iQFleet

Intelligent real-time fleet control and management

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Period:
July 2011 – Jan 2014

Four PhD projects will be started up within the project.

Budget: 24 MSEK
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FFI – Transport efficiency

Partners:

KTH School of Electrical Engineering
Automatic Control Lab

KTH School of Architecture and the Built Environment
Division of Traffic & Logistics

Scania CV AB
Systems development
Pre-development (REP)

Scania Transport Laboratory

VTI – The Swedish National Road and Transport Research Institute

ACCESS Linnaeus Centre

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Fuel optimal control of vehicles and platoons

The focus of this project is to increase the fuel efficiency of heavy duty vehicle (HDV) platoons. Many different situations can occur where there are high possibilities to reduce the fuel consumption.

Fuel reductions will be studied both on vehicle level and on single platoon level but also on the level of interacting platoons, but the main focus will be on one single HDV platoon. The following situations and scenarios are some examples that will be considered:

- The platoon can drive more fuel efficiently using the knowledge of the topology of the road ahead and of other traffic.
- The vehicle can be controlled such that it does not need to fully stop when the traffic light is red, if the information of the time when the traffic light turns to green is known.
- If there is a platoon ahead on the highway, that has the same destination, then your platoon can join the preceding platoon to reduce the fuel consumption even further.
- Reroute and take a different path due to heavy traffic further ahead on the road.

These scenarios are all possible with the help of wireless communication, V2x, with other vehicles and road side units/infrastructures. More low-level control is also needed for coordination of platoons, e.g.:

- Vehicles join the platoon from highway ramp, which requires that the platoon has to split beforehand.
- Vehicles leave the platoon to highway ramps, which requires that the remaining platoon has to merge together.

Safety of the platoon and other vehicles must always be guaranteed no matter the fuel cost. Time limits to destinations is also prioritized before driving fuel efficiently.

Traffic data fusion and traffic flow prediction

This part of the project deals with the problem of extracting information from the large number of heterogeneous, irregularly sampled sensors that are included in our scenario:

- Data from Taxi Stockholm
- Road side units
- Stockholm congestion tax control points
- Position and velocity of single vehicles and platoons
- Information about road construction areas and accident sites.

Other data that will be used include weather data, and data from the Road Weather Information Systems (RWIS) with information about road surface conditions.
Floating car data from Scania trucks will also be used. Around 4.000 Scania trucks are currently on the Swedish roads every day, sending vehicle state information every ten minutes.

The data will be collected at KTH using the ITS laboratory that recently has been established.

Methods for traffic flow prediction will be developed based on this traffic information. Advanced models are needed in order to make accurate estimations and predictions of the traffic conditions, both locally and regionally.

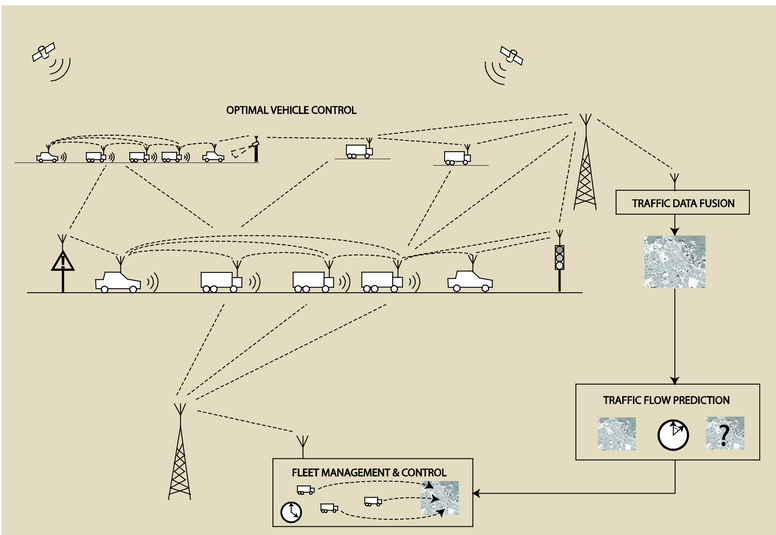
Simulations studies will be performed to understand the influence of platooning on traffic congestion.

