POLITECNICO DI TORINO

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Smart «Cittadella Politecnica»

Theme of the year 2015

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Politecnico di Torino, 2014/2015

Summary

- Definition of the Theme
- Essential features
- Analysis of survey results
- Hints, ideas, suggestions
- How to proceed?

Smart «Cittadella Politecnica»

DEFINITION OF THE THEME

Smart “Cittadella Politecnica”

- Identify, design and prototype some Ambient Intelligent features inside the Politecnico di Torino’s Campus
  - Classrooms, Offices, Corridors, Open spaces, Bars, Laboratories, Residences/dorms, …
  - The campus may be seen as a small city, apply on a small scale the ideas developed for Smart Cities
  - Benefit to students and/or teachers and/or staff and/or visitors …

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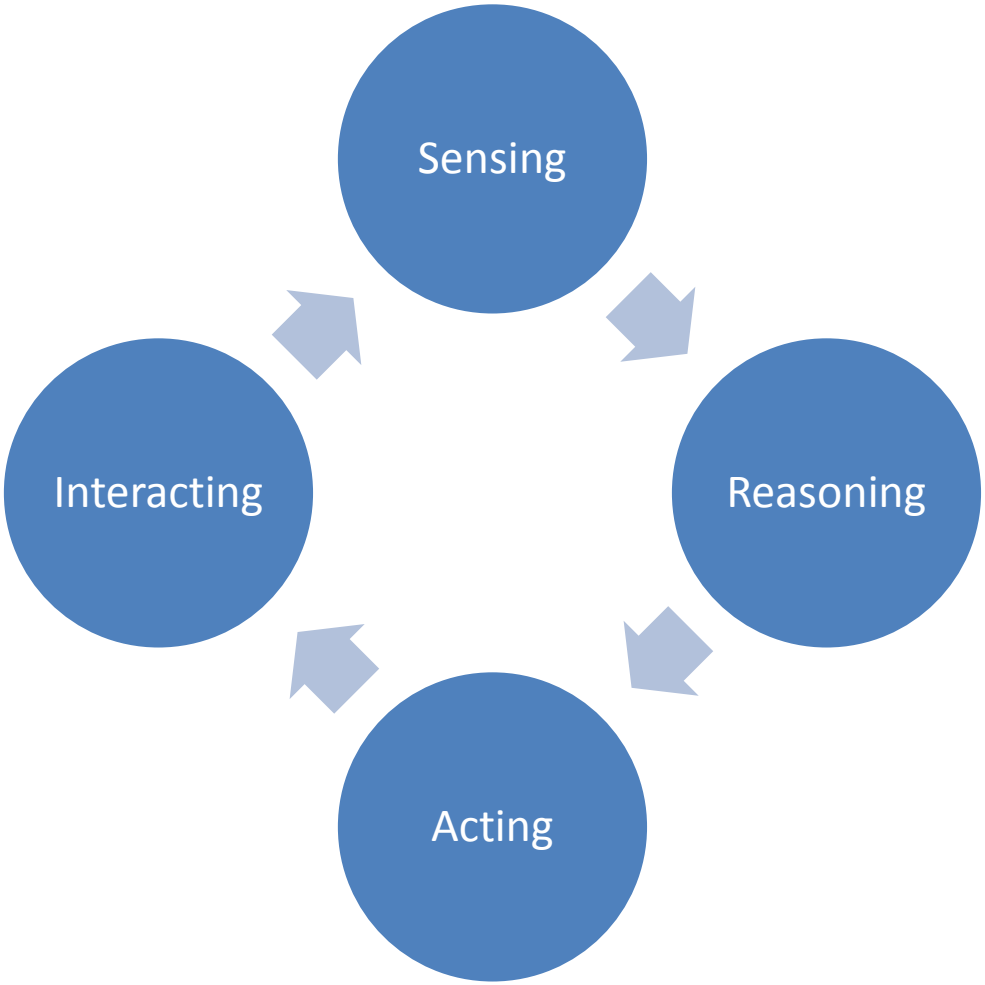
ESSENTIAL FEATURES

