PANEL UBICOMM/AMBIENT

Ubiquity + Ambient Environments + Mobility: Are we Better Served?
Panel

• **Moderator**
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• **Panelists**
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  > Achilles Kameas, Hellenic Open University, Greece
Ambient Ecologies

- **Intelligent environments** (IEs) are spaces equipped with a variety of sensors, supporting heterogeneous devices and providing a multitude of services
  - Applications are formed as orchestrations of services deployed on compositions of devices
  - The high degree of heterogeneity of these components makes their configuration and maintenance as part of an integrated system a non-trivial task

- We use the “**Ambient Ecology**” (AE) metaphor to conceptualize a space populated by connected devices and services that are interrelated with each other, the environment and the people, supporting the users’ everyday activities in a meaningful way
  - All kinds of “smart” appliances and devices, context aware artifacts and services, even robots are part of ambient ecologies
Activity Spheres

- An “activity sphere” (AS) is an ephemeral knowledge-based system, which is formed to achieve a specific goal composed by specific tasks, by binding in an adaptive manner to the most suitable resources that are available within an Ambient Ecology.

- Inspired by object-oriented approaches, an AS expands the bubble notion to contain not only the data and models, but also the associated processes and other resources that create, use or otherwise affect this data, leading to the specification of autonomous and coherent entities, which can adaptively execute on changing infrastructure.
At the basis of our approach is the assumption that the end-user(s) want(s) to fulfil aims or goals such as feel comfortable, go shopping or prepare dinner.

These goals are composed of a number of interrelated tasks and subtasks, each requiring the use of resources from an ambient ecology.

Goals and tasks are independent from any ecology, but always must be realized within some ecology.

The realization of a goal requires the binding of ecology resources to the goal-specific tasks.
The role of ontologies

- An ontology is a structure of knowledge, used as a means of knowledge sharing within a community of heterogeneous entities.
- Activity sphere ontologies:
  - Local ontologies are provided by both active and passive entities and encode their state, properties, capabilities and services.
  - The user profile, as the user is at the centre of each activity sphere.
  - Policy ontologies, representing privacy, interaction, etc.
  - Interaction ontology, which describes the elements of domain independent context aware interaction.
  - The sphere ontology, an information and knowledge pool which is constantly evolving and being updated. Different ways of forming this ontology are possible, by aligning, merging and mapping of entities’ local ontologies.
Agents

Agents are responsible for automated adaptation, resolving conflicts, interacting with the user, establishing plans and in general realizing the concrete tasks in the task model.

Three types of agents are used:

- Planning agent
- Fuzzy Task Agent
- Interaction Agent
Five dimensions of adaptation

- Artifact adaptation
- User behaviour adaptation
- User interaction adaptation
- Network adaptation
- **Sphere adaptation:** It happens along two dimensions:
  - **Functional adaptation:** the system supports the realization of the same activity sphere in different ambient ecologies,
  - **Structural adaptation:** refers to the persistent achievement of the goal when changes on the available resources occur (as AE components may appear and disappear and users may come and go over time) and when changes on the cardinality of the available resources occur (as the numbers of AE components or users that participate in the realization of an activity sphere may differ in time)
The connected plant
Awareness

Community user publishes awareness information "I wish to go for a walk"

Mathmos Lamp: Awareness co-ordination object, expresses user's nimbus

Keys: Provides the broad location of the user (whether at home or not)

Couch: Provides user's location at home

Alexander's Personal Space

Mobile Phone: user's focus when not at home

MP3 Player: user's focus when user is at home but not sitting on the couch

Nabaztag: user's focus when user is at living room

Peripheral awareness

Full awareness

No awareness

A. Kameas @ AMBIENT 2014 9/22/2014
ATRACO Components

Network Adapt. (NA)
Planning Agent (PA)
Privacy Manager (PM)
Interaction Agent (IA)
Learning Agent (FTA)
Sphere Manager (SM)
Ontology Manager (OM)

ATRACO Services
(service discovery, context processing, action services, user profiling, ontology alignment, ontology lookup, policy and control execution, privacy enforcement and access control, connectivity services, personalization and learning over-time, adaptive i/o modality provision, planning task workflows, etc.)

