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Microscopic Statistical Characterisation of the Congested Traffic Flow and Some Salient Empirical Features BO YANG, JI WEI YOON, CHRISTOPHER MONTEROLA, Institute of High Performance Computing — We present large scale, detailed analysis of the microscopic empirical data of the congested traffic flow, focusing on the non-linear interactions between the components of the many-body traffic system. By implementing a systematic procedure that averages over relatively unimportant factors, we extract the effective dependence of the acceleration on the gap between the vehicles, velocity and relative velocity. Such relationship is characterised not just by a few vehicles but the traffic system as a whole. Several interesting features of the detailed vehicle-to-vehicle interactions are revealed, including the stochastic distribution of the human responses, relative importance of the non-linear terms in different density regimes, symmetric response to the relative velocity, and the insensitivity of the acceleration to the velocity within a certain gap and velocity range. The latter leads to a multitude of steady-states without a fundamental diagram. The empirically constructed functional dependence of the acceleration on the important dynamical quantities not only gives the detailed collective driving behaviours of the traffic system, it also serves as the fundamental reference for the validations of the deterministic and stochastic microscopic traffic models in the literature.

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