EU-funded projects in Robotics for Ageing Well

Service and care robots could play a supportive role in the life of many chronic patients and elder people who want to live independently for more years. The European Commission funds research, innovation and development activities for service robotics in what is called assisted living environments made of advanced ICT solutions such as sensors.

Over the last years, research projects in robotics for ageing well have been funded under the ICT strand of the seventh research framework programme (FP7) and under the Ambient Assisted Living Programme, with a total budget of 50M€.

Since 2015, a batch of care robotics projects have been launched under the new Research and Innovation Framework Programme Horizon 2020 (H2020), with a total funding amount of 185 M€.

Recent and ongoing projects under FP7 and Horizon2020 are presented here. For applied research carried out under the Ambient Assisted Living Programme, refer to the 2008-2013 Catalogue of Projects.
Shopping centres, airports, museums and hospitals are the kind of complex and confusing environments where elderly people on the verge of cognitive decline could have difficulties walking around without help. This led researchers on the DALI project to develop a robotic cognitive walker (c-Walker) that can be taken to, or picked up at, the place to be visited, gently guiding the person around the building safely. The device takes corrective actions when the user comes across the type of busy area, obstacle or incident they want to avoid.

The c-Walker uses different solutions (RFID tags, invisible QR codes, and cameras) to localise itself in the environment. Furthermore, it can connect with remote sensors, such as surveillance cameras, and with other c-Walkers deployed in the environment to gain remote knowledge of the presence of anomalies, crowded spaces or hazards. The device is equipped with brakes and motorised wheels. Haptic armbands tell users when and how to turn. They can also call for assistance if necessary.

ENRICHME tackles the progressive decline of cognitive capacity in the ageing population proposing an integrated platform for Ambient Assisted Living (AAL) with a mobile service robot for long-term human monitoring and interaction, which helps the elderly to remain independent and active for longer. The system will contribute and build on recent advances in mobile service robotics and AAL, exploiting new non-invasive techniques for physiological and activity monitoring, as well as adaptive Human-Robot Interaction (HRI), to provide services in support to mental fitness and social inclusion. The system will enable caregivers and medical staff to identify evolving trends of cognitive impairments and to detect immediate emergencies. ENRICHME will use new qualitative models for rich yet compact representations of daily life activities.

GIRAFF+ has developed a system for early detection and adaptive support to people's changing needs related to ageing. The Giraff+ system consists of a network of home sensors that measure e.g. blood pressure and temperature, or detect e.g. whether somebody occupies a chair, falls down or moves inside a room. The data from these sensors are interpreted by an intelligent system in terms of activities (e.g. the person is going to bed) and health and wellbeing (e.g. the person is tired or well rested). Alarms or reminders to the person or his/her caregivers can be triggered, and the generated data can be analysed over time by a health professional. Part of the system is a telepresence robot, the Giraff, which can be moved around in the home remotely via the internet, e.g. by a caregiver. The Giraff is effectively a mobile communication platform, with video camera, display, microphone and speakers, which helps the user to maintain his/her social contacts.
### GrowMeUp

http://www.growmeup.eu/

**Up to 2.7 M€ EC funding (Horizon 2020)**

*February 2015 - January 2018*

The main goal of the project is to provide an affordable robot that will be able to learn from older people's routines and habits, therefore enhancing and adapting its functionality to dynamically compensate the constant deterioration of the cognitive ability of individuals, while simultaneously ensuring a consistent service provision and quality of life throughout the aging process. Moreover, cloud-computing technologies will be explored and developed so as to allow different robots to share information between each other, where each unit will be able to capitalize from a collective knowledge base of service information.

One important advantage of the robotic system GrowMeUp is its ability to grow over time to cope with elderly specific preferences. More specifically, the system provides an adaptable and intelligent dialogue component that will make the system more attractive for older people to interact with. By correlating dialogues with recognized emotions during the interaction, the system will be capable of holding multiple interactions and building emotional bonds with the older person in the same way that humans do. For example, the system will remember and learn from previous interactions and use this knowledge in future dialogues and decisions.

### HOBBIT

**The Mutual Care Robot**

http://hobbit-project.eu/

**Up to 2.8 M€ EC funding (FP7)**

*November 2011 - August 2015*

HOBBIT sets out to investigate the Mutual Care paradigm to overcome problems of robot acceptance by older persons. World players in home care robotics tend to focus on pragmatic single function systems (USA) or humanoid robots (Japan, Korea). HOBBIT zooms in on the interaction between robot and owner/user with a new, more user-centred concept called “Mutual Care”. It allows and entices people to "take care" of the robot like a partner, so they can develop real feelings and affections toward it. For people it is easier to accept assistance from a robot when they themselves can also assist the machine. In close cooperation with institutional caregivers, acceptance and usability of the robots are being measured and improved.

### I-SUPPORT

**ICT-Supported Bath Robots**

http://www.i-support-project.eu

**Up to 3.5 M€ EC funding (Horizon 2020)**

*March 2015 - February 2018*

The goal of the project is to develop a robotic shower system to assist frail persons with the movements associated with showering. Also, the system will assist in sit-to-stand and stand-to-sit actions when they enter the shower cabin. For this purpose the proposed system will be equipped with three service robotic devices:

- A motorized shower chair dedicated to the provision of the stand-to-sit and sit-to-stand functionality.
- A robotic shower hose dedicated to the provision of pouring water, soaping, etc.
- A robotic washer/wiper dedicated to the provision of scrubbing, wiping and drying.