SOA Layer

Service
Service
Service
Service

Core Distributed Middleware Layer
UPnP Middleware
Web-Services Middleware
Other Middleware

Resource Layer
Device
Web-service
Content
Application

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In the “Studying” activity sphere, we are using four objects, a lamp, a chair, a book and a desk. According to the task description, when the chair is occupied and it is near the desk and the book is open on the desk, the lamp is turned on.
Suki has been living in this new adaptive house for the past 10 months. When he comes home after work he wants to feel comfortable and for this reason the house should adapt the temperature, set level of lighting and sometimes present his favourite TV program. Suki prefers a warm living room and a cold bedroom.
Projects

- **eGadgets (extrovert gadgets)**
  - FP5 / IST-2000-25240 / FET Proactive/Disappearing Computer
  - [www.extrovert-gadgets.net](http://www.extrovert-gadgets.net)

- **Plants (Enabling Mixed Societies of Communicating Plants and Artifacts)**
  - FP5 / IST-2001-38900 / FET Open
  - [http://daisy.cti.gr/plants/](http://daisy.cti.gr/plants/)

- **Astra (Awareness Services and Systems – Towards Theory and Realization)**
  - FP6 / IST-2004-2.3.4.1.b7 / FET Open
  - [www.astra-project.net](http://www.astra-project.net)

- **Atraco (Adaptive and Trusted Ambient Ecologies)**
  - FP7 / ICT-1-8.2 / FET Proactive/Pervasive Adaptation
  - [www.atraco.org](http://www.atraco.org)
(Only some of the) issues to consider in order to be better served

- Human interaction & control
  - Is it intuitive enough?
  - Safety and trust

- Scalability of the approach
  - Many resources
  - Many users
  - Many activities

- Performance
  - Start up time
  - Adaptation to changes in an activity sphere

- Evolution
  - Learning
  - Mobility
Thank you!

- You can reach me at
  - kameas@eap.gr

- DAISy (Dynamic Ambient Intelligence Systems) group web site
  - http://daisy.cti.gr

- E-CoMeT (Educational Content, Methodology & Technology) Lab web site
  - http://eeyem.eap.gr
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Markus Ullmann

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1. Instant Messenger

- Example: WhatsApp
- Widely used.
- No secure channel (end-to-end encryption)
2. Wearables

- Example, LG G watch with Android Wear OS
- Permanently capturing of geographic position, heart frequency and walking steps and centralized data storage.
- Location/personal privacy?
3. Glass

- Example: Google head glass
- Show information on the glass, live environmental full-video
- Violation of personal rights due to environmental audio and video monitoring?
Functionality and data capturing is always the primary manufacturer issue, security and privacy are peripherical.

Personal view: From a security and privacy perspective I'am not better served.

**These:**

Only if security and privacy issues are a buying decision of the consumer or regulation comes in place, situation is changing. But consumers like new functionalities.

So, forget about security and privacy ?
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Simon Bergweiler

German Research Center for Artificial Intelligence

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Embedded Systems

- Smart Factories
- Smart Products
- Automotive – Electric Mobility
- Mobile Devices
- Wearable Technologies
- Entertainment - SmartTVs
- Medical Devices
- Virtual Patient
- Smart Factories
- Smart Products
- Automotive – Electric Mobility
- Mobile Devices
- Wearable Technologies
- Entertainment - SmartTVs
- Medical Devices
- Virtual Patient
Are we better served?

- Sensor Networks (technical infrastructure) are an essential piece of the foundation for
  - factories, buildings, energy supply, and public transport infrastructure

- Enriched with Intelligence by embedded analytics
  - Monitoring / Controlling
  - Management

- Software-defined platforms make sensor data available and processable
  - Home Automation: My house is intelligent, everything is interconnected.
  - Heating system, lighting or music is controlled by mobile devices and doors open automatically

- Smart Factories and Smart Products
  - Gathering and fusion of sensor information (networked via Cloud-services)
  - More computing power in many small devices
  - Create object memories, e.g., “product memory”
Bridging the gap

- Connect the real world with the virtual world
- Digital Worlds - each real object has a digital virtual counterpart (digital twin)
- Industry is on the threshold of the fourth industrial revolution - “Industrie 4.0”
- Production of individualized products
Digital Object Memory to CPS

- Digital Object Memory
  - Knowledge
- Active DOMe (ADOMe)
  - Logic
  - Knowledge
- Cyber-physical System
  - Sensors / Actuators
  - Activity Modules
  - Activity Modules
  - Logic
  - Knowledge
Are we Better Served?

Yes!

Thank you very much for your attention!