

## CHAPTER 6 : CONCLUSIONS

The fundamental difference between HCM and CORSIM is that HCM is a deterministic model in which the results are based on traditional data collected in the 1960 while CORSIM is a stochastic simulation model which can model results based on several driver behaviour parameters. Another fundamental difference is the simulation time between HCM and CORSIM. A 15 minute simulation run only represents one point of the data sample while HCM method may represent an average value of samples. Although only one run has been made, more runs or longer time may be necessary for a statistically meaningful comparison in chapter 5.

This research demonstrated the feasibility of microscopic simulation models in traffic weaving analysis of the future. The previous chapters have outlined the comparative analysis and results of weaving areas between CORSIM and HCM. In general the following conclusions have been reached on the basis of these analysis

1. CORSIM is not sensitive to various geometric factors such as length of the acceleration lane, deceleration lane etc.
2. While higher volume estimates are produced by CORSIM, it also produces lower density and higher speed estimates than the 94HCM.

One of the objectives of this research was, based on the research findings, to make recommendations that would improve 94HCM and CORSIM. If some of the insensitivity noted in analysis of CORSIM can be changed, its use could augment field data and allow a more consistent and thorough calibration of regression models for subsequent editions of the HCM. The conclusions are divided into two parts a) those dealing with CORSIM simulation models and b) those dealing with the traditional weaving analysis model (HCM)

### 6.1 Simulation Models:

The simulation results support the argument that microscopic traffic flow theories are well suited for study of weaving areas. The factors affecting the performance of the model are the sensitivity factor, headway, vehicle speed, the maximum acceleration and maximum deceleration limitations, warning sign distance and the delay in response of the vehicle control system. A 15-minute simulation run only represents one point of data samples while HCM may represent an average value of data samples. However since only one run is made in CORSIM for comparison purposes, more simulation runs or longer time periods may be necessary for a statistically meaningful comparison The following section presents the recommendations to address some of the drawbacks in CORSIM.

#### 6.1.1 Recommendations made to CORSIM:

1. The anticipatory warning sign distance should be controlled by the user . In the current version of CORSIM, this distance is set as 1500 ft from the end of the on-ramp. This value cannot be changed.
2. More than one warning sign can be posted for a vehicle in the mainline indicating an off -ramp destination. In the present case , the simulation software allows for one warning sign only .This is not true in real life scenario.
3. Variation of desired freeflow speed over different time periods should be possible. In a real situation desired freeflow speed may vary for different time periods. In the current version of CORSIM , desired freeflow speed is fixed for all time periods.

4. Different types of weaving configurations like Type A or Type B or Type C etc. should be considered while designing a weaving model. Because FRESIM cannot simulate two freeway systems connecting each other directly, the simulation software supports only a Type A configuration
5. Some existing weaving situations like two freeway merging or two freeway diverging cannot be modeled using CORSIM. In the current software only a ramp and freeway are allowed to merge.
6. The logic used for modeling the behavior of driver yielding to lane changes should be modified. The logic behind this states that if there is a vehicle trying to change lanes, the cooperative driver code of its putative follower in the adjacent lane will be checked. For a cooperative driver a risk value of -8 ft/sec is assigned while a value of -10 ft/sec is assigned to a non-cooperative driver. However in the current version of the program logic assigns this code to the vehicle trying to change lanes rather than to the follower.
7. Merging logic forces almost all the on-ramp vehicles into the lane adjacent to the auxiliary lane within 100 ft of the gore area. In real world cases this is not true. Not all vehicles merge within 100 ft of the gore area. The logic can be altered in order to make the merging possible gradually.
8. O-D based output should be generated. In the current version of CORSIM origin destination study can be conducted. In order to test the validity of O-D logic a user has to view the graphics. However a user cannot obtain an O-D volume for each node.
9. Lots of assumptions need to be done in order to make a comparison analysis between CORSIM and HCM (Chapter 4 of this thesis).
10. The variation of random seed number to generate traffic flow conditions did not have effect on the model. This shows that there is a discrepancy in the generation of traffic using random seed numbers.

## **6.2 : Traditional Weaving Models:**

The traditional weaving models used regression based analysis to compute speeds. The data for these regression analysis were collected from the 1960's. The following section presents some of the recommendations to address some of the drawbacks in HCM

### **6.2.1 Recommendations Made to HCM:**

1. The HCM gives the value of the average weaving speed per vehicle. In real life cases we know the weaving speed varies very differently based on the number of vehicles in the adjacent lanes. So instead of getting an approximation of weaving speed per vehicle, the weaving speed can be calculated per lane.
2. The HCM does not mention anywhere about driver type parameters. In other words while calculating the weaving speed the various driver characteristics are not taken into consideration.
3. The HCM methodology suffers from the fate of many regression based models. It cannot model effects not evident in the data base from which these regression equations are developed. A methodology to indicate such a discrepancy can be recommended.
4. The HCM adopts a macroscopic approach to freeway simulation while the freeway simulation adopts a microscopic approach. Addressing issues of stochastic nature or

driver behaviors can be recommended to the HCM in order to consider for several factors contributing to the weaving and thereby affecting the freeway capacity.

5. The regression models developed in the weaving chapter of the highway capacity manual are based on a data base collected in the 1960's. As we all know growth of traffic and traffic patterns change almost everyday, a growth factor can be calibrated to include the changes in driver behavior