Simulation of traffic flow at intersection with traffic responsive signalization

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Modelling the dynamics of vehicular traffic flow by cellular automata has constituted the subject of intensive research by statistical physics during the past years [1, 2, 3]. *City traffic* was an early simulation target for statistical physicists [4, 5]. Evidently the optimisation of traffic flow at a single intersection is a preliminary but crucial step to achieve the ultimate task of global optimisation in city networks [6]. We have developed a Nagel-Schreckenberg for describing of vehicular traffic flow at a single intersection[7]. A set of traffic lights operating either in fixed-time or traffic adaptive scheme controls the traffic flow. Closed boundary condition is applied to the streets each of which conduct a uni-directional flow. Extensive Monte Carlo simulations are carried out to find the model characteristics. In particular, we investigate the dependence of the flows on the signalisation parameters. Our findings show hindrance of cars upon reaching the red light gives rise to formation of plateau regions in the fundamental diagrams. This is reminiscent of the conventional role of a single impurity in the one dimensional out of equilibrium systems. The existence of wide plateau region in the total system current shows the robustness of the controlling scheme to the density fluctuations. The overall throughput from the intersection shows a significant dependence on the cycle time in the fixed time scheme and on the queue cut-off length in the responsive scheme.

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