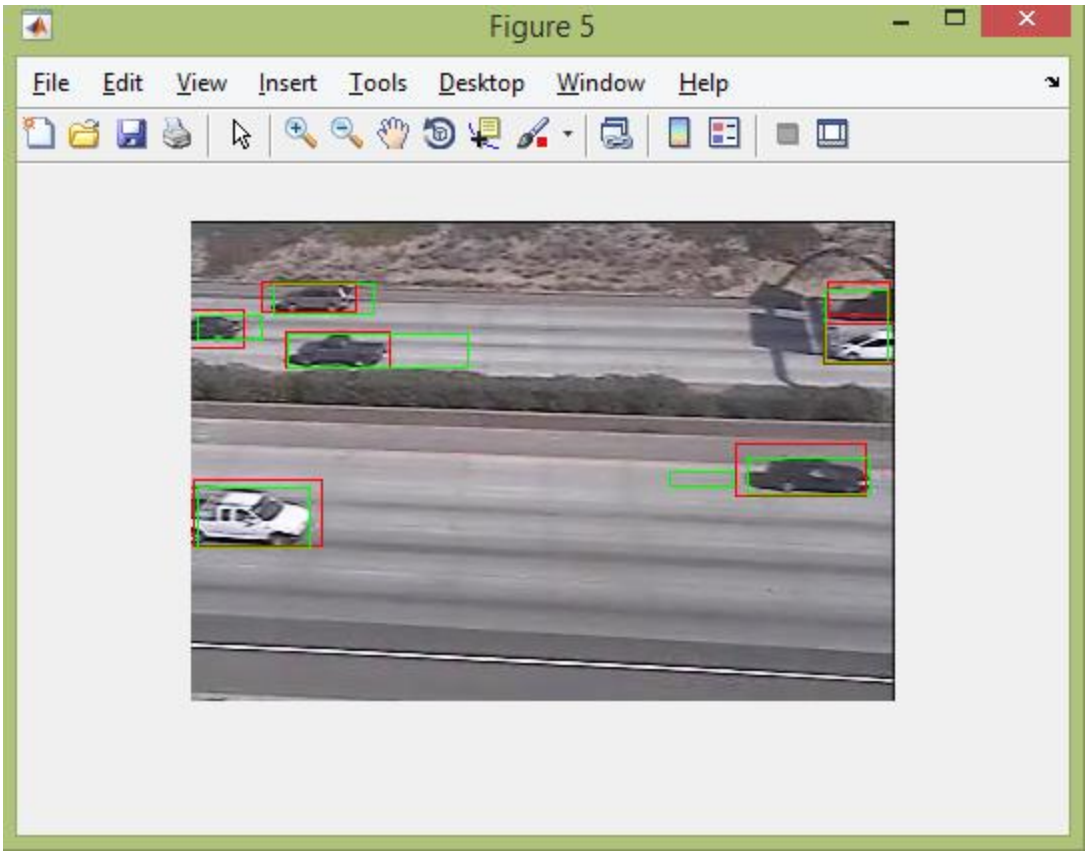


To evaluate the performance of our project we create a manual detection (ground truth) that is showing at figure (3). Those manual bounding boxes generated a N [x,y,w,h] code which was read by MATLAB.