Include all 4 steps of AmI



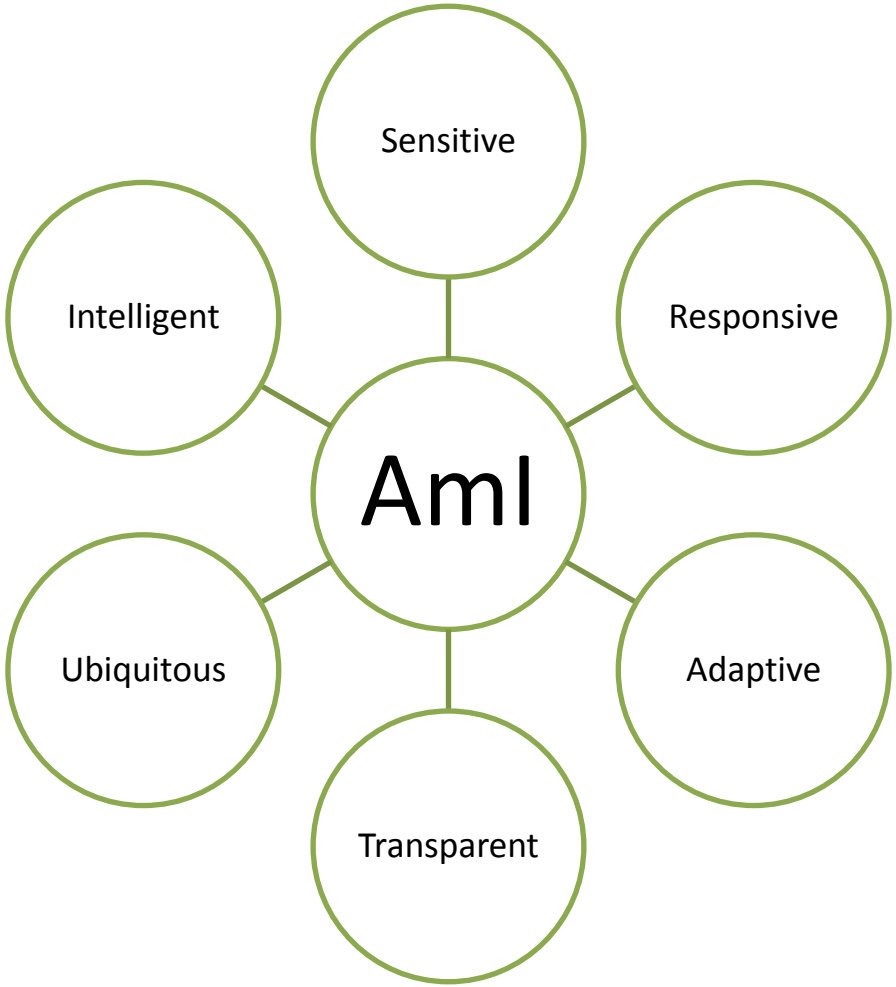
Corollary

- No mobile-only or software-only or cloud-only solutions
- No totally automated behind-the-scenes solutions (that don’t involve the users)
- Should involve some sensing (environmental, user, social, cloud, …)
- Should involve some actuation (on the environment, user, social, cloud, …)
- Should not be simply deterministic (some form of adaptation/intelligence is needed)

About Cloud

- Integrating with cloud services (Facebook, Google Calendar, Twitter, IFTTT, …) can be very useful
- May be used as “sensors” or “actuators”
- Must not be the only sensor and actuator

Try to incorporate most AmI features



Additional constraints (1)

- We can’t modify the infrastructure
  - Walls, doors, hallways, …
  - Lighting, heating, cooling, Wi-Fi, Internet, …
  - Additional devices are ok
  - Many existing plants are already monitored, we may get some data, if needed

Additional constraints (2)

- Easy to demonstrate
  - Easy to show in a lab setting
  - Easy to be moved, installed elsewhere
  - No permanent installations required
    - Except in special “safe” places (Ladispe, some office, some department, …)

Some resources

- http://smartgreenbuilding.polito.it/

Smart «Cittadella Politecnica»

ANALYSIS OF SURVEY RESULTS

The question

- Please provide (max 3) short phrases for describing how would you make the current Politecnico Campus (Cittadella Politecnica) more "smart". Try to describe them by the "end user" (student, teacher, ...) point of view, don't focus on the technology.
  - 55 respondents to the survey
  - 26 provided ideas (47%)

Idea Categories

- Infrastructure
  - no
- Mobile-only
  - no
- Only Human behavior
  - no
- Procedures, bureaucracy
  - no (even if we all would love)

Your responses (1)

- more places to make group studies and discuss lessons (it's the best way to study)
- more interaction with teachers (many teacher treat us like watching us from above and after teaching their class they are done)
- Application to report free study classrooms with the number of seats free
- create an internal messaging system. The network should run on Politecnico's wi-fi and there should be a single subnet per each room, in order to make more interactive courses, in which every student could ask a question without interrupting the professor's speaking.
- Have a wider and faster internet open access.
- Give and establish more project-oriented lessons or Lab sessions.
- Have an interactive portal between teacher and student
- It would be useful to know, in an easy way, if there's a lesson in a specific class or not. It this way, if the class is empty, a student can use that class as a study room. It would be also useful if the smallest classes could be booked by a group of students for few hours to study or work on a project.

