TRAFFIC SIMULATION INPUT DATA

Lee Neuwirth and Richard Wiener

University of Colorado at
Colorado Springs

Traffic simulations commonly use a Poisson process for intersection arrival input data. It is the intention of this design to simulate arrival data which reflects the cumulative effects of traffic control signals in modifying the distribution of the Poisson arrival process. The data generator will consist of a discrete-event stochastic simulation of traffic movement along a one-way single lane roadway (no overtaking) through n intersections having pretimed controllers. Vehicles will originate from a fixed source. The traffic arrival rate at the first intersection will be an independent identically distributed (IID) random variable. The distribution of this variable will be primarily exponential to implement the Poisson process. Other probability distributions such as normal and weibull will be experimented with as well. The mean interarrival time at the first intersection will be varied to simulate light, medium and heavy traffic conditions.

Once the traffic has entered the system, via the first intersection, it will be monitored and controlled car by car with a general intersection procedure. This procedure will be used to process events at each of the n intersections. These events will be both asynchronous and synchronous in nature. One such event will be the asynchronous arrival at an intersection zone. Depending on the state of the signal light as well as the existence of a queue at the time of the arrival, the cars will either be allowed to pass through, be delayed or be queued. The intersection arrival times of the cars that pass through, as well as their velocities, will be used to compute part of the arrival times for the following intersection. The arrival times of the vehicles that are delayed and the information from the release process explained below, as well as vehicle acceleration and deceleration rates will be used to compute another part of arrival time input at following intersections. The queuing process for those vehicles which arrive when the signal light is red consists of counting the number of cars queued and using assigned vehicle size information to determine distance to intersection. This information is also used in the release process. The release process is a synchronous event which deals with the release of queued cars at the time the signal changes from red to green. Driver and vehicle characteristics such as reaction time, headway and acceleration rates will be incorporated to add further realism. This release process at each intersection will be used to determine the remaining part of the arrival data for the following intersection. A scheduler will be used to process events at each of the intersections in a round-robin fashion.

Car-following models are to be used as a primary base for the overall simulation model. The simulation model will also include parameters such as number of intersections, distance between intersections, phasing between intersection signal lights and signal light cycle length. An attempt will be made to make all program parameters variable, thus ensuring a flexible and adaptable model for the data generator. Validation of the simulation model will include the performance of sensitivity analysis.

The programming language used for this simulation will be Pascal. With its powerful data types such as pointers and records, a complete attribute record for each vehicle is easily implemented and maintained. In addition the various lists (i.e., event list), when implemented as linked-lists, can be easily searched and updated.

The simulation output data will be obtained from the nth intersection once the simulation is found to be in steady-state. This data will be processed and analyzed so that meaningful empirical distributions for the arrival process can be defined.

Proceedings of the 1982
Winter Simulation Conference
Highland * Chao * Madrigal, Editors

82CH1844-0/82/0000-0297 $00.75 © 1982 IEEE