EU-funded research into robotics for rehabilitation and independent living

The projects below are funded under the Seventh (FP7: 2007-2013) Framework Programmes for Research and Technological Development and the AAL Joint Programme.

FP7 ICT

BCI-DRIVEN ROBOTS:

Better - Brain-Neural Computer Interaction for Evaluation and Testing of Physical Therapies in Stroke Rehabilitation of Gait Disorders

The project is validating, technically, functionally and clinically, the concept of improving stroke rehabilitation with wearable exoskeletons and robotic gait trainers: The robot exerts physical stimulation -at the periphery- as a function of targeted *neural activation patterns* (related to user involvement). This intervention is expected to result in reorganizations in the cortex.

Project website: www.iai.csic.es/better

TREMOR - An Ambulatory BCI-driven tremor suppression system based on functional electrical stimulation

This research project will validate, technically, functionally and clinically, the concept of mechanically reducing the tremor through selective Functional Electrical Stimulation of muscles. The Brain Computer Interaction (BCI) detection of involuntary motor activity will combine CNS (Electroencephalography) and PNS (Electromyography) data with biomechanical data (Inertial Measurement Units, IMUs). The system will model and track tremor and voluntary motion.

Project website: www.iai.csic.es/tremor

Mindwalker – Mind Controlled Orthosis And Virtual Reality Training Environment For Walk Empowering

The purpose of this project is to help restore the walking ability of people having lost the use of their legs due to spinal cord injury. This will be made possible thanks to a robotic exoskeleton worn by the disabled person, powered by actuators and controlled by his/her brain. New smart dry EEG (electroencephalogram) bio-sensors will be applied to enable lightweight wearable EEG caps for everyday use. Novel approaches to non-invasive BCI (brain-computer interaction) will be experimented in order to control a purpose-designed lower limbs orthosis enabling different types of gaits. Complementary research on EMG processing will strengthen the approach. A Virtual Reality (VR) training environment will assist the patients in generating the correct brain control signals and in properly using the orthosis.

Project website: https://mindwalker-project.eu/

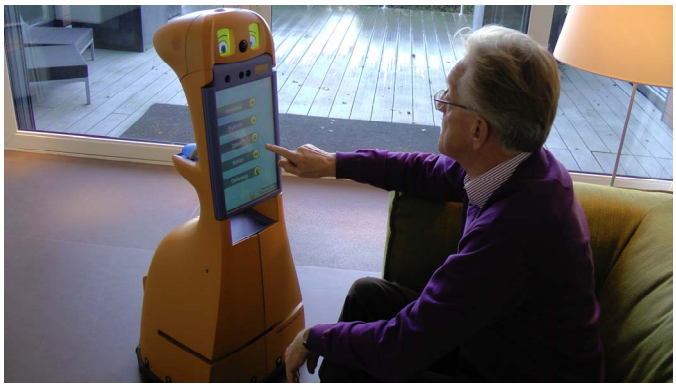
WAY - Wearable interfaces for hAnd function recovery

This project addresses the scientific problem of recovery of hand function after amputation, or neurological disabilities like spinal cord injury, brachial plexus injury, and stroke. WAY demonstrators are able to restore a physiological bidirectional link between artificial aids and patients, and will be shown in clinical studies to improve the ability of users to perform activities of daily living (ADL) and thus to attain enhanced autonomy and quality of life. In other words, the project investigates new WAYs to link the brain with upper limb aids. This result is obtainable by employing already available sensorized hand assistive devices within the consortium—a dexterous prosthesis and an exoskeleton—and by developing non-invasive wearable interfaces designed for bidirectional data flow of sensory information and motor commands.

Project website: http://www.wayproject.eu/

ROBOTS FOR INDEPENDENT LIVING:

Companionable (IP) - Integrated Cognitive Assistive & Domotic Companion Robotic Systems for Ability & Security



The Companionable integrated project has linked intelligent home systems with Hector, a fully autonomous robot designed to play the role of a “companion” for elderly people (especially those living alone, or spending many hours of the day alone), to help them remain independent, secure fit and happy, through fall detection mechanisms integrated with emergency calls or remote monitoring services, personalised dialogue/interaction displaying emotional intelligence (using both visual, vocal and tactile interfaces, sensor-based movements such as “follow me” and natural language recognition of commands) to avoid feelings of loneliness, provide friendly reminders, store/bring important objects such as keys, wallet, and offer cognitive stimulation/games, as well seamless video connections to family and friends.

