

CM3065 Intelligent Signal Processing

End-of-term assignment

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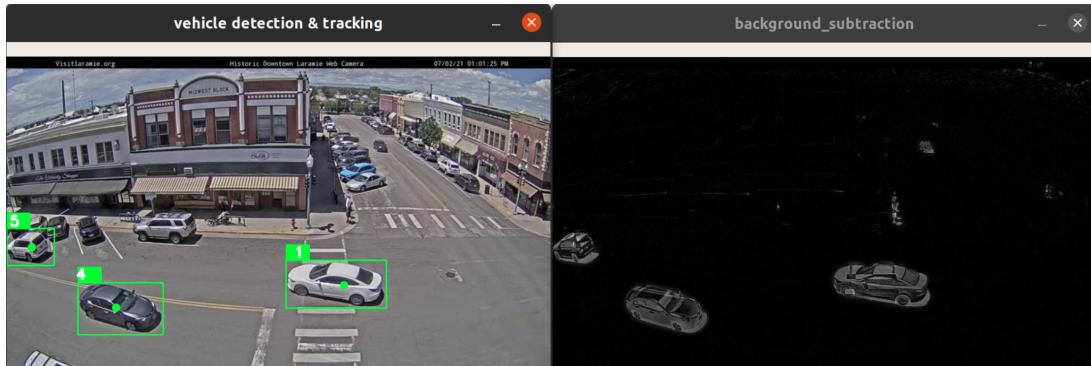
Exercise 1 report

Frame differencing:

Frame differencing is a technique where the algorithm checks the difference between two or more video frames and is used to detect motion in the video. Suppose there are two consecutive frames from the video. Taking the difference of each pixel value from those frames, the resultant pixel value would be zero if the difference is zero. If the pixel values differ, the consequent pixel value would be non-zero. This means that if objects in the frame are in motion, they produce a difference in pixel values between frames and their motion is made visible.

Background subtraction

It is a type of frame differencing technique where the background frame is pre-computed and subtracted from a frame to detect objects in motion.



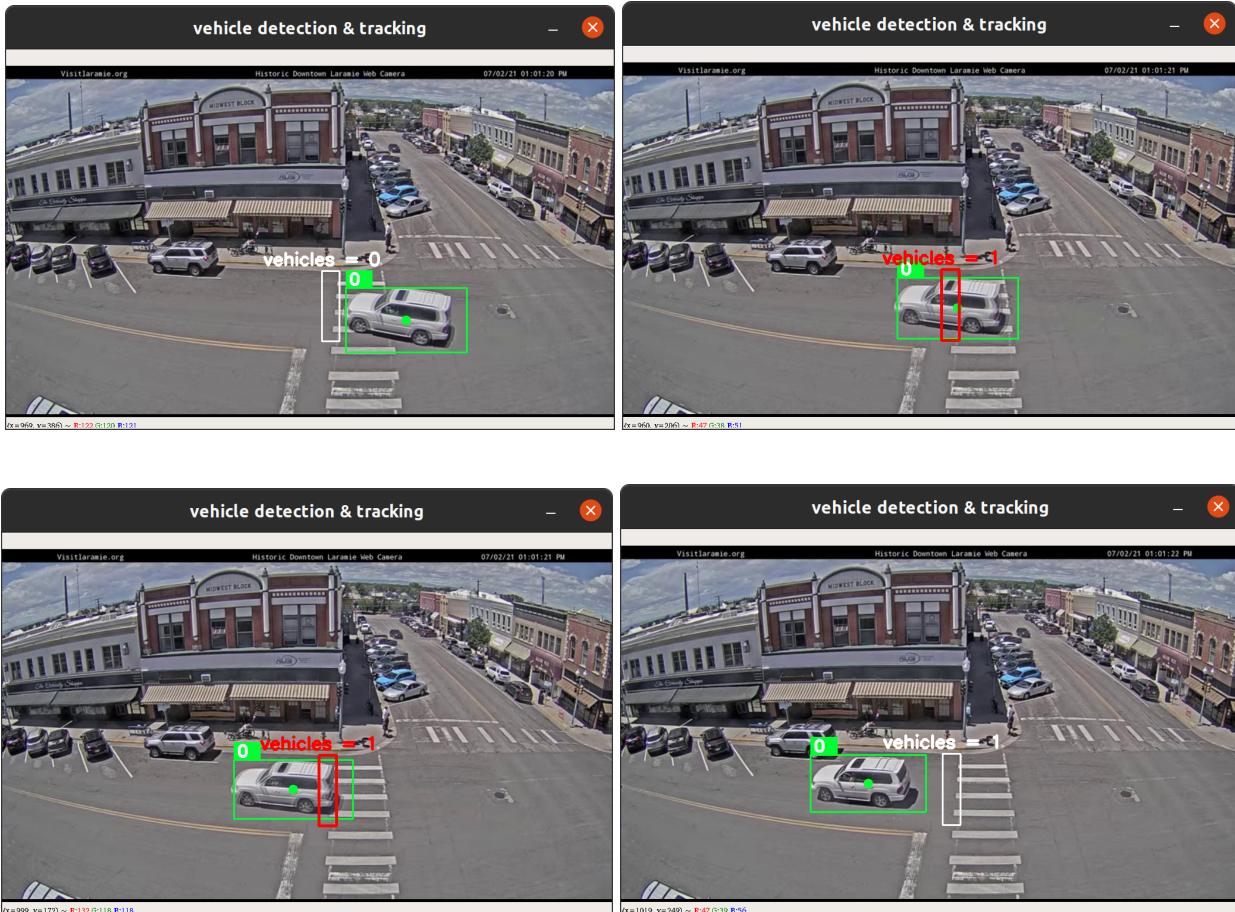
The background frame is computed by taking random sample frames in the video and median pixel values are used to construct the background frame.

```
In [5]: 1 # resultant background frame in gray scale
          2 Image.fromarray(bg_frame)

Out[5]:
```

Task 2: Vehicle count

To count the number of vehicles heading to the city centre, a rectangle detection region is placed on the road. Once the vehicle's centre point is inside the rectangle, the counter is incremented. To avoid the possibility of counting the same vehicle twice as the vehicle centre point might still be inside the detection rectangle at the next frame, once detected, the detection is deactivated for certain frames and then reactivated.



Vehicle count results:

	Total number of cars	Cars per minute
Traffic_Laramie_1.mp4	6	2.02
Traffic_Laramie_2.mp4	4	2.27

Summary

The application detects and tracks vehicles on the main street well with a unique object id, however, when a vehicle is occluded or gets close to another vehicle, the detection considers two vehicles as a vehicle. This might be difficult to solve by a simple frame differencing technique as it does not consider the motion vector of vehicles.

The vehicle counter algorithm works well with this dataset, however, it would fail to work if there is a traffic jam heading to the city centre as the vehicle centre point may sit within the detection rectangle longer than the deactivated period. To solve this, the detection algorithm shall also consider the detected object id and not count for the same vehicle twice or more.