

# FAROMIR

## Autonomous medical assistance robot by the University of Duisburg-Essen

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*Open-Minded*

„To meet the challenges of demographic changes, we must allow as many people as possible to live in their familiar surroundings well into old age,“ stressed Barbara Steffens, Health Minister of North Rhine-Westphalia at a symposium in October 2011. As an example, support for people needing assistance in their own home can consist of adapting new technologies so that they can be used increasingly and sustainably in healthcare. Assistance systems are a particularly good example for such technological innovations. They not only allow intuitive support, but also react positively to the needs of older people.

To meet this requirement, the University of Duisburg-Essen has developed, in a cooperative project which involves the three chairs of Mechanics and Robotics, Mechatronics, and Production Engineering, in conjunction with Innovations-Fabrik, an assistance robot that can be used by older people in their everyday environment. This omnidirectional robot is called FAROMIR (Functional Autonomous Detection Robot for Omnidirectional Motion in Realistic Environment). Since it is provided with lithium polymer accumulators, it operates autonomously and independently of the time of day.



An essential component of FAROMIR is the built-in camera system. A depth camera supplies its data per pixel in real time, so that in combination with a colour camera, colour and depth information can be assigned to every point of the camera scene. This information is used for the touchless gesture-based interaction based on body postures. Thus, the central functionality of the robot is the evaluation of a person's state of health. The robot can clearly differentiate whether the person is lying on a couch or being in an emergency situation. A specific reaction to the evaluation of the skeletal structure is based on specific anatomical characteristics which FAROMIR can detect. For example, if FAROMIR detects a posture that may indicate a fall at home, and if this state continues, the substantial functionality of the assistance system is started: The position of the robot and a colour picture of the situation can be transmitted via WLAN or UMTS to a central rescue control centre.

Thus, trained personnel or family members who receive encoded information can react immediately.

Orientation can be facilitated by static and dynamic path planning. After a layout plan of the home is downloaded, the program divides its environment into a grid of ten square-centimetre areas. The system recognizes walls and fixtures as static objects. On the other hand, the dynamic component of path planning deals with objects which are recognized as obstacles during movement. Coupled with the information from static mapping, algorithms calculate the correct path in real time. This makes FAROMIR an assistance system that may not replace trained, qualified nursing care, but which can certainly contribute to making work easier for the staff. In addition, FAROMIR allows family members to worry less about the current state of health of old people living alone.

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