

Approximating the dynamics of number of vehicles in a zone with homogeneous speed

Modeling the dynamics of number of vehicles (accumulation) driving in some zone of the city is a challenging problem. One popular approach is to say that the trip generation rate (flow of vehicles that entered the zone or started their trips inside) is independent from the accumulation and is a predefined function of time. If we also postulate that this zone has speed-MFD (dependency of space-mean speed on accumulation), constant trip length distribution and the speeds of all the vehicles are equal (homogeneity) then we get so-called trip-based model which is now rather popular in the literature. This model appears to be computationally heavy because it contains one integral equation for the accumulation. In this paper we show that if the trip generation rate changes slowly then the trip-based model can be approximated quite well with an ordinary differential equation which is very easy to solve numerically. Moreover, instead of using the information about the whole distribution, we have to know only the mean and variance. The quality of this approximation is generally better than th