Abstract

This thesis, describes the *Development of GenTAS, a Generic Traffic Animation Software.* One of the primary tools a traffic engineer uses to analyse a traffic system is the tool of computer simulation. Simulation of a particular traffic situation is usually done to explain, predict and demonstrate the driver behavior and performance of the system in that situation. But, these simulation models usually produce text output in the form of the position of the vehicles at different time steps which are difficult to decipher. It becomes very difficult for the user to analyze the movement of the traffic stream and visualize maneuvering of the vehicles using this output and the very purpose of simulation is lost to an extent. Further, often these models fail to provide macroscopic stream information like speed, flow, density, occupancy of the stream they simulate at locations of interest. The aim of the present work is to communicate the results of a microscopic simulation model to its user in an easily comprehensible manner.

An attempt has been made to develop a generic animation software which would create a visual traffic stream from the simulation model data. The tool helps in visualizing the movement of the objects of a traffic system (like vehicles, pedestrians,etc.) generated by any simulation model. The developed tool can animate the elements of the system under various reference; for example the observer could be static or moving with or against the stream. The tool can represent various road features and different types of objects. In addition to providing the analyst with a visual description of the simulated traffic stream, it also allows the analyst to obtain various traffic flow parameters like the space mean speed, density and flow of the traffic stream at a particular point on the road. That is, the analyst is able to treat this visual description as a pseudo-video data of a real stream and place sensors much like he/she would have done on a real stream. The tool also allows trajectories of the vehicles of the traffic stream to be plotted. Other parameters like delay at intersections can be found out using the software.

GenTAS comprises of four major modules; the interpolation module, the dynamic frame of reference module, the animation module and the macroscopic/trajectory information module. The interpolation module is responsible for the smooth animation of the traffic

stream. Linear interpolation is done by this module to obtain the co-ordinates of the vehicles/pedestrians at time steps for which the simulation output does not provide output. The dynamic frame of reference module is responsible for transforming the co-ordinates of the vehicles/pedestrians into a frame of reference which moves with some speed along the x-axis of the co-ordinate system. The animation module is responsible for different types of animations of the microscopically simulated traffic stream. The animation module can animate the traffic under various references, i.e. static observer animation or the moving observer animation. The macroscopic/trajectory information module can be used to calculate the speed, flow and density of the traffic stream along with stopped delay at intersections. The macroscopic/trajectory information module can also produce location vs. time plots of the objects of the traffic stream.

GenTAS, the software developed has been used to animate the movement of traffic (vehicular and pedestrian) simulated by a few simulation models. These models and the results of the animation software are discussed in the thesis. Simulated data on vehicular traffic in Indian conditions obtained from CoTSiM - A Comprehensive Traffic Simulation Model [13] developed at IIT Kanpur have been animated. Three different cases are taken from this simulation model inorder to illustrate how GenTAS was used to visually describe the simulated data of uninterrupted traffic flow and also collect information on macroscopic parameters at points of interest. Data on vehicular movement at intersections is animated to describe the interrupted traffic movement. Simulated data on vehicular movement at Rail- Highway grade crossings obtained from a Simulation model developed at IIT Kanpur was animated. Some synthetic data is used to highlight how the animation tool functions while animating vehicles at signalized intersections. Simulated data on pedestrian movement obtained from PedSiM-A Pedestrian Simulation model developed at IIT Kanpur was animated to describe the movement of people through a small opening in a closed space. It is observed that GenTAS animates the results of the simulation models reasonably well.