

CE 780A: Laboratory Course in Transportation Engineering (Semester: 2019-2020 II)
Lecture Notes

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Experiment 8: Speed-Volume studies

Revisit the discussion on “Fundamentals of Traffic Flow” and “Uninterrupted Traffic Flow” in the Sections 4.2 and 4.3 respectively of Chapter 4 of the book “Principles of Transportation Engineering” (Chakraborty & Das, 2011) and the corresponding lecture materials taught in the CE683: Traffic Engineering course.

Introduction: The main objective of this experiment is to study the relationships between the fundamental variables of traffic stream, namely speed (u), volume (q), and density (k). This will involve collecting traffic data of two basic variables, speed (u) and volume (q) and using the fundamental relation of traffic flow to estimate density (k). Thereafter, the data obtained is used to develop the speed-density model (u - k model) based on some popular linear, logarithmic, and exponential u - k models.

Procedure: The study location is the traffic intersection near Coka Cola Chawk, Kanpur. Traffic volume for a particular intersection leg is collected at 5 minutes interval (along with the vehicle class information, including Truck, Bus, Tempo, Car, Rickshaw, and Bikes). Spot speed of majority of these vehicles (as feasible based on the manpower available) is collected using radar speed guns along with the vehicle class information used for volume data collection. The spot speed data is also aggregated to 5-minutes interval for the exact same vehicle classes, as used for volume data collection. The data collection should be done for at least 1 hour duration.

Methodology: The observed spot speed and volume data is used to determine the following parameters:

1. 15th, 50th (median), 85th, and 98th percentile speed data for the data collection period. Also, discuss the importance and usage of different percentile speeds in traffic operation and design purposes.
2. The vehicle class data for volume data collection is used to estimate the Passenger Car Units (PCU) based on the related IRC standards. Thereafter, traffic volume (veh/hour and pcu/hour), speed (km/hour), and density (pcu/km) needs to be calculated for each 5-minute interval throughout the data collection period.
3. The 5-minute interval speed and density data are used to develop the u - k models, including linear (Greenshield), logarithmic (Greenberg), and (c) exponential (Underwood) model. Compare the discuss the performance of each of these models along with the challenges faced in the data collection and limitations in the different u - k models observed.

Bibliography

Chakraborty, P., & Das, A. (2011). *Principles of Transportation Engineering*. New Delhi: PHI Learning Private Limited.