Program Introduction

Title

Autonomous vehicle and Infrastructure Cooperative Architecture.

Program positioning

Evolution of today's mobility concept to a higher level of smart, safe and environment friendly system seems widely accepted to be inevitable. Ambitions towards zero accident, zero congestion and zero emissions within the next decade require revolutionary measures. Main challenge is not only new technology concepts in terms of efficient powertrains, lightweight solutions or automated vehicles, but will definitely write history as an automotive revolution by replacing the human driver...

Meanwhile several traditional carmakers, together with their suppliers have made successful attempts to realise self-driving cars. Somehow within a modelled or controlled environment, many miles already have been driven. However, although the human driver is considered to be the weakest link in the 'mobility' chain, replacing him by technology proves to be a complex matter.

The **AVICA** program provides a research platform for autonomous vehicles. This platform will allow Flemish OEMs, tier1, infrastructure, component and service providers to research and provide a proof of concept of their products on system level. The program is leveraging past research in the area of functional safety, path planning, control and ADAS information functions and enabling the Flemish partners to level up on future evolutions.
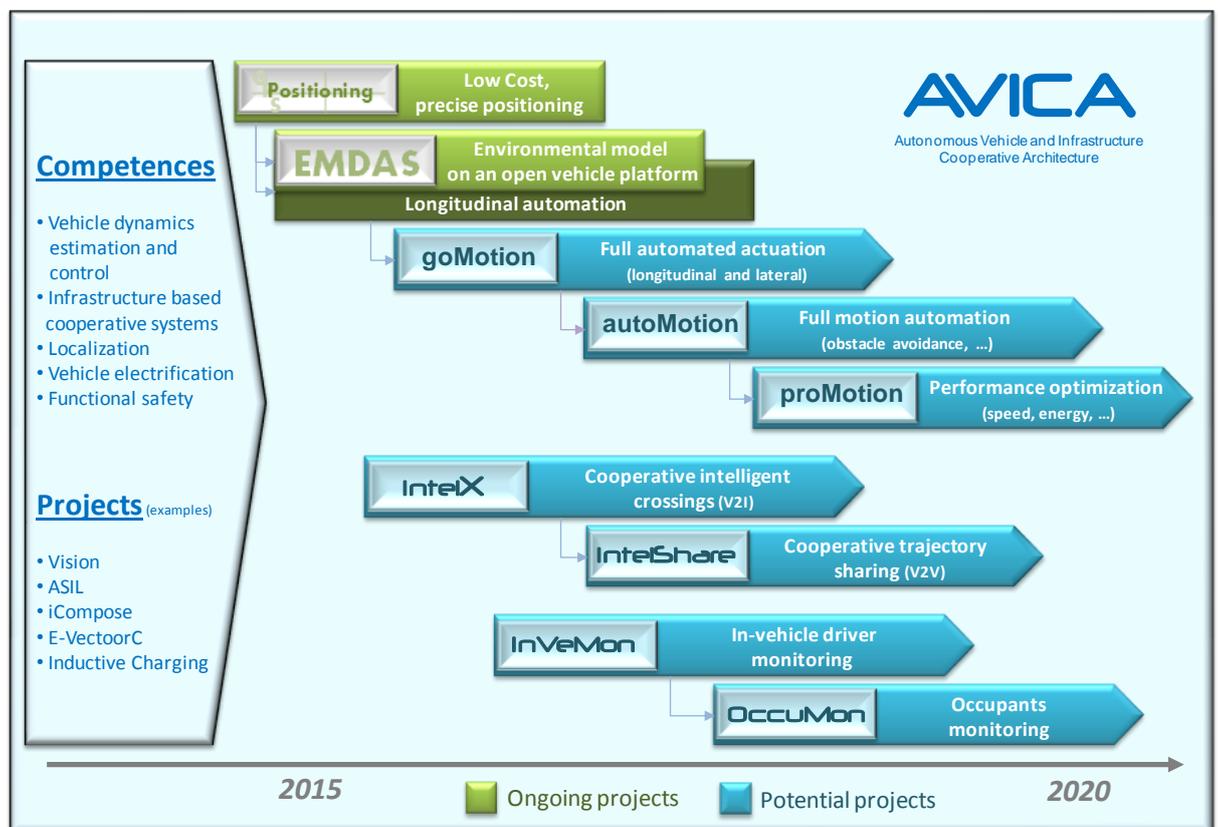

FIGURE 1. AVICA PROGRAM OVERVIEW

The holistic approach of the **AVICA** program enables Flanders Make and its partners to fully target autonomous driving applications for public transportation, since public transportation has the full chain in Flanders and bridges the off-highway and passenger car domains with respect to technology.

The program starts with research and concept development of localisation techniques, followed by longitudinal and lateral guiding techniques based on a virtual representation of the environment. This virtual environment evolves to a 360° perception from both the vehicle and specific infrastructure situations which are complex to perceive by or out-of-sight for a vehicle, to allow for better autonomous decision making.

Project introductions

GPS Positioning, is focussing on low cost absolute and relative localisation techniques. Absolute localisation is obtained from Global Navigation Satellite Systems (e.g. GPS), enhanced with atmospheric corrections in order to achieve higher accuracy. But also visual techniques are used through detection of landmarks and corresponding map matching. Relative localisation is obtained by using active beacons, visual and vehicle sensor based odometry. Through fusion of multiple techniques, at any time a guaranteed accurate localisation can be achieved.

EMDAS, will deliver a open platform based for creating the virtual environment to be used for vehicle path planning. The objective is to obtain a speed profile based on the behaviour of actors in the direct environment of the vehicle. This platform has to be such that not only the environment perception and vehicle control can be verified and validated, but also to support smooth realization of the functional safety requirements and active safety functions beyond the proof of concept.

goMotion, is a first step in the motion evolution of a vehicle in dynamic environments. This project further enhances the virtual environment in order to control the movement of a vehicle, within a predefined track. **autoMotion** will add the capability of obstacles avoidance on the trajectory. Instead of coming to a full stop, possible alternatives will be assessed. When the safety requirements can be fulfilled an obstacle avoidance procedure will be started. The **proMotion** project will be to optimize the performance of the vehicle, infrastructure and/or combination of the two towards e.g. speed or energy.

IntelX, has the objectives to enhance the vehicle environmental model with perception information from the infrastructure, while not compromising on the (functional) safety requirement of the vehicle performance as such. The infrastructure of particular interest are dynamic environments, like crossings, in which a vehicle's perception has limitations to oversee the whole situation, even the out-of-sight areas, and still has to deliver safe and acceptable performance in comparison to other road users.

IntelShare, will research an off-line trajectory knowledge base resulting from perception data of vehicles on the same trajectory for out-of-sight 'predictive' perception.

InVeMon, is to support the transition phase and learn from a supervising driver about the implemented autonomous capabilities. **OccuMon** is intended to provide in-vehicle information of the occupants and based on their behaviour this might influence the autonomous decision making (e.g. emergency situations).