Cooperative Advanced Driver Assistance System for Green Cars

ECOGEM Consortium

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Project Synopsis

EC Programme: FP7 ICT-GC (Green Cars)

Grant agreement: N° 260097

Start date: September 2010

Duration: 30 months

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European Green Cars Initative

SEVENTH FRAMEWORK PROGRAMME

The success and user acceptability of **Fully Electric Vehicles** (**FEV**s) will predominantly depend on their electrical energy consumption rate and the corresponding degree of autonomy that they can offer. FEVs must provide their drivers with the highest possible autonomy, as well as with a high degree of reliability and robustness in terms of energy performance. Appropriate innovative ICT solutions must be pursued and adopted to assist the driver in dealing with such energy-related issues and strengthen FEVs' autonomy and reliability.

Funded in the context of the **European Green Cars PPP Initiative** (www.green-cars-initiative.eu), EcoGem aims to provide innovative ICT-based solutions to ensure energy-efficient operations of Fully Electric Vehicles. Particularly, it aims at designing and developing a **FEV-oriented highly-innovative Advanced Driver Assistance System (ADAS)**, equipped with suitable monitoring, learning, reasoning and management capabilities that will help increase the FEV's autonomy and energy efficiency.
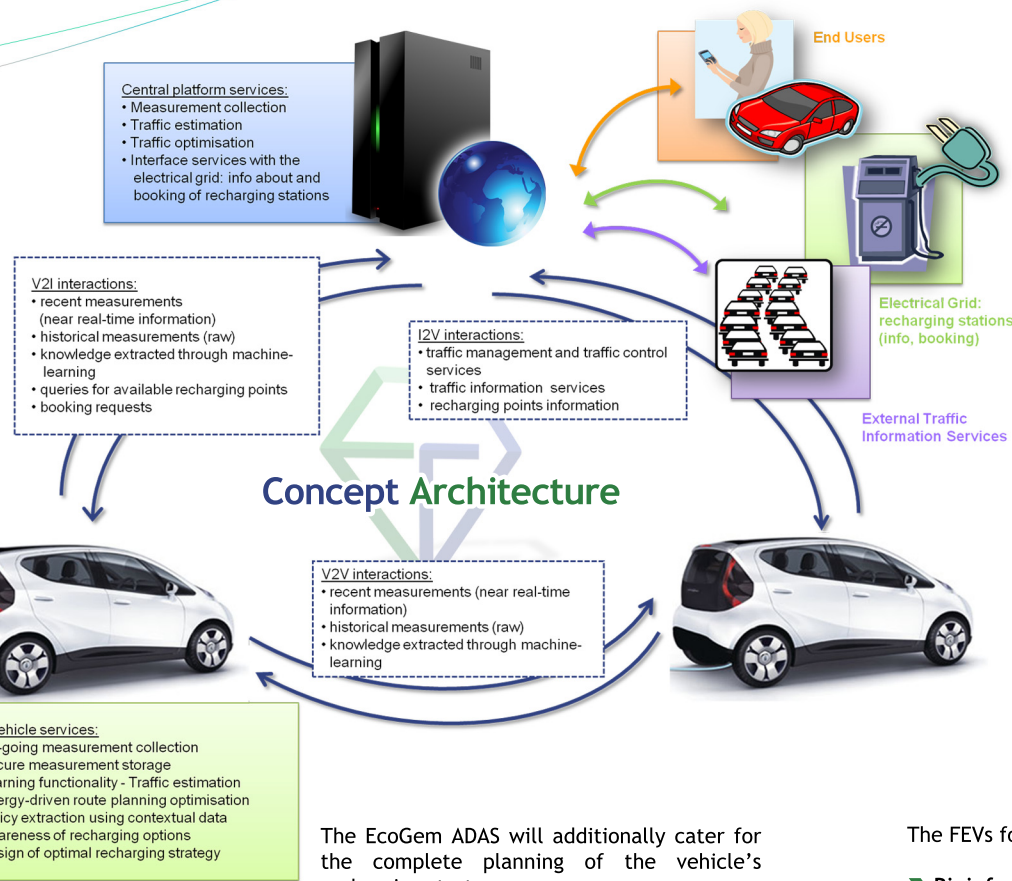
EcoGem will base its approach on rendering the FEV:

» capable of reaching the desired destinations through the most energy efficient routes possible;

» bearing in mind FEV aspects such as battery characteristics, surrounding recharging points/stations, booking of recharging slots, etc.

