PROJECT

ADOSE

Reliable Application Specific Detection of Road Users with Vehicle On-board Sensors

Funding: European (7th RTD Framework Programme)

Duration: Jan 2008 - Nov 2011

Status: Complete with results

Total project cost: €10,223,008

EU contribution: €6,099,793

Call for proposal: FP7-ICT-2007-1

CORDIS RCN : 85243

Background & policy context:

The White Paper on EU Transport Policy for 2010 states a key objective: 50% reduction of casualties due to road accidents by the end of 2010. Improvements on road safety are achievable increasing the EU market penetration of advanced driver assistance systems (ADAS), currently limited by performance and cost of sensor technologies.

According to ICT-2007.6.1, ADOSE addresses research challenges in the area of 'accident prevention through improved-sensing including sensor fusion and sensor networks'. Besides, focus is on 'increased performance, reliable and secure operation' for 'new generation advanced driver assistance systems'. ADOSE project aims at enhancing ADAS functions through the development of high performance and low lost technologies suitable for reliable detection and classification of road users in hostile environments.

Objectives:

The specific objectives of ADOSE were:

- five sensing technologies (FIR imager, multifunctional CMOS and 3D ranging cameras, harmonic radar/tags and silicon retina stereo sensors)
- 'technology-dependent' pre-processing algorithms
- assessment of the sensor prototypes on functional demonstrators
- synergies and complementary actions with on-going and new projects in FP7 on road safety.

The innovations claimed were:

- low-cost FIR optics and imager combined to multispectral (NIR plus VIS) CMOS sensor for reliable pedestrian's detection at night
- multifunctional integration on a single enhanced high resolution CMOS imager
- harmonic radars with passive and active tags for reliable localisation and identification of vulnerable road users
- 3D packaging technology in TOF ranging cameras improving resolution and distance accuracy
- bio-inspired silicon retina stereo sensors addressing time critical decision applications
- low-cost process and packaging technologies for thermal detectors, CMOS-based cameras and tags.

Methodology:

Five sensor module prototypes were designed, fabricated and tested:

- FIR camera (FIR)
- Multifunctional CMOS vision sensor (MFOS)
- 3D range camera and eye-safety illuminator (3DCAM)
- Harmonic radar with passive and active tags (HR P-TAG, HR A-TAG)
- Silicon retina stereo sensor (SRS)

Only 'technology-dependent' pre-processing algorithms will be developed for each sensor: (a) algorithms implemented into the sensor hardware; (b) algorithms on raw data, coming from the sensor hardware, implemented on a PC-based processing hardware, strictly related to the sensing technology and its demonstration. Algorithm developments will not be extended to Sensor Data Fusion.

The algorithms will be compliant to PReVENT-PROFUSION guidelines and ready to be integrated in the standard software architecture for driver assistant systems.

Demonstration will be limited to functional sensor prototypes installed on concept cars without integrating the complete safety system.

Parent Programmes:

FP7-ICT - Information and Communication Technologies

Institute type: Public institution

Institute name: European Commission

Funding type: Public (EU)

Lead Organisation:

Centro Ricerche Fiat - Societa Consortile Per Azioni

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Organisation Website:
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EU Contribution: €588,950

Partner Organisations:

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EU Contribution: €24,379

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EU Contribution: €467,538

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EU Contribution: €1,567,335

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EU Contribution: €317,500

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EU Contribution: €621,331

Interuniversitair Micro-Electronica Centrum

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Organisation Website:
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EU Contribution: €747,892

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EU Contribution: €215,750

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EU Contribution: €224,160

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EU Contribution: €50,507

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EU Contribution: €58,978

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EU Contribution: €297,080

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EU Contribution: €49,195

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EU Contribution: €398,185

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Finland

Organisation Website:
http://www.vtt.fi

EU Contribution: €471,013

Technologies:

Advanced driver assistance systems
Sensor and Communication Platform for ADAS system

Development phase: Demonstration/prototyping/Pilot Production

Key Results:

Within the project five sensor module prototypes were developed and tested. Namely:

- FIR camera (FIR)
  The project developed a FIR camera demonstrator with good thermal and spatial resolution at lower cost, to be combined to a high resolution imager for enhanced night vision applications (more reliable obstacle detection and classification).
  After finishing the processing of FIR samples, a flaw within the read out integrated circuit (ROIC) was detected that prevented further evaluation. A complete redesign was not possible within the project deadline, so a metal-fix was applied in order to show the basic functionality of the imager. Another fix in the MicroElectroMechanical systems (MEMS) part of the chip removed some homogeneity issues with the pixel contacts. Finally the double fixed samples were put into the camera demonstrator, characterised and tested. Evaluation and testing of the samples and the demonstrator camera was conducted with reasonable results. In parallel first steps towards a redesigned and then fully functional ROIC were taken but they were not completed within ADOSE time frame.
- Multifunctional CMOS vision sensor (MFOS)
  Two MFOS camera prototypes, enabling different functional integration, have been developed. The MFOS detects critical environmental parameters (fog, rain etc.) and providing, at the same time, information on the driving scenario (oncoming vehicles, vapor recovery units (VRUs) in night conditions etc.).
- 3D range camera and eye-safety illuminator (3DCAM)
  Different 3D imaging methods have been analysed and simulated. A range-imaging hybrid camera concept for short range safety requirements (high-speed object recognition and distance measurement, e.g. for Pre-crash) was completed. The camera consists of a photosensor and its corresponding readout electronics. These two components are hybridized using existing Interuniversitair MicroElectronica Centrum (IMEC) capabilities for wafer processing and flip-chip technology. At the end of the reporting period the hybrid chips were not showing good functionality. IMEC will continue to debug the problem to identify the issues in the design or the assembly.
- Harmonic radar with passive and active tags (HR P-TAG, HR A-TAG)
  The HR-PTAG and HR-ATAG was developed enabling easy detection of traffic obstacles and vulnerable road users, and their identification, even in dark or adverse weather conditions.
- Silicon retina stereo senso

Strategy targets

An efficient and intergated mobilty system: Acting on transport safety: saving thousands of lives

Documents:
MFOS camera module (Other project deliverable)

STRIA Roadmaps: Cooperative, connected and automated transport

Transport mode: Road transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Safety/Security

Geo-spatial type: Other