Cooperative Safety Based on Shared Conventions

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Introduction

Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication has the potential to improve traffic safety. By cooperatively monitoring the surrounding environment vehicular networks can detect hazardous situations and issue warnings and recommendations to drivers.

Long range

Medium range
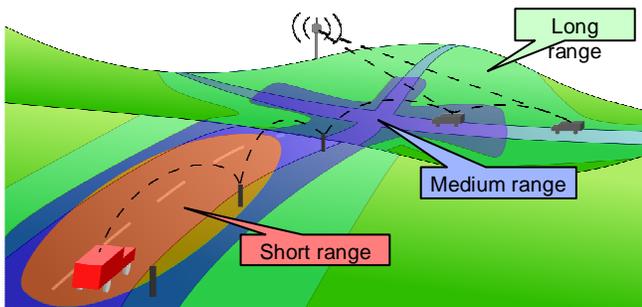
Short range

Our research focuses on situation assessment in the medium-range. In contrast to short-range systems where vehicle physics models are often used the medium-range case relies heavily on the ability to model driver behavior in relation to the environment.

Approach

The shared conventions, both formal and informal, that driver use to coordinate already today should be the base for assisted coordination and warning systems. We are investigating how to create spatiotemporal tracks for vehicles in a road scene that together represent normative evolutions of the traffic state.

Initially these tracks are generated in two phases; spatial track layout and temporal planning. Spatial tracks are determined from a digital map and the temporal planning stage is based on models of driver behavior in relation to road geometry and in relation to distance, velocity and location of other vehicles.
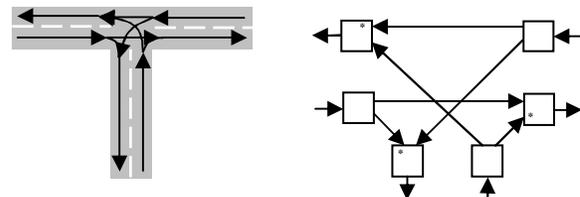
Preliminary results

A compact block notation for expressing right-of-way rules for use in temporal planning has been proposed.
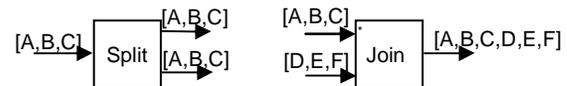
Vectors contain vehicle identities ordered by priority to a specific road segment. The split block duplicates its input on the outputs. The join block concatenates its input with precedence given to the input marked with an asterisk.

Networks of blocks can be used to describe right-of-way rules for various road geometries. Vehicle priorities can be inferred by propagating identity vectors along the links.

Deliverables

The project is expected to provide results on application, network and link-layer. Developed techniques will be implemented in a demonstrator to be presented at the ITS World Congress in Stockholm 2009. The demonstrator scenario will be cooperative situation assessment at a signalized pedestrian crossing.

Project publications
- K. Lidström, T. Larsson and L. Strandén, "Safety Considerations for Cooperating Vehicles using Wireless Communication", in *Proceedings of the 5th IEEE Conference on Industrial Informatics (INDIN 07)*, Vienna, Austria, July 23-27, 2007
- K. Bilstrup, A. Böhm, K. Lidström, M. Jonsson, T. Larsson, L. Strandén and H. Zakizadeh, "Vehicle Alert System", in *Proceedings of the 14th World Congress on ITS*, Beijing, China, October 9-13, 2007
- K. Lidström and T. Larsson, "Cooperative Communication Disturbance Detection in Vehicle Safety Systems", in *Proceedings of the 10th IEEE Conference on Intelligent Transportation Systems (ITSC 07)*, Seattle, WA, USA, September 30-October 3, 2007

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