Pervasive / ubiquitous computing

Design and interaction

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Summary

- Design of pervasive systems
  - Framework
  - Design tool
  - Additional issues
- Interacting with pervasive systems
  - Gestural interaction
  - Experiment: can we do without GUIs?
- Plans for immediate future

Design of pervasive systems

A design framework for pervasive information access

- Established HCI design foci
  - user
  - task
  - domain
- Design foci for truly pervasive systems
  - citizen
  - sphere
  - space

Citizen

- Large-scale system ➔ interaction with everyday norms & regulations
- A truly pervasive system has implications for public accessibility
  - see also work on universal access [Stephanidis 01] and universal usability [Shneiderman 02]
- We can say little about the particular user of a large-scale, publicly available system but we can say some things about citizens
  - rights
  - responsibilities
  - membership
- A wide-scale provider of information as a public service.
  - Public services: characteristics, expectations

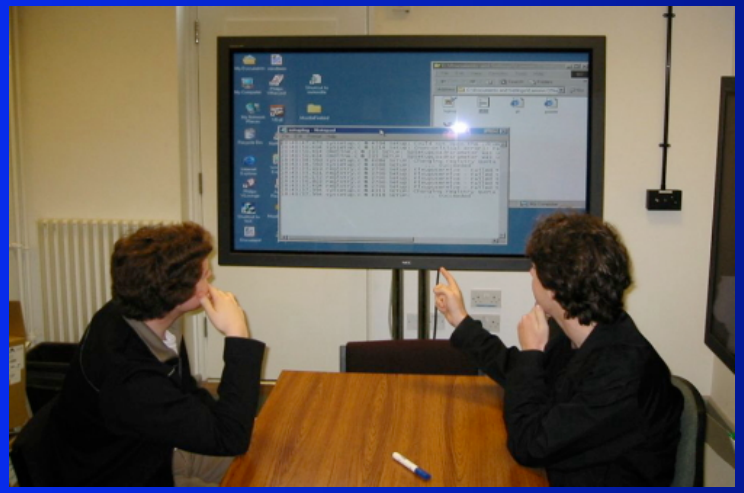
Sphere

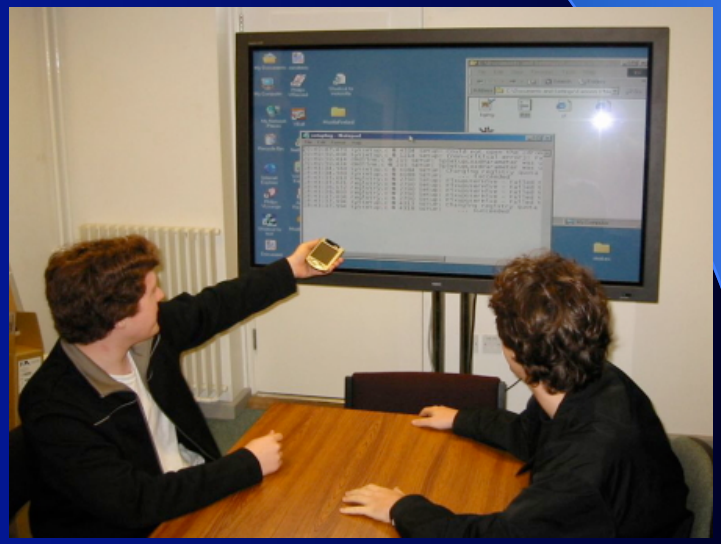
- Public sphere
  - a conceptual area of public debate in which issues of general concern can be discussed and opinions formed [Habermas 62]
  - the space in which citizens deliberate about their common affairs and a site where social meanings are generated, circulated, contested and reconstructed [Fraser 95]
- Private sphere
  - private issues, information and services; access denied to others
- Social sphere
  - issues, information and services; access restricted by rules, conventions, costs etc

