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Topic: Traffic Flow Preference: Oral

Simulation of Conflicting Traffic Flows a Crossroads

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Modelling the dynamics of vehicular traffic flow has constituted the subject of intensive research by statistical physics and applied mathematics communities during the past years [1, 2]. Recently, physicists have paid notable attention to controlling traffic flow at intersections and other traffic designations such as roundabouts [3, 4, 5, 6]. In this respect, our objective is to study some generic features of vehicular traffic flows at a single intersection. Our study includes some aspects of conflicting traffic flows at an intersection without a traffic light. In this case, approaching cars to the intersection yield to traffic at the perpendicular direction by adjusting its velocity to a safe value to avoid collision. The yielding dynamics in the vicinity of the intersection is implemented by introducing a safety distance D_s. The approaching cars (nearest cars to the crossing point) should yield to each other if their distances to the crossing point are both less than the safety distance D_s. In this case, the movement priority is given to the car which is closer to the crossing point. This car adjust its velocity as usual with its leading car. On the contrary, the further car, which is the one that should yield, brakes irrespective of its direct gap. Closed boundary condition is applied to the streets. Extensive Monte Carlo simulations is taken into account to find the model characteristics. Our results suggest that yielding mechanism gives rise to a high total flow throughout the intersection especially in the low density regime. Intersection of two chains makes the intersection point appear as a site-wise dynamical defective site. It is a well-known fact that a local defect can affect the low dimensional non-equilibrium systems on a global scale [7]. This has been confirmed not only for simple exclusion process but also for cellular automata models describing vehicular traffic flow. Next, we consider a signalised intersection which is controlled under a fixed time scheme. There is cycle time T which is divided into two parts: T_g and $T - T_g$. The light remains green for road A for T_g seconds (red for the perpendicular road B). Then the light turns into red for road A (green for road B) for the remaining time of the cycle i.e.; $T - T_g$ seconds. We show the simulation results for this signalised intersection and will compare them to the results of the unsignalised scheme. By this comparison, we will able to quantify the conditions at which the signalised scheme operates in a more efficient manner.

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