POLITECNICO
MILANO 1863

Computing Systems

Course Presentation 2021/‘22

Course Motivation

- The key enabler for future technology development is the ability of a system to **interact** (and expand) **with the physical world** through **computation**, **communication** and **control**.
- Three main trends:
  - Improve current devices and design new ones
  - Make intrinsic behaviors programmable
  - Apply technology where necessary and possible
- Some challenges are next-generation of vehicles (electrical autonomous vehicles), Industry 4.0, Smart environments.

Course Motivation

- To face with these trends it is necessary
  to improve, to identify, to apply and/or to design application specific systems,
  by using specific design methods and technological improvements
  in order to allow devices to pursue their goals,
  while they disappear to our sight…

Cyber Phisical System

Course Motivation

- Definition of Cyber Physical System
  - "*A cyber-physical system (CPS) is a **computer system** capable of **interacting continuously with the physical system in which it operates**. The system is composed of physical elements, each of them with computational capacity and closely brings together the so-called three "C": **computational**, **communication** and **control capacity**. The artificial structures of computation and communication, represented by the prefix "**cyber**", form a distributed system that interacts directly and dynamically with the real world that surrounds them. At the base of the system, the single element is the embedded device.*
    - *Among the possible applications: ambient intelligence (smart city – e.g. intelligent traffic control -, smart farms and agriculture, home automation, cooperating robots, automotive – autonomous driving -, intelligent factories (known as Industry 4.0)*"

Course organization

- Cyber Physical Systems – Contents
  - Smart Environments
    - Embedded System, Smart Ambient Systems (WSN), Wearable Computing, Intelligent Clothing Systems, smart tagging
  - Technology issues
    - System architectures and design
      - Technology, component, sensors, design methods, tools
    - Communication system
    - Dependability & security

Course organization

- To introduce the main aspects of **the design (e.g. prototyping) and programming for pervasive systems**, with **emphasis on the interaction with the external physical environment.**
- **Program and organization of the course**
  - **Computer Systems Outline**

Course organization

- Class Schedule
  - Thursday: 14.15 – 18.15 room 3.1.6 (4h)
  - Friday: 15.15 – 19.15 room 7.0.1 (4h)
    - Classes require the use of your laptop!
- Course
  - The course material
    - Slides prepared by teachers
    - Papers, docs etc. provide by the teachers

Course organization

Note: any project copied from the web without any personal contribution is considered plagiarism; the amount of the personal contribution has to be >70%!

- Project:
  - Project has could be performed in group (2 members)
  - Projects need to have board, sensors, wires etc. Groups must equip themselves with the necessary development kit.
    - For example, you can find ***arduino*** **kits** (Arduino, sensors, wires, etc.) on amazon - from € 15.00.
  - **The project has to be completed at the end of the course**

Projects 2020/‘21: Some Examples

- Projects
  - Type: Research oriented :
    - A. Baserga, F. Grandi «CHADS - CHair usAge Detection System» - Presentation, Video
  - Type: Product oriented :
    - F. Coviello, D. Refaldile “MEDUSA - Monitoring nEtwork for Determination of cUstomer Shopping Appeal” - Presentation , Video
    - B. Ghidotti, C. Motto «MAG-BOARD- Magnetic people detector» - Presentation, Video
    - L. Finazzi, F. Scali «GYVe: Grow Your Vegetables » - Presentation, Video
    - …
- Some videos (a collection)

Teachers

- Fabio Salice
  - Associate Professor at Politecnico di Milano
    - Main Research Field and Competences:
      - Assistive Technologies, Dependable Systems, pervasive systems design.
    - Fabio.Salice@polimi.it

- Andrea Masciadri
  - Ph.D. student
    - Main Research Field and Competences:
      - Data Analytics, Data Modelling, Concept Drift, Home automation
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