Space

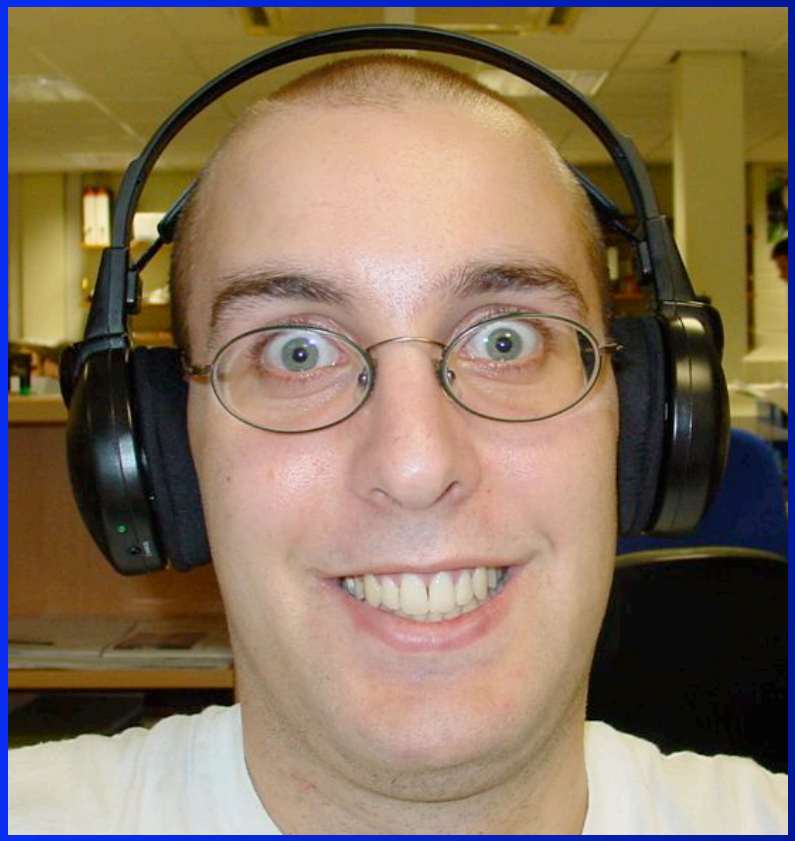
- Architectural Space
  - Physical space
  - Place (i.e. social space)
- Interaction space
  - volume defined by a device/ artefact within which an activity is successfully supported by the device/artefact
- Public, social and private spaces