The robotic shower hose will be made of soft materials and its design will resemble that of a conventional shower hose. The central controller of the I-SUPPORT robot will control the motion of the robotic shower hose to wash difficult-to-reach parts such as the back or the feet. The robotic shower hose will move either semi-autonomously (i.e. its motion will be partially controlled by the computer and partially by the person) or will be tele-manipulated in a very intuitive way by the frail senior him/herself using a device very much similar to a TV remote control.
<table>
<thead>
<tr>
<th>MARIO</th>
<th>Managing active and healthy aging with use of caring service robots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The project will last for three years during which three pilot studies of robots interacting with people with dementia will be undertaken. The first pilot will run in the West of Ireland, organised by NUI Galway’s School of Nursing and Midwifery, the second will run in Stockport, UK, organised by the city’s health care managers, while the third will run in Italy, organised by a leading research hospital, Casa Sollievo della Sofferenza, which is pushing research boundaries in comprehensive geriatric assessment.</td>
</tr>
<tr>
<td></td>
<td>The technology at the heart of MARIO is the robot Kompai, designed and developed by a consortium partner, French company Robosoft. Other partners in the consortium will provide technological expertise in the areas of robotic applications and semantic computing.</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.mario-project.eu/">http://www.mario-project.eu/</a></td>
</tr>
<tr>
<td></td>
<td>Up to 3.3 M€ EC funding (Horizon 2020)</td>
</tr>
<tr>
<td></td>
<td>February 2015 – January 2018</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RADIO</th>
<th>Robots in assisted living environments: Unobtrusive, efficient, reliable and modular solutions for independent ageing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RADIO action’s four main dimensions: User acceptance, Integrated and power-aware data collection – transmission – processing, User interfaces and Architecture, will pave the way for wider deployment of technology solutions in active and healthy ageing, for integration of robots and smart home sensors in the Internet of Things and for larger penetration of technology – based solutions. In a wide-area ecosystem of RADIO deployments, different societal needs and health problems will be addressed by different configurations of the key enabling technologies.</td>
</tr>
<tr>
<td></td>
<td>The consortium is pursuing a novel approach to acceptance and unobtrusiveness: a system where sensing equipment is not discrete but an obvious and accepted part of the user’s daily life. By using the integrated smart home/assistant robot system as the sensing equipment for health monitoring, we divert the users’ attention from the functionality of the sensors rather than from the sensors themselves. In this manner, sensors do not need to be discrete and distant or masked and cumbersome to install; they do however need to be perceived as a natural component of the smart home/assistant robot functionalities.</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.radio-project.eu">http://www.radio-project.eu</a></td>
</tr>
<tr>
<td></td>
<td>Up to 1 M€ EC funding (Horizon 2020)</td>
</tr>
<tr>
<td></td>
<td>April 2015 – March 2018</td>
</tr>
</tbody>
</table>
### RAMCIP
**Robotic Assistant for MCI patients at home**

http://www.ramcip-project.eu

*Up to 3.9 M€ EC funding (Horizon 2020)*  
*January 2015 - February 2017*

The RAMCIP vision is of future service robots for assisted living environments that can provide safe, proactive and discreet assistance in the significant aspects of the user’s daily life, ranging from food preparation, eating and dressing activities, through to managing the home and keeping it secure. At the same time, the robot should help the user maintain a positive outlook and also to exercise their cognitive and physical skills. RAMCIP will work towards future robots which help the users to perform exercise as part of their assistive work, thus embedding exercise in their daily behaviour.

The key research strands the RAMCIP consortium will address to make this possible are:

- Cognitive functions based on advanced modelling and monitoring of the user and home, allowing the robot to decide when and how to assist, acting autonomously or in cooperation with the user.
- Adaptive multimodal human-robot communication interfaces, with a strong emphasis on empathic communication and augmented reality displays.
- Advanced, dextrous and safe robotic manipulation capabilities, for the first time applied in service robots for assisted living environments, enabling grasping and manipulation of a wide variety of home objects, as well as safe physical HRI, introducing assistance activities that involve physical contact, all with special emphasis on safety.

### ROBOT-ERA
**Implementation and integration of advanced Robotic systems and intelligent Environments in real scenarios for the ageing population**

http://www.robot-era.eu/robotera/

*Up to 6.5 M€ EC funding (FP7)*  
*January 2012 - December 2015*

Robot-Era develops, implements and demonstrates the general feasibility, scientific/technical effectiveness and social/legal plausibility and acceptability of a plurality of complete advanced robotic services, integrated in intelligent environments. These robotic services will actively work in real conditions and cooperate with real people and between them, to favour independent living, improve the quality of life and the efficiency of care for elderly people. The Domestic, Condominium and Outdoor robotic platforms have been developed and the Robot-Era services have been defined. The first experimental loop in Peccioli (Italy) and Ängen (Sweden) started in September 2013.

### SILVER
**Supporting Independent LiVing for the Elderly through Robotics**

http://www.silverpcp.eu/

*Up to 2.6 M€ EC funding (FP7)*  
*January 2012 - September 2015*

SILVER searches for new robotics based technologies to assist elderly people in their everyday lives. Their purpose is to help older people to continue independent living at home even if they have physical or cognitive disabilities. A unique aspect of SILVER is that it uses a Pre-Commercial Procurement (PCP) process to identify and select the new technologies and solutions. In Europe, the PCP has so far been an under-utilized tool for promoting innovation. One of the aims of this project is to demonstrate the effectiveness of the PCP approach to address societal and governmental needs.

*Updated January 2016*