"All-embracing" fleet control

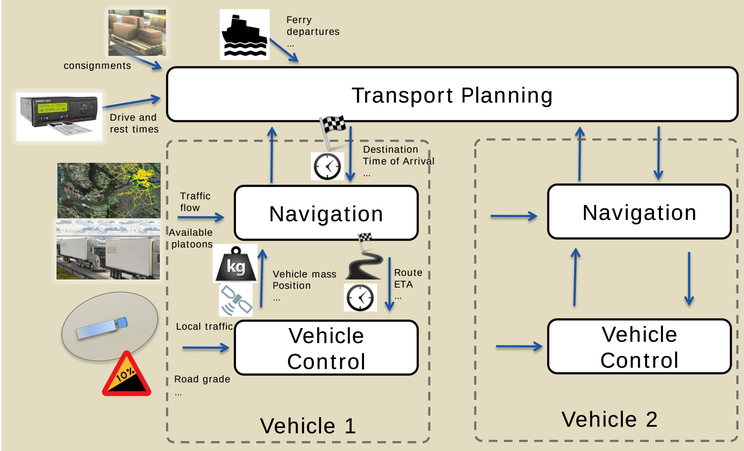
The goal is to provide the vehicle with a longer planning horizon than before, both in time and in space. When all vehicles are connected, there will be enough information to provide long distance trucks with a prediction horizon of several hundreds of kilometres or several hours.

The traffic flow information and predictions will be used for real-time optimization of the route planning, for single vehicles or for entire fleets of vehicles, giving trade-offs between travel time and fuel efficiency.

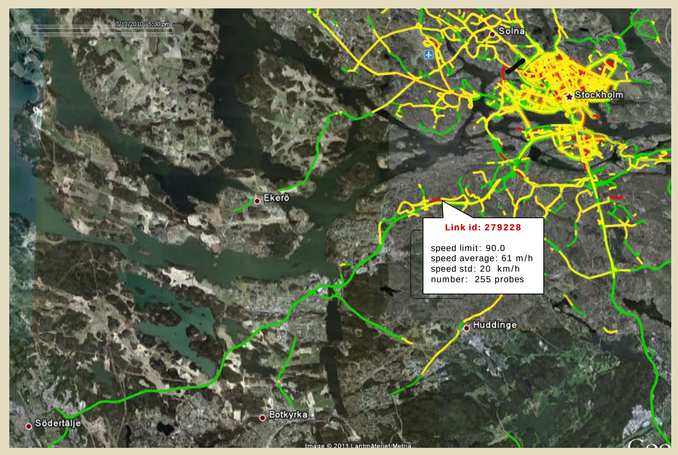
Arriving in time has the highest priority; slot times at ferries or goods terminals can not be missed. The optimization will allow for fuel savings while still guaranteeing that the vehicles arrive in time.



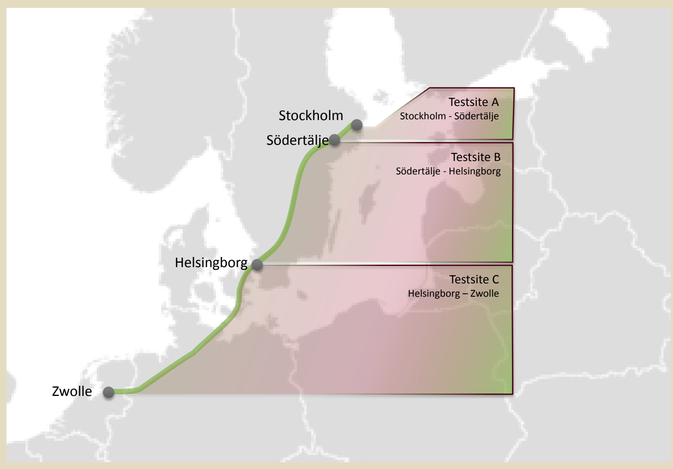
"All-embracing" fleet control



Hierarchical control system



Data from KTH ITS laboratory



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