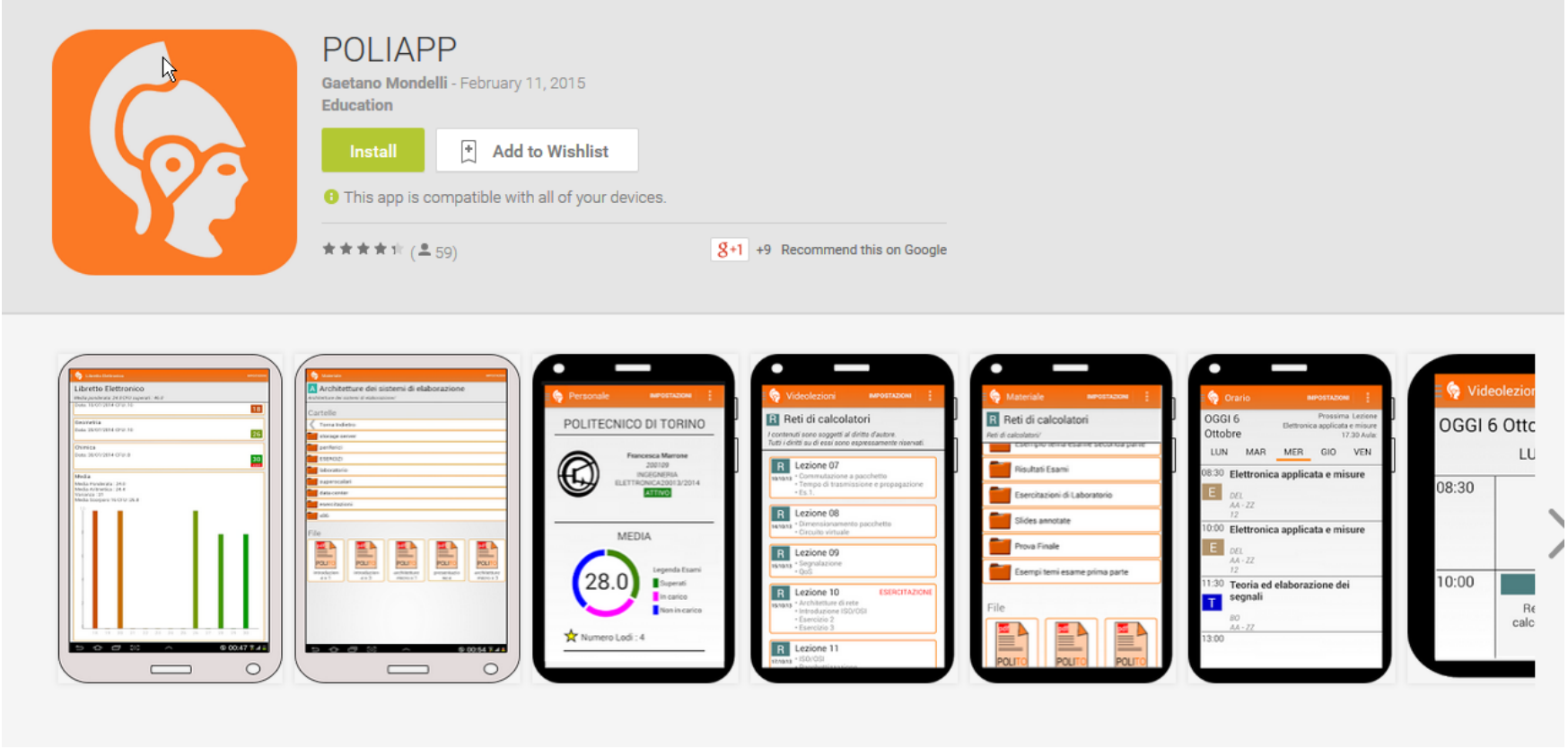
Your responses (2)

- Automatic semaphores that turn green when many students (or not many, but for a while) are waiting to cross the street.
- A screen that shows which places in the study rooms or classrooms are available to go and study. Maybe online, access via smartphone or a computer.
- A kind of google maps but for the Politecnico, I've lost a couple of times):
- Maybe a pc room accessible to everybody for any need.
- I think that, using temperature sensor a system, could control the heating system. In this way we can have a more comfortable environment e less consumes.
- Useful to improve the timetables monitors already present: i found that system useful (at 1st year they worked much better).
- It would be nice to coordinate all the events organized (seminars, Polincontri, meetings) together to get involved easier in the Campus events, perhaps ""booking"" could be useful for organizers.
- Also the nearest free classroom (easily accessible by our smartphones) could be a nice feature...
- A solid wi fi Connection Everywhere , without re-doing the login every 10 minutes.

Your responses (3)

- A free IOS / Android app : the timetable and the functionality of the students profiles site without going on the actual site, like seeing and download the material that the teachers upload for their courses.
- 1-Smart rolling shutter connected with light sensors and light actuators in order to allow a smart management of the power consumption and, at the same time, to guarantee the better brightness possible. (if the rolling shutter is made by solar panel is also possible to regulate the grade to optimize the quantity of light captured)
- 2-Smart fan connected with some sensors(Co2,humidity,heat) that allow to control the quality of the air and to recycle heat in the area"
- - smart card on phone: create a software to manage the canteen wallet through web and give the possibility to use phone nfc system to pay. The target is to reduce queue at the automatic cages;
- - streaming lesson: add the possibility to follow a videorecorded lesson on real time, in this way students could avoid to accumulate retardment in case of absence.
- 1) Having a way of knowing how many students are attending to a class, so you will know (if you are arriving late to a class) if there are any free seats for example.
- 2) Having a way to connect to a class-network which gives you information about the topics which are been explain at that specific moment in a specific classroom. “

PoliApp


POLIAPP
Gaetano Mondelli - February 11, 2015
Education
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MEDIA
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Reti di calcolatori
Lezione 07
Lezione 08
Lezione 09
Lezione 10
Lezione 11
Risultati Esami
Esercitazioni di Laboratorio
Slides annotate
Prova Finale
Esempi temi esame prima parte
Elettronica applicata e misure
Teoria ed elaborazione dei segnali

Your responses (4)

- I'd like to have a makerspace in it.
- Every lectures provided by the professor may be recorded automatically in class and uploaded.
- End users could be given access to a set of API providing the number of WiFi devices connected at a given moment in any area of the campus.
- Developers (i.e. us Ambient Intelligence students) could then develop apps providing information about classrooms/library/corridors congestion, and therefore allowing the end users to know the campus' situation. - More electricity outputs in older classes.
- - More self service stations, also make them more accessible to the user, and provide day to day information, such class schedules, ""where can i find a free class"" etc."
- I would introduce a better lighting system. I would insert LED lighting, with sensors that can shut down the lights when there's nobody nearby
- Official app of portale della didattica for mobile platforms instead of mobile version of the portal
- The first thing that should be "fixed" is staff of the international office that require so many bureaucracy. There were not well-organized students there. These all messy "bureaucracy" can be done on-line indeed. I lost so many time because of the documents & therefore I couldn't participate in the beginnings of the all classes that are really important for understanding the subject. And I believe there are hundreds of students that faced the situation like mine.

