

Image Processing CSE2225 Resubmission Report

Bram Stellinga & Vincent van Vliet

Changes

One of the biggest changes since our previous submission is the colour range used as a mask to the image. Our new range much better caught the yellow licence plates, leading to accurate plate localization and less noise. This change drastically increased our score, from around 51% to 72%.

We also optimised our functions to use less memory and made our system more efficient in general. An example of this is the crop_height method, made to remove rows that do not store any important information. These optimizations were done to all functions, greatly increasing the time efficiency. Where our system used to perform frame skipping of 24 frames with a duration of 4.5 minutes, it now performs frame skipping of 6 frames with a duration of 1.5 minutes.

Another big difference is the way we approach recognition. We now perform ISODATA thresholding which gives good results, and as stated in our previous poster, when our system encounters an ambiguous result, it now makes an extra comparison using the SIFT descriptor. This leads to the originally ambiguous result now making a correct decision based on a second method of comparison.

Besides that, we updated the way we deal with frames of the same licence plate. When we receive the same car multiple times in different frames, we take all of them into account and for the final result and keep an array of all found plates. When we are completely done with all frames, we condense this array by taking the most common plate we found for each individual plate. When a plate differs less than 4 characters with the previous plate, we treat it as if it's the same car.

Frame skipping	Accuracy	Time
1	83.7%	05:27
2	85.7%	02:44
3	83.3%	01:55
4	82.9%	01:24
5	82.9%	01:07
6	85.4%	00:54
7	74.4%	00:45
8	80.0%	00:44
9	82.9%	00:38
10	78.5%	00:37
Average=	82.0%	

To evaluate the system based on the training video, we have performed multiple different frame skipplings to collect different frames containing different cars, the results of which along with the duration of the program can be seen in the image on the below. In our previous submission, we had a running time of 8 minutes. As can be seen on the left, the performance has been significantly improved. This allows us to make use of smaller frame skips, so that more frames are used by our system. A combination of all the aforementioned changes brought our accuracy score up to > 80%.

For fair evaluation, to test our system we have used frame skipping of 6 frames each time. When running the evaluator method on this test batch, we receive the following results:

```
*****
RESULTS:
          Category I   Category II   Category III   Category IV   Total
True positives(TP) [26.  86.6666667  9.  90.  1.  10.]
0.  0.  36.  60.  ]
False positives(FP) [ 4.  0.  2.  0.  4.  0.  0.  0.  10.  0.]
False negatives(FN) [ 0.  0.  0.  0.  5.  50.  10.  100.  15.  25.]
Too late true positives(LTP) [0.  0.  0.  0.  0.  0.  0.  0.  0.]
-----
          Score [0.8666667 0.8181818 0.1  0.  0.  0.]
0.  0.  0.59016393 0.  ]
Score of Category I & II: 0.8536585365853658
root@6a0b358e87b6:/home#
```