Project website: companionable.net

FLORENCE - Multi Purpose Mobile Robot for Ambient Assisted Living

The Florence system with its multipurpose mobile robot platform is pioneering the use of robots in delivering new kinds of AAL services to elderly persons and their caretakers. The main objective is to make this concept acceptable for the users and cost effective for the society and care givers. Florence will put the robot as the connecting element between several stand alone AAL services in a home environment as well as between the AAL services and the elderly person.

Project website: www.florence-project.eu

SRS - Multi-Role Shadow Robotic System for Independent Living

The project will demonstrate an innovative, practical and efficient system called “shadow robot” for personalised home care. SRS solutions are designed to enable a robot to act as a shadow of its controller. For example, elderly parents can have a robot as a shadow of their children or carers. In this case, adult children or carers can help them remotely and physically with tasks such as getting up or going to bed, doing the laundry and setting up ICT equipment etc. as if the children or carers were resident in the house.

Project website: www.srs-project.eu

MobiServ – An Integrated Intelligent Home Environment for the Provision of Health, Nutrition and Mobility Services to the Elderly

The objective of the MOBISERV project is to design and evaluate a system and service to support independent living of seniors by means of a proactive personal companion robot integrated with smart textiles, innovative sensors, and a smart home environment. The system monitors your physical activity and health indicators by means of wearable fabrics, monitors your nutrition habits by smart home sensors, and offers an extensive secure portal for informal and professional carers to use, setup, and fine-tune the support system. MOBISERV provides older adults with: 1) nutrition assistance and dehydration prevention by eating and drinking reminders and encouragements; 2) a personal health coach encouraging physical activity and specific exercises, and supporting telemedicine services; 3) well-being services for cognitive stimulation and social inclusion, responding to the user’s emotions; 4) games for entertainment 4) a mobile remote control for the home environment; 5) fall detection with direct communication to a care centre; and 6) video communication to friends and family.

Project website: www.mobiserv.info

KSERA - Knowledgable SErvice Robots for Aging

KSERA investigates the integration of assistive home technology and service robotics to support older users in a domestic environment. The KSERA system helps older people, especially those with pulmonary disease, with daily activities and care needs and provides the means for effective self-management. The main aim is to design a pleasant, easy-to-use and proactive socially assistive robot that uses context information obtained from sensors in the older person’s home to provide useful information and timely support at the right place.

Project website: www.ksera-project.eu

ACCOMPANY - Acceptable robotiCs COMPanions for AgeiNg Years

The ACCOMPANY system will consist of a robotic companion as part of an intelligent environment, providing services to elderly users in a motivating and socially acceptable manner to facilitate independent living at home. The ACCOMPANY system will provide physical, cognitive and social assistance in everyday home tasks, and will contribute to the re-ablement of the user, i.e. assist the user in being able to carry out certain tasks on his/her own. Services to the user will be delivered through socially interactive, acceptable and empathic interaction, building on computational models of robot social cognition and interaction. The envisaged relationship of the user with the robot is that of a co-learner – robot and user providing mutual assistance for the user not to be dominated by the technology, but to be empowered, physically, cognitively and socially.

Project website: http://accompanyproject.eu

HOBBIT - The Mutual Care Robot

While world players in home care robotics tend to follow a pragmatic approach such as single function systems (USA) or humanoid robots (Japan, Korea), HOBBIT introduces a new, more user-centred concept called “Mutual Care”: By providing a possibility for the Human to “take care” of the robot like a partner, real feelings and affections toward it will be created. It is easier to accept assistance from a robot when in certain situations, the Human can also assist the machine. In turn, older users will more readily accept the help of the HOBBIT robot. Close cooperation with institutional caregivers will enable the consortium to continuously improve acceptance and usability.

