Mechanics - Project01 Report

1. Project folder is sent.
2. For the second task I have created Car and Crossroad classes with their respective member variables and methods.

The system containing these two obejcts is responsible for making the decision of accelerating or stopping the car.

For distance calculation I am using r(t) = r0 + v0 \*t + 1/2a\* t^2,

where r0 = 0(start counting from the current position)

a = positive acceleration, or a = negative acceleration.

1. How is the decision made?

For conveniece reasons I have converted the km/h values of [20, 80] to m/s [5.5, 22.2] and [50, 100] to [13.8, 27.7].

The conditions are checked in the following order.

1. Priority is crossing the intersection - If the passed distance with positive acceleration is larger than the initial distance from the car to the intersection + the width of the intersection => the car should accelerate.
2. If the car’s speed = 0 before the intersection with the negative acceleration => the car will manage to stop before the intersection=> it shoud stop.
3. If the case when the car is neither able to stop, nor pass the intersection the decision function returns how earlier the car needed to start stopping.

After running the program for different values and outputting the resuls, we can see that for every intersection width s and initial distance x0, there exist at least one speed and acceleration value that will result in the problem solution.

1. The red regions indicate the prohibited values.

For Time-Distance graph the prohibited valued are when the car’s passed distance lies in the region of red light.

For the Speed- Distance graph the prohibited values are 0-minimal speed at the intersection - becasue it is assumed that the car should increase the speed to pass the intersection.

1. With the bounded maximal speed in some cases the car is not able to pass the intersection, because of the upper bound. The car would be otherwise able to pass the intersection if it was able to constantly increase the velocity.
2. In the last problem with 2 cars, for the first car the problem is the same, however for the second car the distance is a time dependent function. Relative velocity is used to identify the distance change between the cars and thus solve the problem for the second car.