ARTRAC - ADVANCED RADAR TRACKING AND CLASSIFICATION FOR ENHANCED ROAD SAFETY

Goal of the project

ARTRAC aims to develop an active safety system to protect vulnerable road users (VRUs) from vehicles in motion that is economically viable in the volume vehicle market. The safety system will consist of both actuators for controlling vehicle driving dynamics and the perception component for the vehicle's surroundings. It will be tested on two types of vehicles that pose the biggest hazard to VRUs in urban settings, namely cars and light delivery goods vehicles.

Short description of the project

The environmental sensing used in ARTRAC project will be based on a single automotive 24 GHz narrowband radar sensor. This sensor offers the potential to overcome the hitherto price barrier that has prevented VRU protection systems from entering widespread use. To meet the challenging technical requirements for extremely short measurement time, reliable target detection, ego motion and road condition estimation that have to be met, a new transmit/receive antenna and multi-channel receiver will be developed. Existing microwave technology in the 24 GHz band is utilised as much as possible to facilitate low-cost mass production applications.

Project implemented by

Consortium of seven institutions:

- 2 car manufacturers (VOLKSWAGEN, FIAT through CRF);
- 2 research organizations (VTT - Finland, CTAG - Spain);
- 2 universities (TUHH - Technical University Hamburg-Harburg, UPT - Timișoara);
- one SME specialized in car sensors (SMS Germany).

Implementation period

November 2011 - October 2014

Main activities

The whole system consisting of radar sensor, sensor fusion, risk assessment and vehicle control has a high potential to be launched in serial cars because the majority of components is already standard equipment in series cars. The additional equipment required should not be a show-stopper from a pure technical point of view.

Measures for VRU protection might be divided into passive and active systems. Because of basic physical properties, passive measures can provide limited protection potential only. Therefore (active) actuators are necessary to achieve the desired protection for VRUs. For example, vehicle deceleration seems to be a potential approach for active VRU protection with high benefit and high potential for high volume series cars, as they are already in use in high-end limousines.

The environmental sensing will be conducted with a novel high performance but low-cost 24 GHz narrowband radar system. From an operational viewpoint, this RF frequency fits exactly into the existing ISM band from 24,000 GHz to 24,250 GHz. Due to this techno-political feature this radar has a long term perspective on European and world-wide markets.

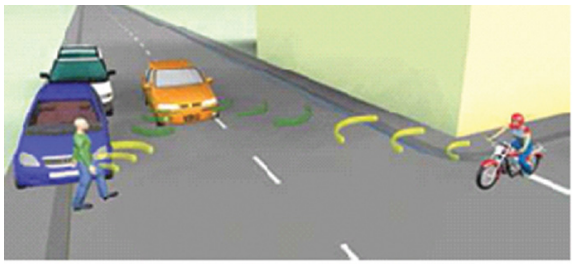
Results

ARTRAC address the following six major scientific and technical objectives:

- Develop a generic detection system able to detect pedestrians, cyclists, and other vulnerable road users (VRU) as well as vehicles.
- Implement the capability to monitor road surface conditions and detect low-friction road sections caused by water, ice or snow on asphalt. This will be able to be used to warn or adapt the vehicle's electronic control systems such as electronic stability control (ESC)
- Implement the capability to monitor road surface conditions and detect low-friction road sections caused by water, ice or snow on asphalt. This will be able to be used to warn or adapt the vehicle's electronic control systems such as electronic stability control (ESC) and collision avoidance systems (CAS) for changed friction conditions.

Studies developed by UPT research team for ARTRAC project in 2013

- Ioan Nafornita et al, ARTRAC "Denoising techniques applicable in Radar signal processing. Validation report", oct. 2013 ARTRAC meeting, Espoo, Finland.
- Ioan Nafornita et al, ARTRAC "Applying denoising methods for automotive Radar data (UPT Activity Report)", march 2013, Timisoara, Romania.
- Ioan Nafornita et al, ARTRAC Preliminary Report "Denoising techniques applicable in Radar signal processing"; february 2013 ARTRAC meeting, Timisoara, Romania.
- Adrian Macaveiu, Andrei Campeanu, Ioan Nafornita, Estimation of Automotive Target Trajectories by Kalman Filtering, Scientific Bulletin of the Politehnica University of Timisoara - Transactions on Electronics and Communications p-ISSN 1583-3380, vol 58(72) no.1 , 2013, pp. 30-35.
- Adrian Macaveiu, Andrei Campeanu, "Automotive radar target tracking by Kalman filtering", 11th International Conference on Telecommunication in Modern Satellite, Cable and Broadcasting Services (TELSIKS), Vol. 2, pp. 553 - 556, Nis, Serbia, 2013.



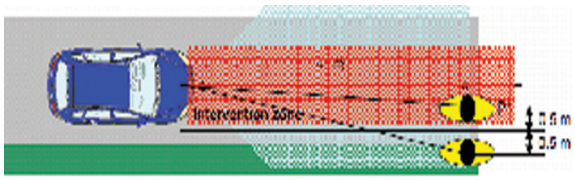
ARTRAC road traffic scenario involving VRU's

Applicability and transferability of the results

The key result of the ARTRAC project will be a safety system that aims to protect vulnerable road users, designed to be economically viable in the volume vehicle market. The safety system will consist of both, actuators for controlling vehicle driving dynamics and the perception component for the vehicle's surroundings. The ARTRAC detection system will be small, lightweight and economical in order to enable an easy integration in the vehicle design.

Fields of interest

Radar, sensor, vulnerable road users, protection, road condition detection, collision avoidance, assisted braking.



ARTRAC car radar technical specifications

Research centre

Research Centre for Intelligent Signal Processing (ISPRC)

Financed through/by

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Research team

Prof. Dr. Ing. Ioan Naforniță;
Prof. Dr. Ing. Alexandru Isar;
Prof. Dr. Ing. Andrei Câmpeanu;
Conf. Dr. Ing. Corina Naforniță;
Drd. Ing. Adrian Macaveiu.

Contact information

Prof. Ioan NAFORNIȚĂ, PhD
Corresponding Member of the Romanian Academy of Technical Sciences
Department of Communications
Address: Bd. Vasile Pârvan, No. 1, RO300223, Timisoara
Phone/Fax.: (+40) 256 403 302
Mobile: (+40) 722 567 912
E-mail: ioan.nafornita@upt.ro
Web: www.artrac.org