Your responses (5)

- A mobile application that show if there are places to sit avaiable in the study rooms.
- - a system to manage reservations in laboratories
- - a system to report study rooms free and number of free seats
- 1) we could use the automatical doors of each classroom as the door of office of prof. and students opening the doors by student card (although it seems so complex)
- 2) at every seat of classroom we could set a electronic supply . in my mind the supplies are too less . perhaps as aula I is much better . as during lessons some of students use computer ipad and so on .
- First wifi Should be accessible from every part of polito (now there are some problem of connectivity). Then I create an app for polito students in which you can talk each other like a forum about project you would like to realize and also maybe create a work team about it.
- try to use better the monitors, creating a more interactive environment.
- Online canteen(ristorante) account: due to the problem I have met and saw these years, our canteen usually has its machine broke down----many students' money is ""eaten"" by the machine and their recharging end with failure ----their need to find the workers inside the canteen to figure it out which deals a small but annoying problem.(my money has been ""eaten"" at least twice :P) -- we can improve our online system to solve this problem by set up an online canteen account which not only be able to let students recharge their card but also can show the degree of students and for which service they can enjoy(free meal per day,ect).

Surviving ideas (to be refined!)

- Free (and near) places/rooms to study (and booking?)
- Chat with other students in the same classroom
- How many students in classes ??
- Traffic lights (interaction??)
- Canteen??
- … many others, if expanded from the original idea

Smart «Cittadella Politecnica»

HINTS, IDEAS, SUGGESTIONS

Smart City Players around us…

- Several companies, within the PoliTO Campus, are already developing project, technologies, experiences, applied to Smart City / Smart Buildind
- I asked some of these companies to describe what they are doing
- It will be useful to “widen” our mind and imagine other projects
- The companies are also available to help you during the project development, if you plan to use their systems

The companies

- Istituto Superiore Mario Boella, PERT Area

- Telecom Italia – Joint Open Labs (JOL)

- CSP Innovazione nelle ICT

BIG WARNING

- The following ideas are NOT examples of projects suitable for the course
  - Too large, too small, not AmI-focused, etc
- You may use them for imagining which “ingredients” you may want to include in your project
- You may use them to gain some “contacts” with enterprises

- Did you notice the NOT ?

Smarty: The Attentive Waste Bin

Istituto Superiore Mario Boella

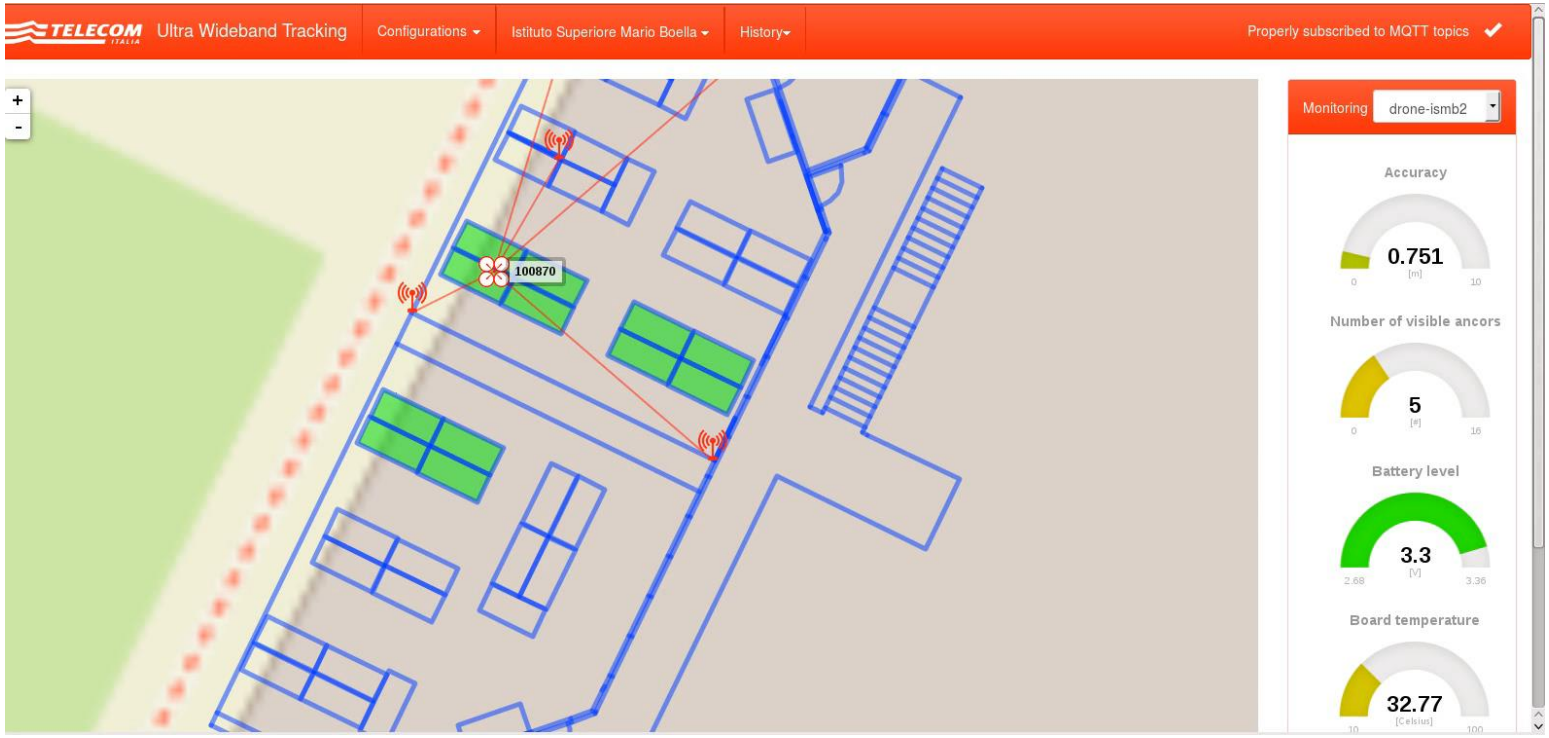
- Speech-enabled smart waste bin
  - Fill-level measurement
  - WiFi connectivity
  - Data transfer through MQTT
  - RGB LED strip (single LEDs can be addressed) for feedback
  - Speech sysntesis
  - Presence detection (Ultrasound)

