Summary

- Principled design of pervasive systems
  - Framework
  - Design tool
  - Additional issues
- Interacting with pervasive systems
  - Gestural interaction
  - Experiment: can we do without GUIs?
- Future research
Design of pervasive systems
What are pervasive systems?

- They pervade the
  - physical,
  - social,
  - cognitive

- environments
  - They affect the way we move, behave and think

- Large scale vs small scale pervasive systems
  - Public vs domestic
A design framework for pervasive information access

- Established HCI design foci
  - user
  - task
  - domain

- Design foci for public pervasive systems
  - citizen
  - sphere
  - space

Social considerations
Citizen

- Traditional “user” focuses on psychological characteristics
  - Large-scale system ➔ interaction with everyday norms & regulations (user makes no sense?)

- We can say little about the particular user of a large-scale publicly available system, but in respect of citizens we know
  - rights
  - responsibilities
  - membership

- A wide-scale provider of information may be viewed as a public service
  - Public services: characteristics, expectations
Sphere

- Traditional notion of task studies cognitive aspects
- Pervasive systems: what task?
  - Need to abstract
  - Conceptualise ownership/control
  - Effects of location / technology on task
- Information spheres
  - Public sphere
  - Private sphere
  - Social sphere
Space

- Space: more than GPS
  - Architectural/physical space
  - Place (i.e. social dimensions)

- Effects of technology, information

- Abstract away those important characteristics
  - Physical space: public, social, private
  - Interaction space: public, social, private
Visual interaction spaces
Auditory interaction spaces
Designing with the framework

- In designing systems for the delivery of information and services, we have a range of artefacts available; e.g. wall displays, PDAs etc.
- We use these artefacts to define appropriate interaction spaces.
- To know what kind of interaction space to create, we need to take account of the information sphere and the space in which the citizen is currently located.
• Manipulate interaction spaces (change the technology that is used)
• Relocate artefacts (relocate technology)
• Re-establish links between information and technology (what information to deliver using which technology).
Using the design tool (Hospital A&E case study)
Where did my framework come from?

Testing out of my framework
- Post hoc evaluation (can I explain something that exists?) hospital case study
- A priory design (can I propose something new?) city of Bath case study

Levels of application
- Generate proposals (city of Bath)
- Design exploration and alternatives (hospital)
- Interaction design
Further design issues

Pervasive computing and architecture
  – Architecture: Manipulates physical spaces
  – PerComp: Manipulates interaction spaces

Design of pervasive systems:
  – Effective integration of physical spaces + interaction spaces
  – Learning from architecture
Interacting with pervasive systems
Interaction spaces can be created by
- devices (PDA, speakers, screen, etc)
- the physical aspects of interaction (keyboard, touchscreen, etc)

In PerComp we can make use of varying devices to create appropriate interaction spaces
- What about interaction itself? How can we control the interaction spaces created by the *act* of interaction?

Need to *decouple* the interaction from the artefact (abstract away)
- Stroke-based gestural interaction
What is stroke recognition?

A stroke is a recorded path of a motion performed by an input device or token
Identify pre-defined paths
Execute a command assigned to a particular motion / stroke
The DSR
(Directionality Stroke Recognition)

- Separate the device from the interaction
- Provides flexibility of stroke input & output devices
  - Can use a mouse, stylus, smart ring, smart card, and any object that can be carried
- Uses bare minimum characteristics of a stroke
  - Only the direction is used
  - Position of strokes, or relative position of many strokes is not used
Examples of Strokes

Single Strokes

Multiple Strokes

- EE
- SS-EE
- WW-SS
- NN-SS
- SW-EE
- SS-EE-NN
- SS-NN-EE
- EE-WW-EE
- EE-SS-EE
Flexibility of Directional Strokes

- Smart Ring
- Stylus
- Finger
- Bright Object
- Mouse
- Touch Screen
- Object Tracking

Coordinates
Gesture Recognition
Touch-Screen Strokes
Camera Tracking

[Image of a software interface for camera tracking with various controls and settings]

- Camera Driver: Driver 0
- Start Camera / Stop Camera
- Camera Settings:
  - Camera Setup / Video Source
  - Preview
- What to track:
  - Enable Tracking
  - H: 49, Width: 20
  - S: 68, Height: 20
  - L: 182
  - Threshold: 20
- Adding to gesture Point: (24,99), (65,97), (120,79), (140,79), WW-EE
- FindGesture
- Mouse Test - Hold LButton Down
How can the DSR help us?

- Define appropriate interaction spaces
  - run time
  - user decides
  - carried across devices
  - carried across systems
  (? – future work)
Experiment: Multimodal Interaction

- Separation between device & interaction
- Can we do without GUIs?
- Effects of presence/absence of visual cues
Further work

- Slow object recognition (different technology?)
- Personalization, mental mapping?
- Multiple object tracking?
Research for the immediate future
To do…

- CHI ’05 Workshop
  - “Social implications of ubiquitous computing”
  - Social issues affect more than just the design…
  - ETH Zurich, Fraunhofer Institute, Bartlett UCL

- Interacting with Computers Special Issue
  - “Social impact of emerging technologies”
  - Trends from traditional to emerging technologies, government involvement

- Space syntax of public pervasive systems (Bartlett)

- Cityware (Bartlett, Imperial, Vodafone, HP, etc.)
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The end
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