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The Role of Traffic Modelling For Dynamic Road Safety

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Extended Abstract

The technologies of intelligent transportation systems (ITS) such as communications and sensors technologies are evolving increasingly. An important impact of these advances is resulting in their deployment to optimize the transport network management techniques for road safety continuous improvement. Among the critical applications related to road safety, we consider the real-time incident management. Minimizing the travel time and avoiding potential collisions involving emergency vehicles still remains a challenge. Our first goal is to identify a traffic model that detects congestion categories that can cause significant delays of emergency vehicles.

From our study on the state of the art on traffic patterns, we have identified an original contribution based on a multi-level model characterised by the combination of several models, namely **1)** Macroscopic, **2)** Mesoscropique, **3)** Microscopic and **4)** Sub-microscopic. The main advantage of this model is its ability to combine multiple parameters to measure a given traffic that can be used for different applications requirements.

The sub-microscopic model considers one vehicle at a time and is based on specific parameters such as the acceleration, braking and tire movements. These measurements are acquired by sensors integrated with these vehicles. This model does not take into account other vehicles and therefore cannot be used to characterize traffic on a road network. The microscopic model is based the acceleration, position, and vehicle speed in addition to the driver behavior. The microscopic model is relatively complete compared to the submicroscopic model.

The multilevel model is based on the technique of link graph that is characterized by the transfer of power between the different elements of the mechanical system. This model is more complete than the previous ones since it integrates physical components of vehicles such inertia member, compliance and loss item. The multilevel traffic model is easily generated from the previous models combined. Its main strength is its ability to consider multiple layers of traffic integrating the details of the vehicles motions that can affect the traffic model.

Our current work is based on scenarios that we consider in the context of an incident management application. The real-time traffic model processing will be analyzed to identify the limits of the multilevel traffic model deployment for realistic situations. Improvements will be made to maintain the required traffic parameters while minimizing the real-time traffic pattern recognition processing, which is required for traffic control for emergency vehicles collisions avoidance. Traffic conditions have also a significant impact on emergency vehicles delay and especially their travel time. The system we are developing will integrate selected algorithms from a review on traffic pattern matching. We aim to identify a methodology and a tool development for multilevel traffic model processing in order to minimize emergency vehicles delays and avoid collisions related to congestions.