Smart Mirror UI

Istituto Superiore Mario Boella

- Mirror UI for safety alerts in theaters
  - Semi-transparent Mirror showing alert details
  - RGB light for color-feedback
  - Plugwise-controlled blinking lamp

Flying Drones Tracking



- Ultra Wide Band - based navigation for flying (and land-travelling) drones
  - MQTT event delivery
  - Active Zone detection
  - Alert and anomalies tracking
  - Telemetry data
  - UWB performs better than GPS in indoor environments

Opportunistic networks

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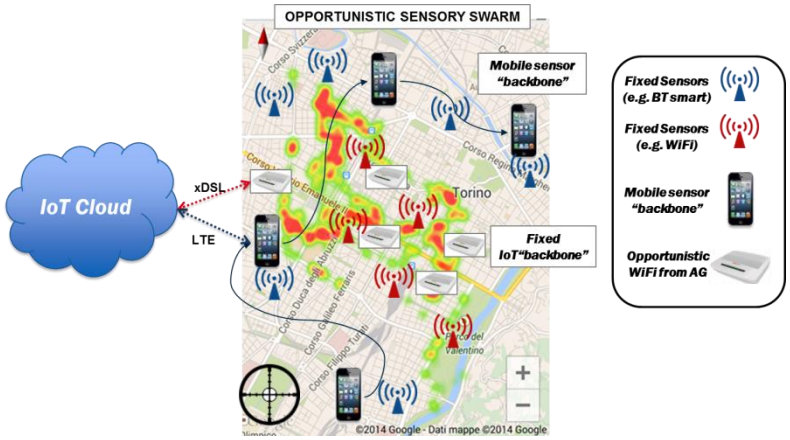
SWARM
Beyond the Internet of Things

- Distributed Sensors may communicate with a central service, by «hopping» trough smart phone connections



Crowdsensing

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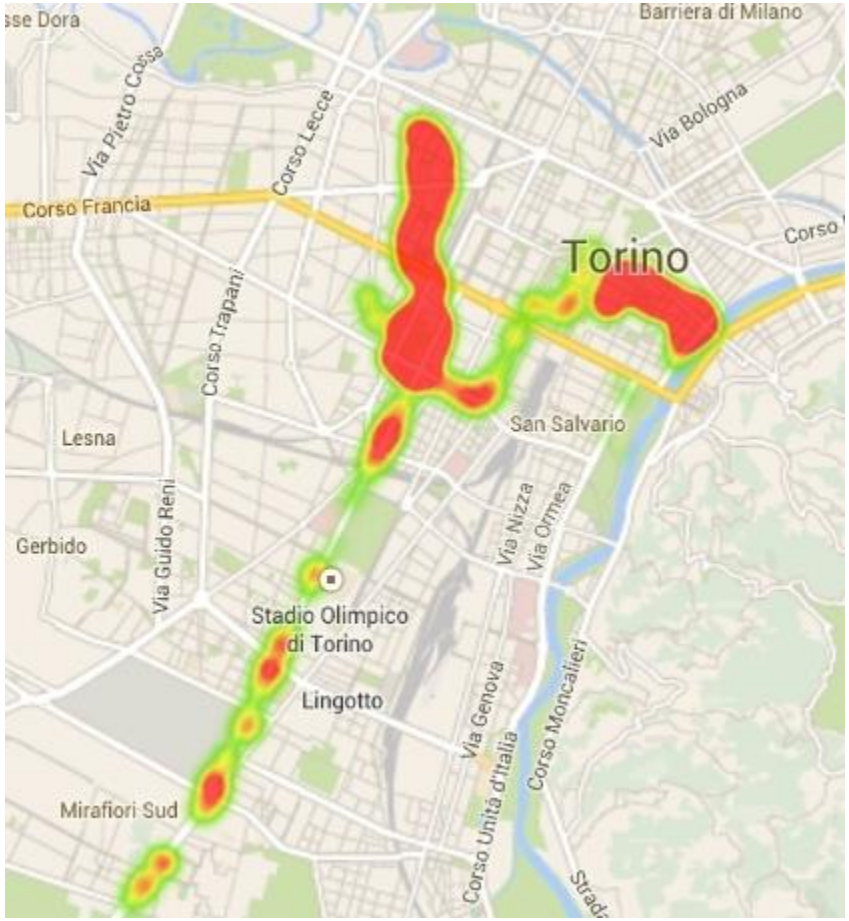
- Distribuyted sensing of acoustic pollution through smart phones
- Phone accelerometers may also be used to detect street anomalies (holes)
- Data is reinforced by repeated passages of different users (“virtual pheromone”).



