Robotic ADaptation to Humans Adapting to Robots

Fact Sheet

Project Information

RADHAR

Grant agreement ID: 248873

Funded under
FP7-ICT

Overall budget
€ 3 292 071

EU contribution
€ 2 418 212

Coordinated by
KATHOLIEKE UNIVERSITEIT LEUVEN
Belgium

Start date
1 August 2010

End date
31 July 2013

Closed project

Project description

Cognitive Systems and Robotics
Intelligent Robotic wheelchair - Shared autonomy between human and the wheelchair

The success of airplanes autopilots in reducing navigational complexity and improving safety explains the strong interest to introduce navigational assistance in other transportation means as well. However, implementing robotic navigation correction on a large scale also represents a potential safety risk for millions of users. For this reason, a thorough understanding of driver behaviour is imperative, besides pervasive environment perception. RADHAR proposes a framework to seamlessly fuse the inherently uncertain information from both environment perception and the
driver’s steering signals by estimating the trajectory the robot should execute, and to adopt this fused information for safe navigation with a level of autonomy adjusted to the user’s capabilities and desires.

The first autopilots in airplanes can be traced back to the beginning of the twentieth century. These devices greatly reduced the pilot’s workload by taking over parts of the navigation. The success of autopilots in reducing navigational complexity and improving safety explains the recent interest to introduce navigational assistance in other transportation means as well. However, implementing robotic navigation correction on a large scale also represents a potential safety risk for its users. For example, some plane crashes have been attributed to the incorrect estimation by pilots of the state of the plane’s automatic pilot, an effect known as mode confusion. RADHAR therefore proposes a novel framework to design human-aware adaptive autonomy that avoids mode confusion by embedding a thorough understanding of diver behaviour and estimated intention into the decision making. Through lifelong, unsupervised learning, the robot will fuse the inherently uncertain information from environment and driver perception sensors; autonomously estimate the user model and intention and calculate a human-friendly trajectory. Since human characteristics vary over time a continuous interaction between two learning systems will emerge, hence RADHAR: Robotic ADaptation to Humans Adapting to Robots. In order to apply this framework to realistic real-world scenarios, sensor models will be developed to build 3D models of the environment with estimation of dynamic obstacles’ motion and terrain traversability. To verify driver model assumptions such as focus-of-attention, the driver’s posture and facial expression will be estimated with a camera and a haptic interface. The framework will be demonstrated on a wheelchair platform that navigates in an everyday environment with everyday objects. Tests on various levels of autonomy can be performed easily and safely on wheelchairs. Evaluation will happen by a diverse and challenging population of wheelchair users who currently drive unsafely.
**Funding Scheme**

**Coordinator Contact**

Joris DE SCHUTTER (Prof.)

**Coordinator**

KATHOLIEKE UNIVERSITEIT LEUVEN

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Website  
Contact the organisation

**Administrative Contact**

Tine Heylen (Ms.)

**Participants (8)**

**PROFACTOR GMBH**

Austria

EU contribution

€ 384 513

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Website
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Andrea Möslinger (Ms.)

**ACMIT GMBH**

Austria

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EIDGENOESSISCHE TECHNISCHE HOCHSCHULE ZUERICH

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EU contribution
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