Objectives

" **EcoGem's key-objective is to integrate intelligence and learning functionalities to on-board systems for FEVs and ensuring energy-efficient driving and travelling**

EcoGem aims to design, develop and prototype an innovative Advanced Driver Assistance System (ADAS) capable of integrating machine-learning capabilities to existing FEVs' on-board systems. EcoGem vehicles will learn over time to **predict (and thus avoid) congested routes**, based on experience that they gather and share through V2X interface. This learning process will eventually render each **EcoGem** FEV capable of autonomously classifying routes according to their degree of congestion, enabling energy-driven route planning optimisation.

Central platform services:
• Measurement collection
• Traffic estimation
• Traffic optimisation
• Interface services with the electrical grid: info about and booking of recharging stations

End Users

V2I interactions:
• recent measurements (near real-time information)
• historical measurements (raw)
• knowledge extracted through machine-learning
• queries for available recharging points
• booking requests

I2V interactions:
• traffic management and traffic control services
• traffic information services
• recharging points information

Electrical Grid: recharging stations (info, booking)

External Traffic Information Services

Concept Architecture

V2V interactions:
• recent measurements (near real-time information)
• historical measurements (raw)
• knowledge extracted through machine-learning

In-vehicle services:
• On-going measurement collection
• Secure measurement storage
• Learning functionality - Traffic estimation
• Energy-driven route planning optimisation
• Policy extraction using contextual data
• Awareness of recharging options
• Design of optimal recharging strategy

The EcoGem ADAS will additionally cater for the complete planning of the vehicle's recharging strategy.

This optimisation process will typically include automated battery monitoring and various levels of pro-activeness, optimised scheduling according to several parameters (battery levels, energy consumption rate, desired destination, present location, daytime, traffic, user agenda, etc.), and real-time booking of recharging points.

To successfully deliver the above solutions, EcoGem will pursue the following key S&T objectives:

1. Development of an on-board ADAS equipped with monitoring and machine learning functionality, and targeted for route planning and recharging optimisation;

2. Development of an enhanced traffic and recharging management platform at the infrastructure side;

3. Provision of secure and open interfaces to the knowledge and information of the platform;

4. Definition and development of V2V interactions and interfaces;

5. Definition and development of V2I/I2V interactions and interfaces;

6. Development of mechanisms and software tools for data security, user privacy, safety and acceptability;

7. Development of a FEV-oriented traffic simulation platform suitable for EcoGem;

8. Validation through simulation trials;

9. Validation through field trials with test vehicles.

Demonstration

For the integration and testing of the proposed technologies and solutions – and to minimise time-to-market – EcoGem will perform a systematic validation of the engineered system prototype in field trials. Firstly, simulated evaluations will be carried out using an enhanced simulation environment provided by EUVE and HIB. Then, two kinds of field trials will be performed using test electric vehicles: (i) field trials in controlled environments, in Pininfarina's test facility CERAM (France) and TEMSA trial environment METU (Turkey); (ii) field trials within urban regions (city trials). The latter will be performed in Bavaria (Germany) using facilities and services provided by PTV and VIB (Bavarian Traffic Information Agency).

The FEVs for real-life trials will be provided by

» **Pininfarina:** Pininfarina BLUECAR (www.bluecar.fr) an electric vehicle which will go into production in Italy, and

» **TEMSA:** two alternative platforms for public transportation
- small size vehicle – 20/22 passengers
- large size vehicle – 30/35 passengers

pininfarina

TEMSA