Comfort detection

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- Indoor spaces
- Combines readings from different sensors (CO2, temperature, humidity, …)
- Includes subjective measures (mobile app)
- Determines the overall comfort level

CrowdSteering

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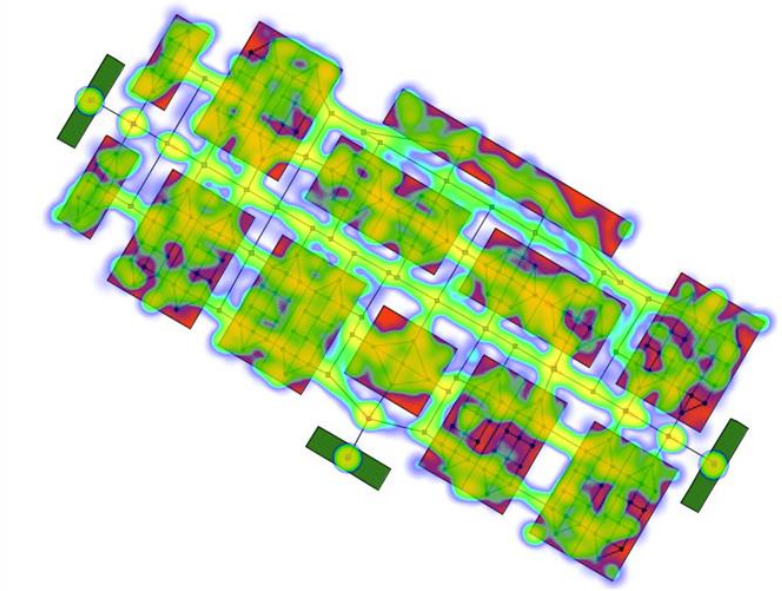
- Detect how many people are in a given area (people density)
- Suggest preferred paths



Robot-guided tours

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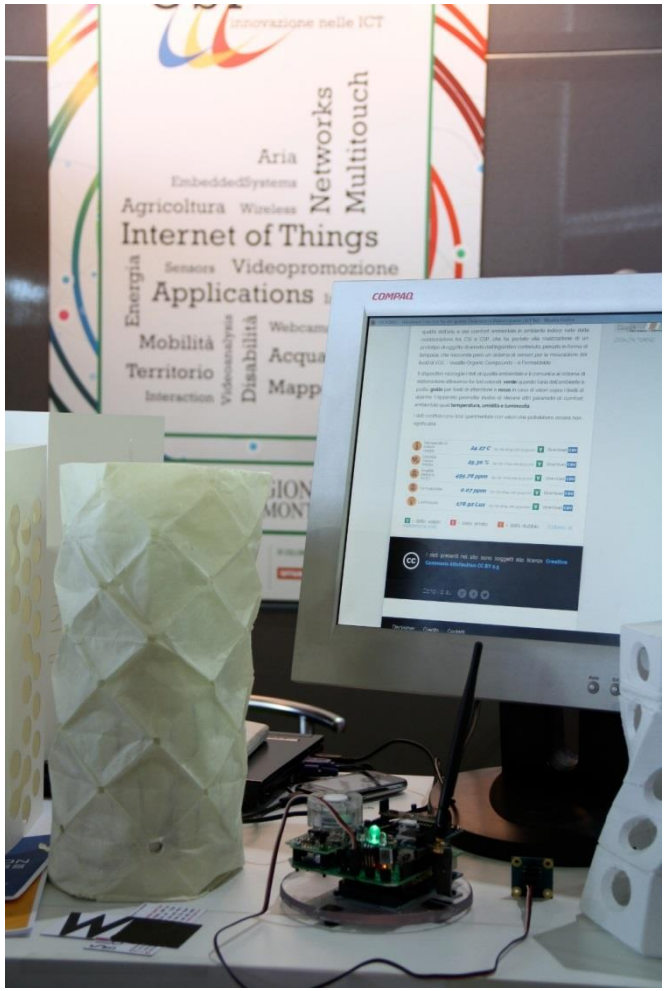
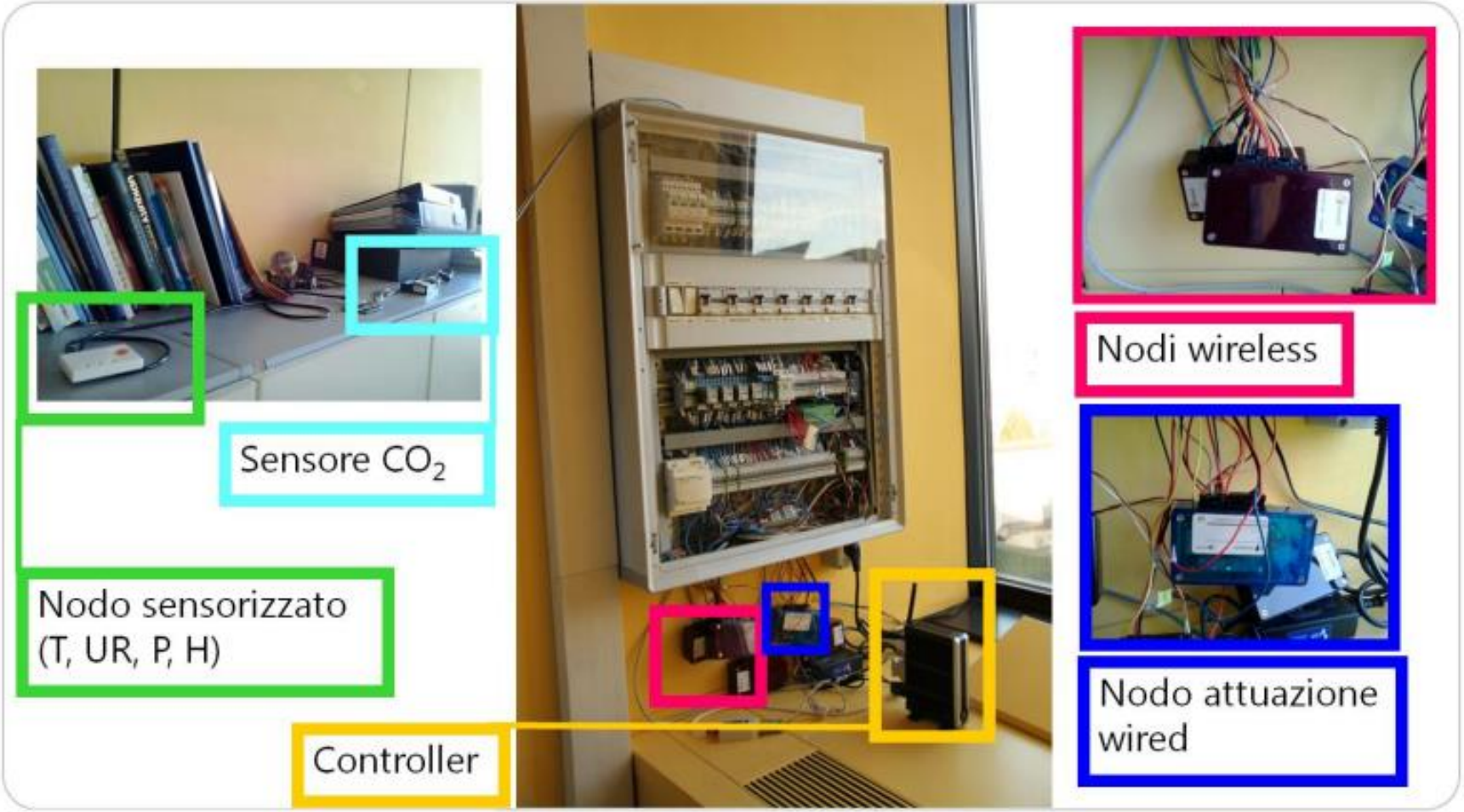
Connected Robotics Applications Lab

