Density estimation through background separation and flow methods

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Introduction

Motion detection is a classic computer vision problem. In this subpart of Assignment-1, we try to use motion detection through background subtraction to get the density of traffic at different times on a busy road in New Delhi. First we measure the static queue density which gives a measure of how busy the particular intersection is. This is done by subtracting the background image and processing this image (converting to grayscale, thresholding and dilating) to get an idea of vehicle or pedestrian positions at any particular time. Then, we measure the dynamic queue density which is a measure of how often vehicle has to stay idle on the particular intersection. This is done by analysing the optical flow to get an idea about various moving vehicles at any time.

How to run

To compile the *traffic.cpp* file, run *make compile*.

Listing 1: bash version

```
make compile
```

This will create the executable *a.out*. Now pipe the output of the program to *plot.txt* by running the command *./a.out>plot.txt*. Ensure that the *trafficvideo.mp4* and *empty.jpg* are in the same directory before running *a.out*. Else you have to use the *-v* and *-e* options as arguments to specify their paths. You can also *-h* option to get the required help option regarding these arguments.

Listing 2: bash version

```
./a.out>plot.txt
```

Now run *make plot* to compile and run the accompanying *cpp* file containing commands for *gnuplot*.

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Listing 3: bash version

```
make plot
```

The plot is saved in the same directory. We have used difference between the frames to calculate the dynamic density as the optical flow method had a plot varying from the needed plot. We have included the flow file as well so values and plot can also be compared. The *Makefile* also has the *make all* or *make* command which can run the sequence of commands to save the plot as a *.png* file.