INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

The dissertation attempts to address some unresolved challenges on understanding and modelling driving behavioral phenomena of disordered traffic systems, by capturing both lateral and longitudinal interactions simultaneously. Specifically, this research aims to attain a comprehensive investigation of different driving regimes in the vehicle-following scenario such as car-following, staggered-following and two-leader following; and filtering scenario of disorderly traffic environments.

Utilizing the trajectory data extracted from video recorders, this research work has illustrated that the lateral descriptor of traffic, or centerline separation has a prominent effect on the drivers' selection of headways, on defining time-to-collision thresholds and also in modelling behavioral responses of drivers in the staggered-following scenario. The behavioral aspects of drivers in a two-leader car-following scenario, which has remained unexplored, has also been attempted in this research. Emphasis has been laid to understanding the differences in drivers' behavioral characteristics with respect to different positional arrangement of the leaders, control actions of the subject drivers and modelling their dynamic non-linear responses. In an attempt to model the uncertainties of human driving process in vehicle-following scenario, data-driven artificial neural network based single-leader and two-leader car-following models were developed. The developed models could explain the dynamic behavioral phenomena of drivers, much better than the classical car-following models. In particular, driver's response in a two-leader vehicle-following scenario depends on vehicle types, speeds of the interacting vehicles and lateral positioning of the vehicles. In this line, the concept of 'critical pore' is introduced to represent the minimum pore size accepted by the subject vehicles to pass in between the leaders or perform the filtering maneuver. The transition regime from vehicle-following to filtering scenario for motorized two-wheelers and cars has therefore been evaluated in this work.

Results obtained in this research can contribute a major step towards development of a comprehensive integrated driving behavioral model for disordered traffic streams. In the context of intelligent transport systems applications, this research can be the new impetus in the target of providing real-time information and advanced collision warning system adaptation databases in vehicle following and filtering scenario, which will not only improve driver's safety but also optimize traffic flow.