Designing Pervasive Systems for Society

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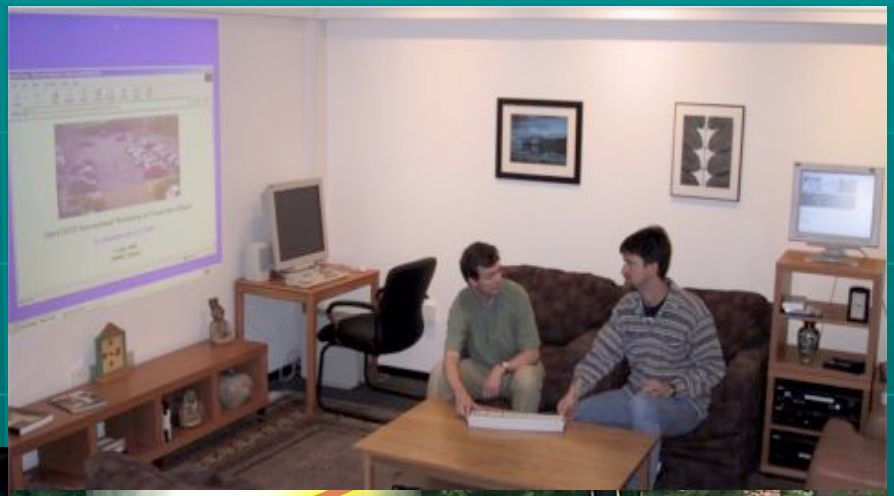
Overview

- What are pervasive systems? How do we envision them?
- How can we design such pervasive systems?
- Building on our ideas
  - Pervasive systems as public services?
  - A “metaphor” for combining architecture and pervasive systems.
  - Design ideas for pervasive systems in public spaces.

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.
  - 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.
  - Spaces & Interaction spaces.
- Architecture and civil engineering
  - PPS guidelines.
  - Pervasive systems should

Building on our ideas

Pervasive systems as Public Services?

- Access to information is a public good.
- A truly pervasive system is a nationwide carrier of information.
- A nationwide carrier of a public good is a public service.

- Therefore, is a pervasive system a public service?

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.

Beyond economic & political characteristics of PS's

- 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.

Combining Architecture and Pervasive Systems

- Why?
- The built physical environment is a pervasive system.
- Well understood, studied for long time.
- A number of useful ideas can be drawn.
- Guidelines provided by the Project for Public Spaces.
  - Accessible, activities, comfortable, sociable.

What did we gain?

- A metaphor for combining architecture and pervasive systems.
- Traditional approach:
  - Computers: store, retrieve, monitor, calculate.
  - Humans: patterns, extrapolate, creative.
- A new metaphor:
  - Architecture: manipulate physical spaces to provide greater functionality.
  - Pervasive systems: provide functionality to overcome physical limitations.
  - Essentially, architecture manipulates *physical spaces*, while pervasive systems manipulate *interaction spaces*.

Design Implications

- A pervasive system is…
  - a set of digital artefacts.
  - a part or extension of the physical environment.
- Duality of views applies to design ideas (e.g. security).
- Accessible (are people aware of the system's existence?) – WiFi.
- Minimum requirements – walk up to it and use it. (Water fountains).
- Comfort – mechanical equipment hidden or not? (User interface hiding backend – CYSMN).
- Orientation, surprise, activities.

In summary

- Description of what truly pervasive systems could be like.
- How can such systems be designed (Citizen - Sphere - Space).
- Where does this approach take us?
  - Public services.
  - The role of Architecture, spaces and interaction spaces.
  - General design implications/ideas.

The end
Thank you

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