CHARM PCP Project

Phase 3 publishable summaries

Lot 1: Advanced Distributed Network Management

Mott MacDonald Limited

Mott MacDonald together with Fileradar have developed a module for Advanced Distributed Network Management, addressing Challenge 1 of the CHARM PCP programme, and in this Phase 3 project will integrate it with the customer's future traffic management system and make it available for customer testing.

Our module combines a set of complementary innovations in order to meet the challenge brief, each aimed at improving the overall utility of advice given to motorists. Ultimately this will support total travel time, emissions and safety targets as drivers use the best advice to reduce wasted time and emissions, and avoid hazards.

Potential diversions across multiple networks are generated dynamically by a new algorithm using only the road network data as configuration. Commands to re-parameterise traffic control equipment are also generated. The potential utility of responses is evaluated by a prediction engine using pattern recognition and traffic theory, which takes into account the effects of the response being evaluated, and any other active responses. If a response is predicted to produce beneficial effects, location-specific information is published for use in in-vehicle devices. Responses can be evaluated using multiple performance indicators, including delay and air quality. A consultation amongst traffic managers has informed the design and development of functionality for distributed collaboration and control, which has been realized using the emerging DATEX Collaborative ITS Services specification. This allows different traffic management authorities to collaborate to meet their combined goals.

PSI Mines & Roads GmbH

PSI have introduced during the previous phase 1 and 2 of the CHARAM-PCP project a new category of decision support which enables new steps in multi-layered traffic network management.

The software supports the management of large traffic networks and the co-operation of urban, regional and national road authorities by balancing different goals. It includes self-learning adapting to changed conditions or new knowledge and is flexible to allow new trends in advanced network management.

Traffic operators in TMCs have to ensure the best network performance for road users. During congestion, incidents, special events and bad weather the traffic operator has to select the services which are most effective to solve the current situation. Often these are not isolated conditions, but mixed with other incidents. Selection of the best services is not an easy task and needs a lot of local traffic management experience.

The introduced multi-criteria decision support system supports the operator by offering groups of services which may optimise network performance.

The approach uses the multi-criteria decision technology Qualicision® to balance the available services in the given traffic scenario and under the applied goals and their priorities. The relations between services and goals are expressed in graphical goal functions which indicate how a service under certain situations supports a goal or hinders the goal achievement.

The definition of those goal functions is performed by traffic engineers with general and local traffic management know-how.

The introduced system is easy to use in daily network management and enables the co-operation between different authorities to optimise overall network performance. It can be integrated in different traffic management environments and can easily be adapted to a various number of tasks.

Lot 2: Detection and Prediction of Incidents

Fileradar B.V.

ADAPT (Advanced Data Patrolling) is a system developed by Fileradar in cooperation with Be-Mobile that automatically identifies, classifies and predicts traffic related events. A series of advanced algorithms fuses a large number of data sources including floating car data, Twitter, apps, rainfall radars and emergency services reports, resulting in superior quality. With ADAPT's unique user interface, traffic controllers can easily monitor, prioritize and anticipate on incidents throughout the road network, on motorways as well as on urban roads, all via a standard web browser.

Goudappel Coffeng

Identification and prediction of incidents by learning algorithms

Goudappel Coffeng, Mott MacDonald and Be-Mobile developed a module to:

- Predict and detect congestion
- Detect incidents as car breakdowns and accidents.

This module is based on three key features: data fusion, real-time estimation of the fundamental diagram and fuzzy traffic state estimation consistent with traffic flow theory.

The module will be demonstrated on real traffic data in the regions Amsterdam and the West Midlands. As input we use loop detector data and floating car data (Be-Mobile). By using data fusion the reliance on loop detector data will be minimalized.

The final result will be a demonstration version of a module to be used for virtual patrolling, using floating car data (which is available worldwide), enriched with, if available, loop detector data and other data. This module can, after the complete implementation, be used in traffic management centres, by road authorities, service providers, et cetera.

Lot 3: Support of Cooperative ITS Functions

Beijer Automotive B.V.

WiFi-P connected CAN In-Car; connecting cars for cooperative traffic flow management.

Combined in-car sensor data such as speed, use of brakes, use of (fog)lights, use of wipers, steering wheel position, outside temperature and headway to the next vehicle give valuable information about traffic situations, especially if the information of individual vehicles can be combined, analyzed and enriched with other vehicle and environmental data, like weather data, as a basis for tailored information (warning messages) to Traffic Management Centre operators.

A generic in-car module allowing wireless communication to the cloud and from vehicle to vehicle (V2I and V2V), combined with a generic CAN-bus device will exchange detailed in-car sensor data and its fusion with TMC's for traffic management purposes.

TMC operators will receive predefined event data for them to use in traffic management, like Fog-reduced Visibility-, Precipitation/Heavy Rain- or Slippery Road warnings, which they can use in their advices to drivers in relevant areas.

Besides that, connected cars in a wide perimeter will receive in-car sensor data from other cars to make sure drivers are aware of the traffic situation by warning/advising the driver regarding for example Slow Vehicle-, Emergency Brake Light-, and dangerous weather and traffic situations warnings.

By using a combination of proven in-car technologies, independent from road-side systems, TMC's, vehicle brand or –type, a scalable and place independent transmissible solution is offered for generation of real-time information to TMC's.

Through the cooperative wireless information exchange of in-car CAN-sensor data by both 3G/4G and WiFi-P, drivers will receive personalized advice on i.e. their smartphone (in vehicle signage) aimed at improved traffic control, a lower impact of incidents by i.e. E-Call and B-Call and by i.e. road and weather condition warnings, improved road safety, lower emissions (CO2/Greenhouse gasses) and less investments in road (-side) infrastructure.

Cubic Transportation Systems (ITMS) Limited

As mobile and in-vehicle computing become more widespread, new opportunities to achieve strategic views of the road network and influence individual journeys are becoming possible.

Through in-vehicle equipment, extended via a Smart Phone application, this module will implement a cost effective intelligent interface between a Traffic Management Centre (TMC) and road users, providing the TMC with:

- ☐ Classification and aggregation of individual vehicle data
- ☐ Notification of vehicle event data
- ☐ Virtual information dissemination and collection sites, to supplement physical roadside infrastructure.

This module will also allow the TMC to provide the road user with:

- ☐ ☐ High quality, targeted information that can be tailored to specific journeys.

The Smart Phone technology will expedite the deployment of these services, whilst the core functionality remains compatible with the roll-out of conventional C-ITS On-board Units and Roadside Units.