On the Required Degree of Detail in Mobility Modeling for Vehicular Multihop Access Networks

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Abstract - This work investigates mobility models for vehicular multihop access networks. The models are derived from simple graph-based mobility models presented in [2, 3]. By adding more and more features to increase their realism, we show to which extent this approaching of reality is really necessary.

Features of the mobility models include two different pausing models at intersections of streets, a probabilistic model and a modeling of traffic lights. Furthermore, we implemented two different user-dependency models in addition to the independent user movement used by the basic models. These are a simple non-overtaking model and an adaptation of the intelligent driver model described by Helbing et al. in [1]. Another detail we analyzed is the border behavior. We implemented the traditional reflecting boundary as well as an open boundary where users can leave and enter the network simulation area into or from a larger movement simulation area.

With the help of ns-2 simulations of a vehicular multihop access network, we identify the properties of mobility models that really do influence the performance of three different applications: a broadcast to all users in the network simulation area, a unicast to a subset of users with constant bitrate traffic, and a greedy file download using TCP.

The results of the simulations show that the biggest influence on the performance of all three applications is the steady state user distribution. Another important result is the influence of different pausing behaviors at intersections. The performance of constant bitrate traffic was considerably worse with mobility models that use a simulation of traffic lights instead of probabilistic pausing at intersections. While the influence of different border behaviors showed a heavy impact on the TCP application, the influence of different models for user-dependence was visible but not very drastic in any application.

References

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