Traffic flow monitoring based on video processing

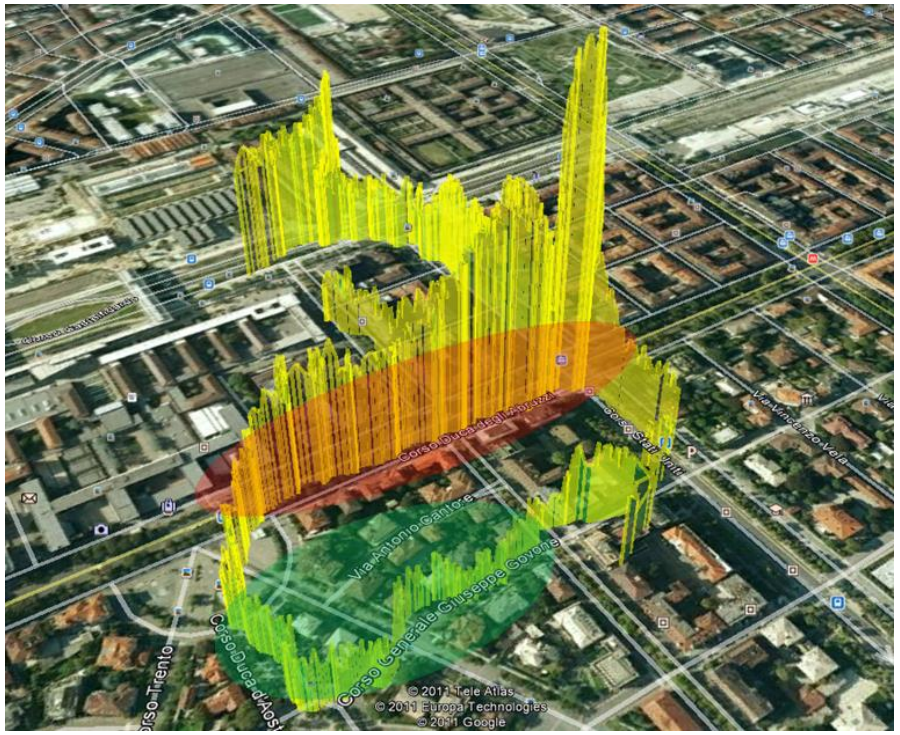
A lamp measures the air quality



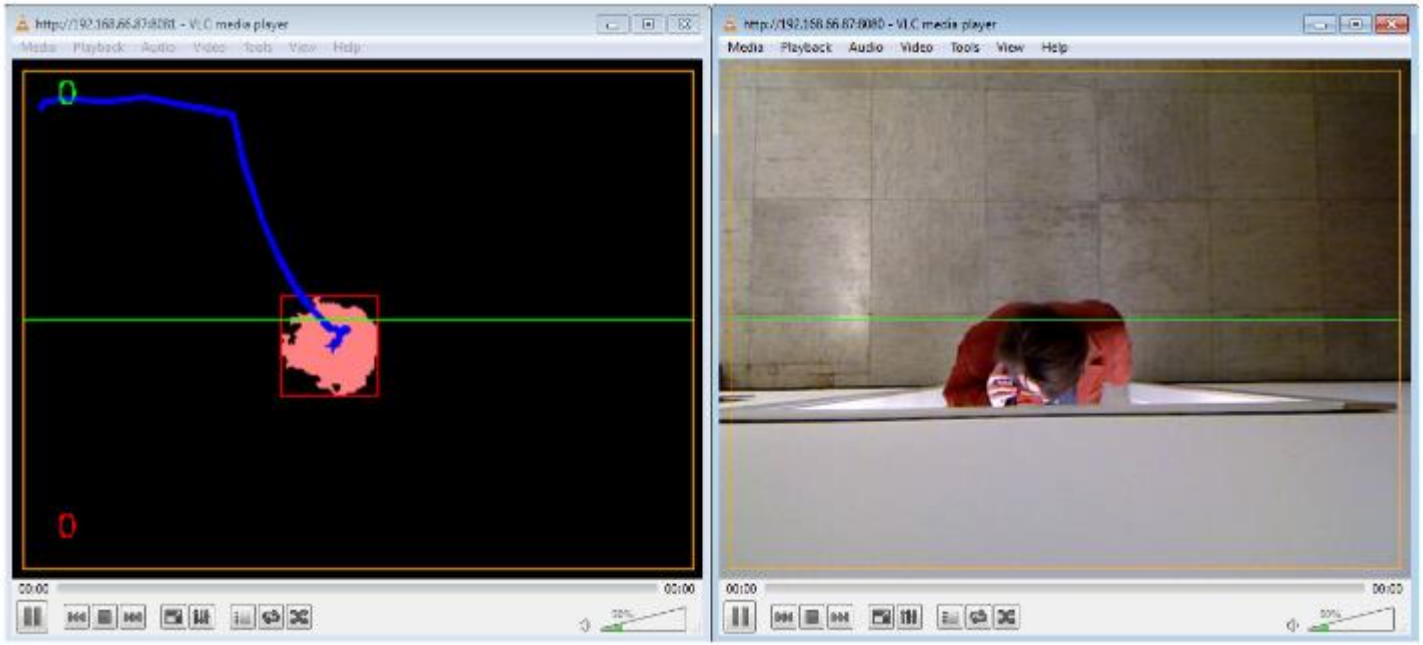
Measuring air parameters



Nomadic air measurements



Counting people (Kinect + video)



General proposals

- Environmental comfort – measuring and combining different sensor readings
  - Mainly based on wireless sensor networks
- Relational comfort – include user-related information (social, individual). Estimate, e.g., level of attention
  - Mainly based on indirect measurements
- Support algorithms (people recognition, indoor localization, DSS, data validation, …)

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HOW TO PROCEED?

Immediate next steps

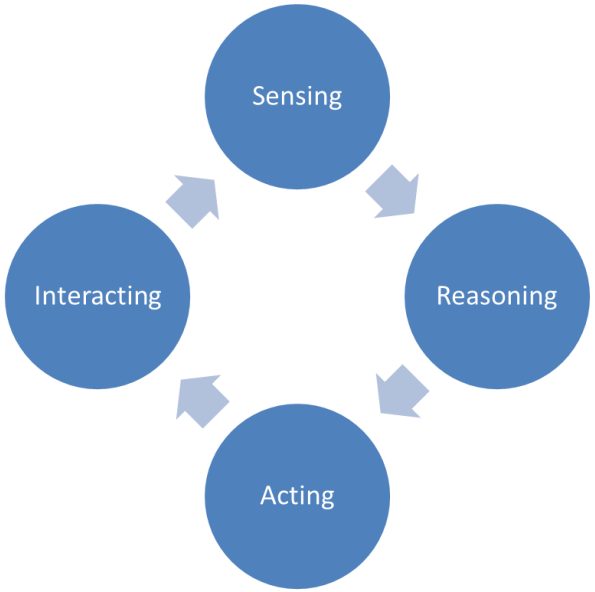
- By 19/03 (upload on Google Docs)
  - Forming groups
  - Submitting ideas
