Pervasive Computing in Emergency Situations

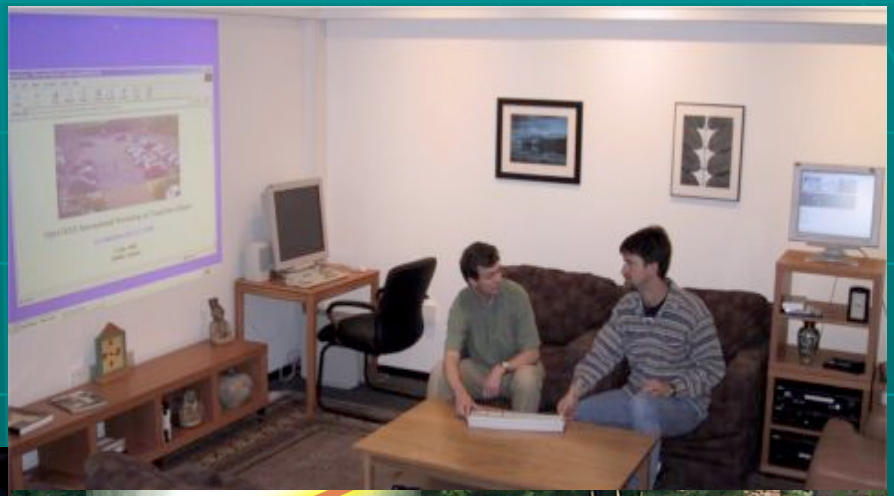
Vassilis Kostakos & Eamonn O'Neill
Department of Computer Science
University of Bath

Overview

- Pervasive systems today. Why and how are they limited?
- Can we apply existing knowledge to the design of pervasive systems?
- How can pervasive systems become easy enough to be used in such extreme situations such as emergencies?

Today's pervasive systems

- Mostly "smart" rooms or "smart houses."
- They're like islands of computing support.



What is the vision?

- Computing to be part of everyday life, and everyday tasks.
- Current systems fall short – they are physically and conceptually limited.
  - Currently designed for specific physical locations and specific social situations.
  - The proposed solutions include speech, gesture, tactile & kinaesthetic I/O, environment sensing, person and object tracking, and data mining.

What is missing?

- Most pervasive systems utilize location as a prime characteristic. Many other dimensions could be explored
  - Context awareness.
  - Replace physical sensing and simplistic assumptions with theoretically-informed and empirically derived models.
  - Modeling of goals and intentions of the users and the system (status, actions, goals).
  - Social issues that the design, deployment and use of pervasive systems raise.

Towards “truly pervasive” systems

- Systems that pervade the **Physical**, **Social** and **Cognitive** environments.
- What about today’s systems?
  - *Domestic* vs. *Public* pervasive systems.
- Public pervasive systems:
  - Cover towns, cities, countries.
  - To be used regardless of location or identity.
- How to design such public systems?

Building on existing knowledge

- Use the established approach of User – Task – Domain.
- Designing pervasive systems is similar to designing traditional systems.
- Extend the User – Task - Domain approach to address social issues.
- The approach now becomes Citizens – Spheres – Spaces respectively.

Users (Citizens)

- The intended users of a public pervasive system may usefully be viewed as "the public."
- Designing without knowing your users?
  - Many systems do it: Trains, buses, electricity, telephone, television.
- Citizenship
  - Civil rights
  - Political rights
  - Social rights

Tasks (Spheres)

- What tasks might users carry out using a public pervasive system?
- Group them in categories, based on the nature of information.
  - *Public*, *social*, *private* spheres.
- Information spheres to capture the cognitive environment – a way to think about the system.

Domain (Spaces)

- Currently usurped by the simpler concept of location.
- Physical locations have embedded social dimensions (understandings, protocols, presence of others).
- Group them in categories
  - *Public*, *social*, *private* spaces.
- Architecture and civil engineering
  - PPS guidelines.

Can pervasive systems be used in Emergencies?

