

Elements of Ambient Assisted Living and Cloud Robotics

Filippo Cavallo
Course 2013/2014
October – November 2014

“Ambient Assisted Living” (AAL) denotes concepts, products and services that interlink and improve new technologies and social systems, in order to enhance the quality of life for all people in all stages of their lives. AAL could be best translated as “intelligent systems of a specific assistance for a better and safer life in daily living environments”. ICT-enabled assisted living and innovative technological developments can really provide improvements in quality of life, autonomy, participation in social life, skills and employability of older people, home assistance for patients and caregivers, domiciliary assistance for slowing down the course of diseases (not early hospitalization) and reduction of welfare costs. The aim of this course is to present the main advanced technologies and methodologies to build AAL systems and services adequate to the end-users’ needs, adaptive to the environment and end-users’s behaviour, embedded not invasively in the environments, easily wearable by end-users, pro-active with Ambient Intelligence (AmI) capabilities and highly usable with advanced human machine interfaces. The main technological contents include wireless sensor network, wearable technology, service and cloud robotics.

Lesson 1

October 22, Wednesday, h11-13, Aula 1

“Introduction to course and definitions”

Filippo Cavallo

Introduction to Ambient Assisted Living, concepts, systems and application fields. Service robotics technologies: companion robot, social robotics, cloud robotics. Integration of smart environments and service robotics. Key project examples and AAL scenarios.

Lesson 2

October 27, Monday, h15-17, Aula 1

“Roboticising jobs, politicising bots”

Sakari Taipale, Mauro Sarrica & Leopoldina Fortunati

Socio-political perspective and key issues to understand social robotics. Large-scale adoption of robots in manufacturing, services work and in domestic settings vs. social inequality; political regulation and their effects locally and globally. AI, Robotics and the Future of Jobs. Robots will create more jobs than they replace, or net reduction of employment?

Lesson 3
November 3, Monday, h15-17, Aula 1
“Service design principles: acceptability and dependability ”
Filippo Cavallo

Design and methodology with user centred design and co-creative approach. Service design thinking. The concept of acceptability and dependability of technologies in designing robotics- and ICT-based services.

Lesson 4
November 6, Thursday, h11-13, Aula 1
“Wireless Sensor Networks for AAL applications ”
Filippo Cavallo

Introduction to wireless sensor network. ZigBee protocol and architecture. Hardware and firmware development. Wireless sensor networks for home automation. Integration of smart environments and robotic systems.

Lesson 5
November 10, Monday, h14-18, Aula 2
“Lab Immersion in Sensor Networks 1”
Filippo Cavallo, Manuele Bonaccorsi

Lesson 6
November 13, Thursday, h14-18, Aula 2
“Lab Immersion in Sensor Networks 2”
Filippo Cavallo, Manuele Bonaccorsi

Lab Immersion in Sensor Networks for Ambient Assisted Living applications. Students will have the possibility to work with specific tools, based on customized hardware, (firm/soft)ware development platforms and sensors (IAR STM32F, IAR STM32W, ZigBee and Bluetooth Protocols, Inertial Sensor ST Microelectronics iNemo M1, Invensense, etc.) to implement some advanced ICT systems for healthcare. Possible example of Body area network, using inertial and physiological sensors for biomechanics applications.

Lesson 7
November 17, h15-17, Aula 1
“Cloud robotics and applications”
Filippo Cavallo

Introduction to Cloud computing, definition and main concepts. Example of cloud services. Networked robotic systems. State of the Art for Cloud robotics. Implementation of Cloud robotics solutions. Introduction to indoor localization with WSN and main techniques. RSSI-based localization models. Sensor fusion and algorithms.

Lesson 8
November ??, h2 (to be defined with students)
“Presentations and discussions”
Filippo Cavallo, Manuele Bonaccorsi

Closure of the course and evaluation. Workshop on prototypes produced during the course.

In order to facilitate the organization of the Lab Immersion Lessons, it is recommended and appreciated early registration, because students will be divided in groups and each group will be provided with a hardware kit.