    - Title
    - [very] short description
- Already think at AmI steps & AmI features
- Teacher validation during 19/03 class
- Final version on Google Docs by 20/03

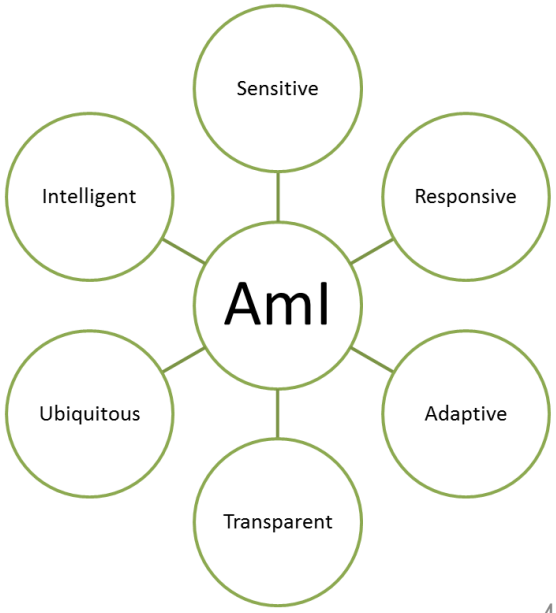
An example

- Group: X, Y, Z, [,W]
- Title: Effective Wake-up call (the most hated AmI feature, ever)
- Acronym: WakeKill
- Description: Exploit different means to wake me up (ring, switch-on lights, turn on radio). Automatically adjust time according to agenda. When not at home (e.g. hotel) use only phone ringing. Detect when I actually wake up (or if I'm already up).

Final tips

- Be creative
- Exploit your skills or passions
- Concentrate on 2-3 key features
- What will your users like?
- Avoid too much “integration” or “device support” or “data processing” work





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