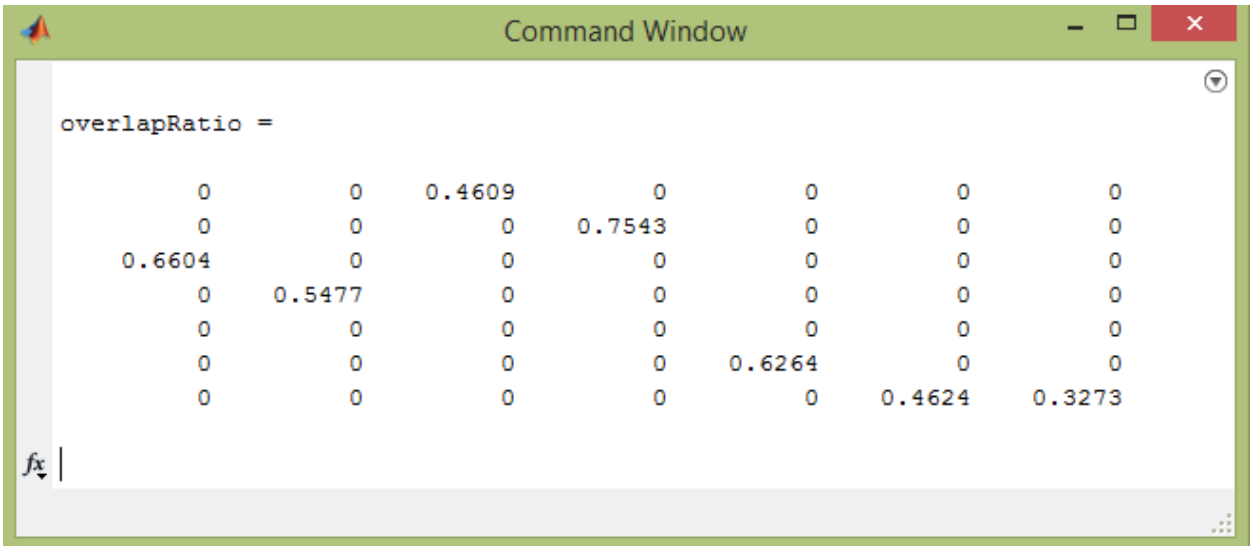


Experimental evaluation

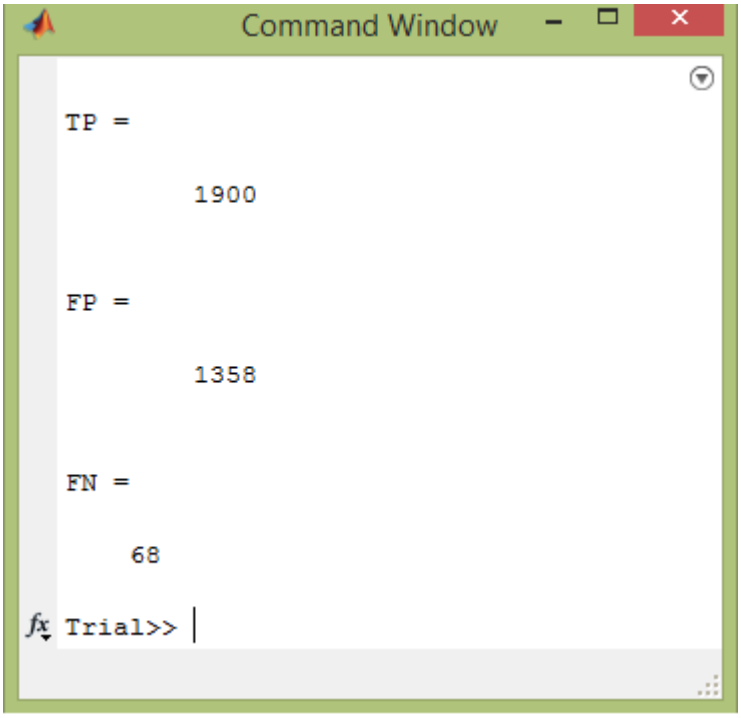
On Figure (5) we find the manual and computational detection. Finally we analyzed the overlap between the two bounding boxes that we have.



This is the Overlap Ratio on this particular frame:



With this we are able to classify the overlap between the cars in True Positive (TP) if it is more than 50% False Positive (FP) if this rate is lower than 50% and finally, False Negative (FN) when the detection is not tracking a car.



These were the performance result.

Summary

The car tracking was realized. This project was a start to computer vision and image processing and taught introductory basic skills from them. To improve the performance results would be necessary work on a new background subtraction such as the Gaussian mixture. We worked on the overlap ratio matrix to create the performance numbers. The performance test worked perfectly and served to be used into any other video because of his general code.

References

"Detection Cars Using Gaussian Mixture Model." The MathWorks. Inc. <http://www.mathworks.com/help/vision/examples/detecting-cars-using-gaussian-mixture-models.html?prodcode=VP&language=en>. 16 May. 2015.

Morris, Brendan. "Computer Vision and Intelligent Systems". Lecture 16. 2012.

Wikipedia. *Background Subtraction*. (April 2015) < http://en.wikipedia.org/wiki/Background_subtraction >. 16 May. 2015.