MOBILE HOUSEHOLD ASSISTANT FOR HANDICAPPED AND ELDERLY PEOPLE

Initial situation

Mrs. K. is 82 years old. Her children are long since grown up and she is now living on her own. She is still in shape for her age, but as of late she is not as nimble and has problems picking things up.

Her nurse from the social service comes two times a week to look after her. The rest of the week Mrs. K. is supported by Elmar. This is how she named her new assistance robot. “He” assists her, e.g. if she needs to bend down to take something out of the cupboard or if something has fallen to the ground.

At the beginning, she was skeptical whether she should learn how to control a robot at her age. But by using the intuitive gesture control system she learned quickly and now highly values her little robotic helper. Elmar is very independent due to novel 3D sensors.

Goal

To fulfill this vision of a self-determined life up to a high age, the Fraunhofer AST works on a new 3D sensor based indoor localization system and navigation methods. The project partners Focal Meditech BV and Götting KG take care of the development of the robot platform including tools for grabbing and carrying.

In this joint project granted by the German ministry of education and science, a robot shall be developed, to assist elderly and handicapped people to deal with their daily life.

The main tasks of this household robot are fetch and bring services.

To fulfill this tasks a robot arm will be integrated. Also it should drive to the charging station autonomously.
### Concept

The challenge in this project is the field of application – domestic – because this is a complex working area for a robot. Therefore the Fraunhofer AST will develop an intelligent control system. This needs to be robust and designed for the “near human use”. Furthermore it has to work nearly without human interventions.

The robot shall recognize its environment autonomously and detect and handle changes in its surroundings accordingly. This information is necessary for the system to “find its way” through an apartment or to avoid obstacles. Furthermore the interaction with the user is important to improve acceptance and usability and is treated as a principal point in the project OTHELLO. For this task, guided and autonomous learning skills are compiled for the assistance robot.

### Technology

For the secure use in a home, a comprehensive perception of the environment is necessary.

For this reason 3D cameras are used, and for those an appropriate data processing to evaluate the 3D data will be developed. In particular a data registration for multiple cameras into one map has to be realized, which is used for the path planning and reactive navigation. For the reactive navigation „potential-field“ approaches shall be refined for the special characteristic of the OTHELLO platform. The aim is to react on planning insecurities due to moving obstacles or sensor noise of the 3D cameras in a real-time capable control loop. For the intuitive handling of the OTHELLO assistance robot a gesture based controlling will be developed, which adapts itself to the user.

Last but not least, OTHELLO should be a cost-effective and energy-saving mobile assistance system. For this reason small, embedded components are used for realization of the intelligent control.

### Projectpartner

- FOCAL Meditech BV (project management)
- Advanced System Technology AST Branch of Fraunhofer ISOB
- Götting KG

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1. A Robot arm by Focal, which will be enhanced for the special task in this project.

2. Example of an autonomous mapping of the environment by the robot under use of its sensors.