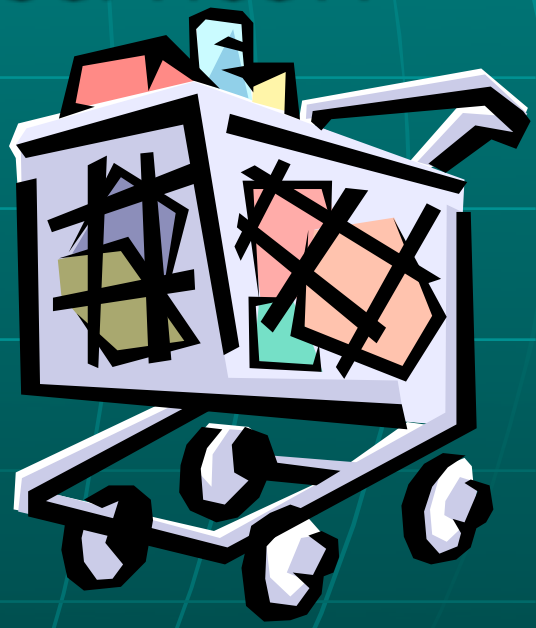
- Can they become embedded in everyday life? (Telephone)
  - Can it be used in a variety of situations, even in emergencies? (Impact on physical and psychological well-being, severe implications of actions, timely responses.
  - No need for specialist training (firemen).
- Yes – Users of "simple" services used in emergencies DO get training (Telephone).
  - Phone, bus, trains (Users get training since a young age).
  - We argue that services offered as a "public services" qualify.
  - Can we operationalize this? (definition)

What are public services?

- At least three definitions
  - Services considered as public or for the common good.
  - A service provided to the general public.
  - A service provided by a public entity.
- Public services are universal (people equally entitled to benefit from them).
- Obligation to supply.

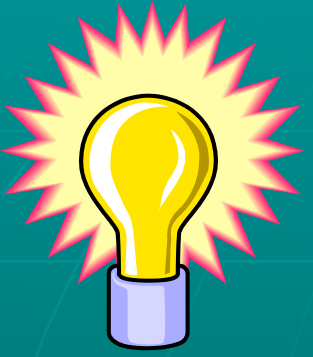
Advanced economies blur issues

- Public services fundamentally exist to improve the quality of life.
- Are super-markets a public service?!
- Key characteristics
  - Rely on tax-payers' money.
  - Extended accountability.
  - Public scrutiny.
  - Defined customer base.
- Survey results
  - "Available for everybody to use."
  - "Important to the whole community."



Beyond economic & political characteristics

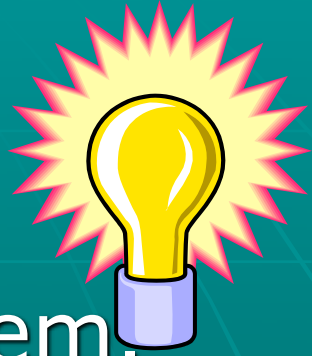
- Public services have some common functional characteristics.
- Products & services persist over long periods
  - Become embedded in everyday life.
- Infrequent changes
  - Must undergo public scrutiny.
- Centralized production
  - Assure uniformity & stability.



Recommendations

- Deciding which services to offer
- Mapping functionality to location.
- Generic way of predicting “failures” by studying the combination of sphere/space.

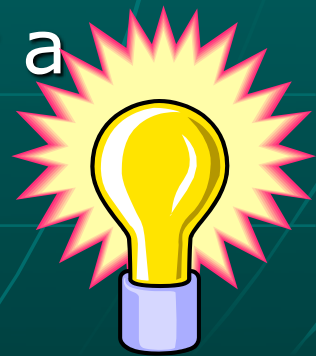
Recommendations



- Installing a public pervasive system.
- Useful guidelines provided by architecture and urban design.
- PPS has operationalized guidelines
  - Accessible public spaces.
  - Activities in public spaces.
  - Comfortable public spaces.
  - Sociable public spaces.
- “Translate” these in terms of pervasive systems.

Recommendations

- Pervasive systems as public services.
- By definition?
- Benefits to be realized.
  - Embedded in everyday life.
- Follow existing paradigms?
  - Equal treatment & Uniformity vs. Personalization
  - Centralized structure – a feature or a limitation?



The end
Thank you