PROJECT

CHAMELEON

Pre-crash application all around the vehicle

Funding: European (5th RTD Framework Programme)
Duration: Jan 2000 - Mar 2003
Status: Complete with results

Background & policy context:

Improving road safety is a policy imperative, given the scale of deaths and injuries caused every year. Significant progress has been obtained in recent years by introducing passive safety systems on vehicles, which can reduce the consequences of an accident once it occurs.

This positive trend can be further improved by equipping the vehicle with a pre-crash system, able to predict the risk of an accident in advance.

Objectives:

Main objective of the Chameleon project has been to develop and evaluate a pre-crash system for vehicles, able to detect an imminent impact with high reliability.

Aim of a pre-crash function is to increase the protection of all the occupants, optimising the effectiveness of restraint systems by an adaptable or anticipated action, or even conceiving new types of passive safety devices.

The focus of the project is on applications for passenger cars. The sensor technologies investigated are especially the microwave radar, laser and computer vision. All the different scenarios of road and traffic are taken into account.

Starting from the existing knowledge on Advanced Driver Assistance Functions (ADAS), the Chameleon objective involves therefore the following main aspects:

- To define a system concept for this new function, exploring how to link preventive and passive safeties in order to obtain an added safety value;
- To investigate the sensor requirements, identify the most useful technologies, develop and test suitable sensor solutions;
- To define what type of information should be delivered to the passive safety systems and especially the correct timing before the crash;
- To evaluate effectiveness and safety benefits of a pre-crash system, analysing new solutions for restraint systems.
Methodology:

To reach these results, a first important point is to improve the performance of sensors now available for ADAS, particularly in term of range, data rate, and capability to track close objects. This is related to the shorter times and distances involved in the pre-crash application domain.

A further key issue is to develop crash prediction algorithms, which are able to estimate when a risky situation is about to turn into an unavoidable crash, with suitable advance time but maintaining an acceptable reliability.

The final pre-crash evaluation in Chameleon involves a demonstrator vehicle and several ad-hoc test procedures defined in the project itself. Besides a technical analysis, the evaluation framework includes an impact analysis and a study on safety, legal issues and standards.

Related Projects:

- Protector (IST)
- PReVENT (Sixth Framework Programme)
- Aprosys (Sixth Framework Programme).

Parent Programmes:
FP5-IST KA1 - Systems and services for the citizens

Institute type: Public institution
Institute name: European Comission, DG Information Society
Funding type: Public (EU)

Partners:

Organisation: Centro Ricerche Fiat
Address: Strada Torino
Zipcode: I - 10043
City: Orbassano
Contact country: Italy
Telephone: +39-011-9083595
Fax Number: +39-011-9083337

Key Results:

1) The Chameleon project, starting from basic ideas, has defined a concept for the pre-crash application and implemented the system in a demonstrator car.

2) A functional Road map to guide future developments has been identified.

3) Prototypes of advanced sensor solutions for the pre-crash have been developed and tested:

- A compact multi-beam laser with high update rate (100 Hz);
- A short range radar at 24 GHz, covering a range down to 0.5m;
- A 77 GHz radar complementary to the ACC sensor;
- A laser scanner with wide field of view and precise distance measurement;
- An active stereo video sensor for the detection and classification of objects.

4) Crash prediction algorithms have been developed and tested, delivering good predictions of the time to impact and of the impact speed and position.

5) The project has shown the feasibility of the pre-crash concept; the application is still in a preliminary phase of development, considering the present performance of sensor technologies. Gaps to the realisation have been defined by suitable testing and analysis.

6) Tools and methods for an effective evaluation have been defined, with innovative approaches to test ‘crash’ or ‘quasi-crash’ conditions.

7) The potential impact of pre-crash has been confirmed by bio-mechanical simulations and expert evaluations: the availability of pre-crash information makes possible the development of restraint systems more effective than the state of the art.

**Policy implications**

According to the Road-map, Chameleon will contribute to the realisation of marketable products, in a time frame around five years for the first categories of applications. Besides the pre-crash function, several Chameleon subsystems and tools will be available, as enablers for a series of products, especially the sensor technologies, the SW modules, the testing methods. Even if the final control function will concern the passive safety equipment, the focal point remains the sensorial technology.

In this frame, considering the expected trends for Driver Assistance applications, exploitation will be based on the following approaches:

- products will be presented with a strong ‘safety related’ content, changing somehow the from previous ADAS commercial applications more focused on comfort;
- specific features of the different sensor technologies, conceived for accurate and fast detection at short range, will be exploited;
- the multifunctional applications already investigated in the project will be further explored and proposed, due to the remaining high costs of the sensor devices.

Sensor suppliers have already launched development programmes with automotive partners regarding the technologies of the project. Car manufacturers are continuing their efforts to design and produce safer cars, and will make use of project results concerning especially the system definition, the sensor characteristics, the testing procedures. Sensor fusion still requires R&D work to improve the reliability of situation capture. The engineering company is actively developing SW products based on the Chameleon approach. The research institutes are using the methods and technologies developed in Chameleon for the realisation of new vehicle demonstrators and for projects in the area of preventive...
safety.

Road

Key Findings
No results directly relevant to this theme. However, please note that some findings relevant to the project's key theme (Safety and Security) are generically applicable.

Documents:

- CHAMELEON - Final Report (Final report)

**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