|  | Total number of cars | Car per minute |
| --- | --- | --- |
| Traffic Laramie\_1.mp4 | 6 | 2.18 |
| Traffic Laramie\_2.mp4 | 4 | 2.29 |

In the application for exercise 1.2, it is able to detect and track vehicles travelling within the main street region. However only cars moving towards the city centre have been counted for the interest of this assignment. The vertical rectangle bar at the pedestrian crossing will light up whenever a car moving towards the city centre passes by. This is able to do so due to the reason that there is a function which allows us to check whether the direction of the car is towards the city centre. This is the end of the brief description of the application. Further detailed analysis will be covered below.

Frame differencing is a technique where the computer is able to check the difference between two video frames. If there is a change in pixels, it can be deemed as a change in motion in the video. Most frame differencing techniques work with blur and threshold to distinct real movement from noise. It is impossible to disregard noise as even different light conditions can lead to a change in pixel between frames which can become a false positive which we are trying to eliminate.

The motions of cars are detected using background subtraction using certain techniques such as frame differencing which I will cover later on. Background subtraction is basically generating a foreground mask which contains the binary image of a moving object. The mask is calculated through subtraction between the current frame and a background frame which is usually the first frame or whichever which does not contain any item in motion which for this case is the first frame. However further steps have to be taken in order to eliminate many noises in each different frame. This needs to be done using frame differencing.

In my code, I was able to do frame differencing through using opencv builtin function Gaussian Blur. Next I used another opencv built in function, absdiff. Absdiff is a function that helps to find the absolute difference in between pixels at the same position of 2 different frames. However it is important that this has to be done after the blur as this will help us eliminate much of the noise between 2 different frames, leaving only the true result we need. After that, I used dilation in order to expand the elements that have been detected by the abs diff to further differentiate it between the 2 frames.

The application is broken down into 2 main helper classes. One which is for background subtraction, mainly for the detection of motion and noise reduction. Second is for the tracking of cars. In order to count the number of cars detected in a certain region, a tracking algorithm has to be implemented so as to identify the vehicle thats has already been counted.