Project website: http://hobbit-project.eu/

DALi - Devices for Assisted Living

DALi targets a user group consisting of older adults with emerging non-severe cognitive disabilities. These are often compounded by deterioration in auditory and visual sensing abilities. DALi proposes a cognitive navigation prosthesis, a device that assists navigation in unstructured and crowded environments by acquiring sensory information, by anticipating the intent of human agents and by deciding the path that minimises the risk of impacts or of anti-social behaviours. With recent advances in sensing, automated reasoning, and crowd modelling this ambitious objective becomes technologically feasible. The project will prototype a novel cognitive walking assistant (the c-Walker), a device based on a standard mobile robotic platform.

Project website: www.ict-dali.eu

Robot-Era (IP) - Implementation and integration of advanced Robotic systems and intelligent Environments in real scenarios for the ageing population

The objective of Robot-Era is to develop, implement and demonstrate the general feasibility, scientific/technical effectiveness and social/legal plausibility and acceptability by end-users of a plurality of complete advanced robotic services, integrated in intelligent environments, which 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.
Project website: http://www.robot-era.eu/robotera/

Giraff+ - Combing social interaction and long term monitoring for promoting independent living

Early detection and adaptive support to changing individual needs related to ageing is an important challenge in today society. The Giraff+ project aims at developing a system that addresses such a challenge. The system consists of a network of home sensors that measure e.g. blood pressure or 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. These activities can then trigger alarms or reminders to the person or his/her caregivers, or be analysed over time by a health professional. There is also a telepresence robot, the Giraff, which can be moved around in the home by somebody connected to it over internet, e.g. a caregiver. The Giraff is effectively a mobile communication platform, equipped with video camera and display, and microphone and speakers, and it helps the user to maintain his/her social contacts.
Project website: http://www.giraffplus.eu

AAL Joint programme projects

DOMEO – Domestic Robot for elderly assistance

Two robotics platforms are evaluated in DOMEO project, RobuMate for cognitive stimulation and daily life assistance, and RobuWalker for walking assistance. These 2 platforms are connected with a remote medical centre through Web interface.

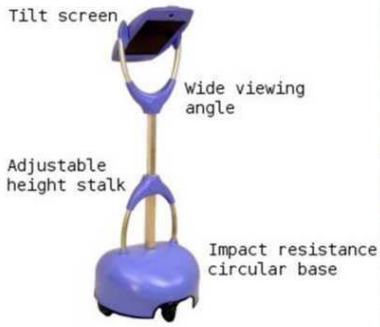
Project website: www.aal-domeo.eu

ALIAS: The Adaptable Ambient Living Assistant

The objective of the project Adaptable Ambient LIving ASsistant (ALIAS) is the product development of a mobile robot system that interacts with elderly users, provides assistance in daily life, and promotes social inclusion by creating connections to people and events in the wider world. ALIAS is embodied by a mobile robot platform with the capacity to monitor, interact with and access information from on-line services, without manipulation capabilities.
Project website: www.aal-alias.eu

ExCITE: Enabling Social Interaction through Embodiment

The purpose of the project is – in an in-situ, longitudinal, and pan-European scale - to evaluate user requirements for robotic telepresence employing the Giraff robotic platform. The ExCITE project methodology is highly inspired by a user-centric approach used for prototyping, validating and refining a solution in both multiple and evolving real contexts. In order for the results of the evaluations to be significant, prototype deployment must consider a large scale and a longitudinal perspective. This is possible in ExCITE because (1) a Giraff prototype designed to accommodate future needs already exists, (2) the members in the ExCITE project are geographically distributed in Italy, Spain and Sweden and (3) the end-user participation is closely tied to the consortium and project activities. Healthy adult volunteers have been selected at different end-user test sites. Each end user site has received a prototype to be tried and used for a period of time (up to 1 year). Currently test sites are on-going and the Giraff has already been improved technically and in user interface to address the challenges encountered. Feedback shows a very positive response from elderly and families and outlines the challenges in penetrating the organizations.



Project website: www.excite-project.eu

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