Abstract

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In traffic flow, three kinds of traffic phenomena such as traffic hysteresis, capacity drop, and phase transition at the macroscopic level, are observed. Traffic hysteresis happens by retarded recovery of speed in the deceleration-acceleration process in stop-and-go oscillation traffic. Moreover, the fundamental Diagrams (FD) are used to predict the capability of a road-stream, or its behavior when applying inflow regulations or speed limits. Averaging the traffic flow characteristics in order to find macroscopic variables was a fundamental problem for the traffic research community due to the ambiguity in the kind of averages to be employed. Edie's definition eliminates the ambiguity caused by the spatial and temporal average of traffic variables. For the present analysis, vehicle trajectory database generated by image sensing technology from Hanshin Expressway, known as Zen data is used and the noise was eliminated from the data using the exponential smoothing method.

The trajectory data has been transformed by shear mapping and this will help to increase the chance of stationary conditions inside the area of the rectangle. The macroscopic variables were extracted in the stop-and-go region and using that hysteresis was constructed. After plotting hysteresis, these plots have been classified into positive and negative hysteresis based upon the direction of movement of hysteresis and further, the level of traffic hysteresis will be identified using the area and perimeter occupied by the hysteresis in the flow-density region with clustering technique. Further, FD's were plotted using Adaptive Smoothing Method and among all combinations of rectangle areas, the pair with the smallest average Coefficient of variation of speed was used to plot the FD and compared with the earlier methodologies to check the reduction in scattering of plots.