# Question from Deepak Kumar Swain

At a speed of around 120km/h = 33.3m/s the 5s interarrival time corresponds to a distance of 166m. This is getting smaller or larger depending on the actual speed differences between cars that follow each other, which sooner or later results in a random crash.

The function randomSpeedVariation() is a culprit because it uses normal distribution with a standard deviation of +/-5%. This means in rare cases can mean +/-15%, which you can actually measure by calling randomSpeedVariation 2000 times and then comparing minimum and maximum you get 27.6 and 38.8m/s. A speed difference of 11m/s (40km/h). This is probably too much. By using another distribution one could reduce the dynamic range. Example: use uniform distribution in the range +/-5%.

If the actual speed variation is getting very small, you can decrease the IAT to 1.2s which corresponds to a traffic volume of about 3000 veh/h and the traffic density to about 27 veh/km, i.e. a distance between cars of just below 40m.

The crash behaviour is oversimplified in that the cars come to an immediate stop (no deceleration, no skidding). If a crash happens further down the road, vehicles that come later can in most cases navigate around the crash site.

However, if the crash happens in the first meters, there is no chance, which has the effect of effectively every later car gets into emergency breaking, but has no chance of avoiding the mass collision.

The crash function could be changed by moving the crashing cars with a negative acceleration (using the current speed of the car coming from behind).

# Question from Abhishek Padalkar:

No, you don’t need subclasses of Vehicles, you can work with a number of parameters in the constructor (CAR\_LENGTH, max acceleration etc.). You can also use a boolean parameter indicating autonomous cars.

# Question from Khushboo Lavania

Check the FAQ. Optimal Travelling Time is achieved at maximum average Speed.

You can compute the average speed of a car over a lane by dividing the lane length by the time difference between entering and leaving the lane.

Then you average over the cars entering and leaving the lane.

Throughput is the same as traffic volume (in veh/h), you can easily measure that by counting the ‘leave lane’ events for a particular lane and divide it by the time difference of the first and the last vehicle leaving that lane.

# Question from Aman Khanna

For the first part there is no reference code.

Second Question:

You can only document a simulation you did actually run, because otherwise you don’t get measurements to report. For the simulation you made certain assumptions (usually by means of constants for the actual run) and used a particular model. You may have for example modified the Vehicle class. These changes are part of your model. You can use a high level description in the report and comment your code in the .zip file, or you give a self-contained description in the report. That is up to you.