Visual interaction spaces





Auditory interaction spaces

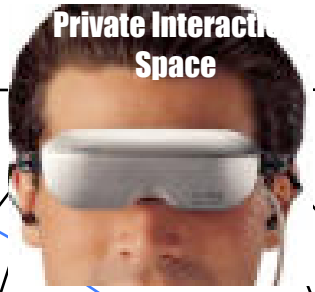


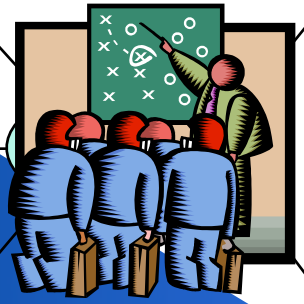
Space

Interaction Space

Sphere

Citizen

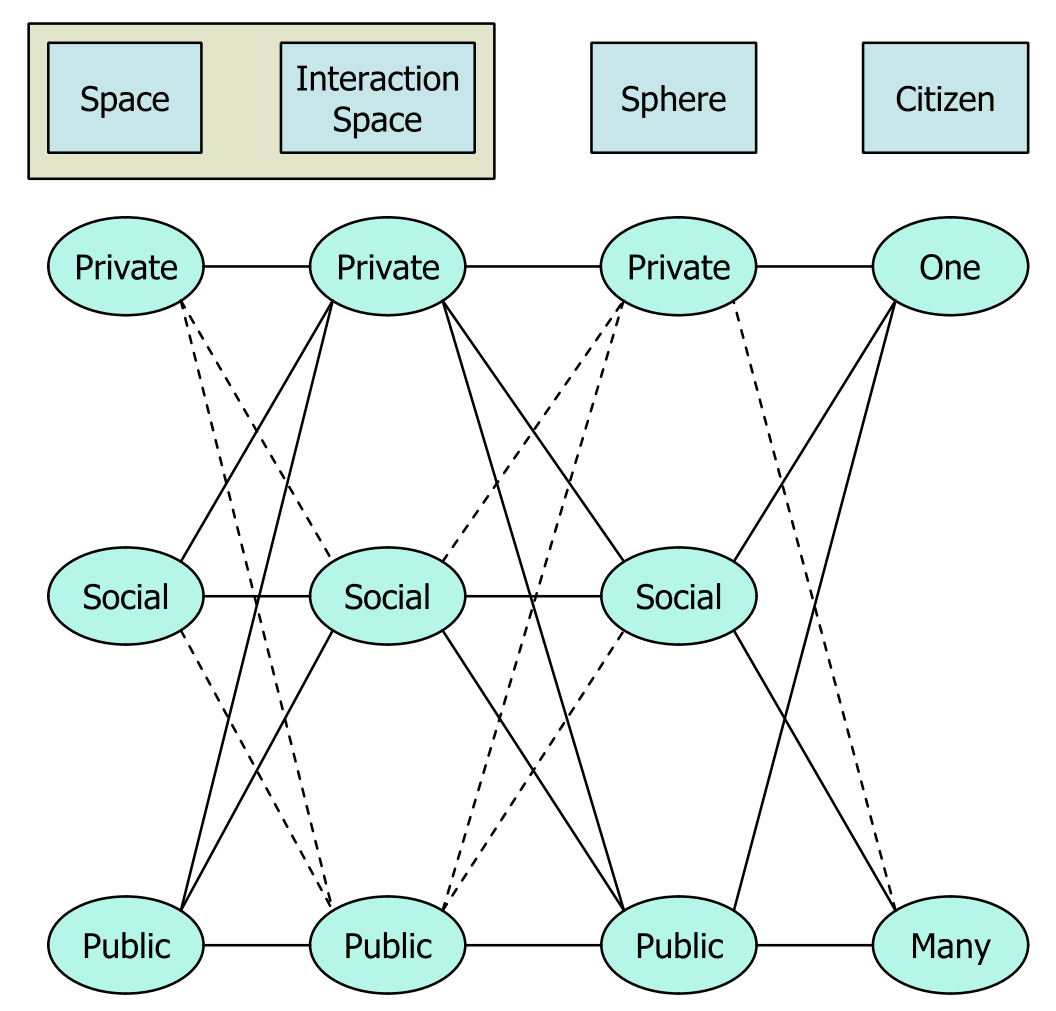




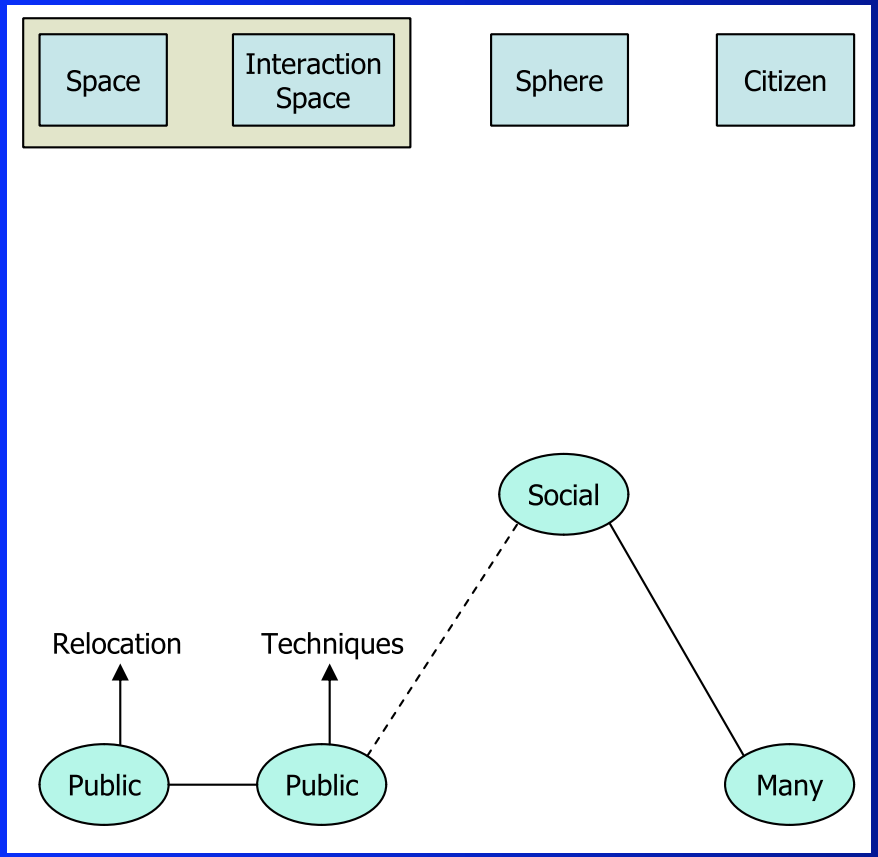
Designing with the framework

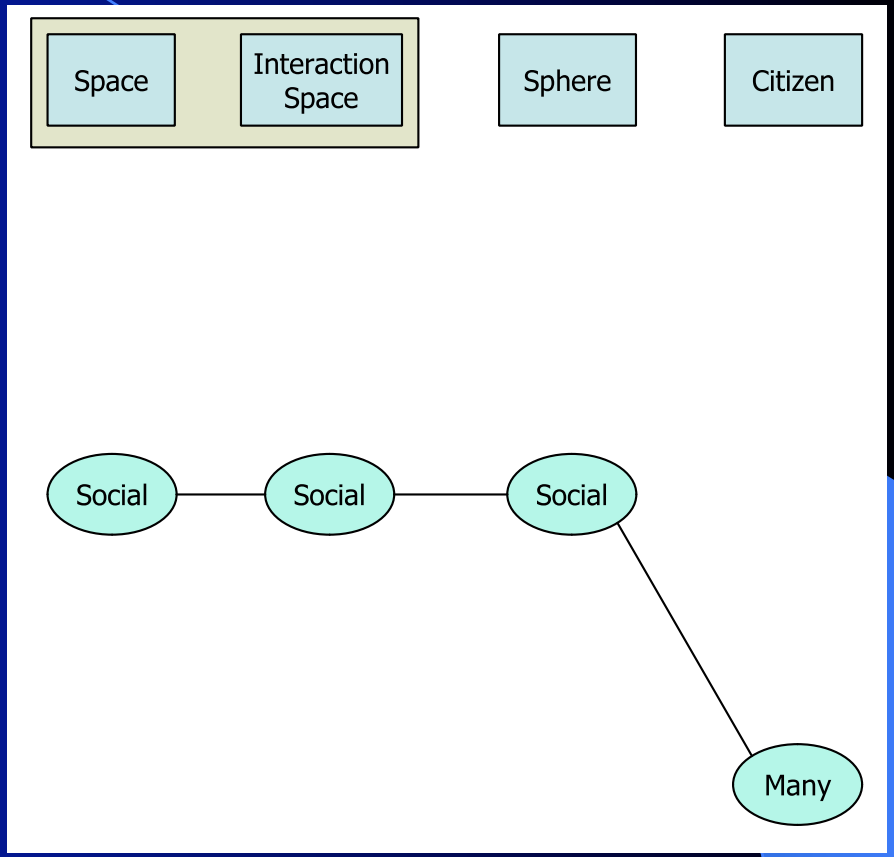
- In designing systems for the delivery of information and services, we have a range of artefacts available; e.g. wall displays, PDAs etc
- We use these artefacts to define appropriate interaction spaces
- To know what kind of interaction space to create, we need to take account of the information sphere and the space in which the citizen is currently located

The design tool



Using the design tool





Further issues

- Pervasive computing and architecture
  - Architecture: Manipulates spaces
  - PerComp: Manipulates interaction spaces
- Design of pervasive systems:
  - Effective integration of spaces + interaction spaces
  - Learning from architecture
- Sustainability
  - Public vs. domestic pervasive systems
  - Public services
  - Pervasive systems: part of the building vs. extension
  - Buildings last 10 years+

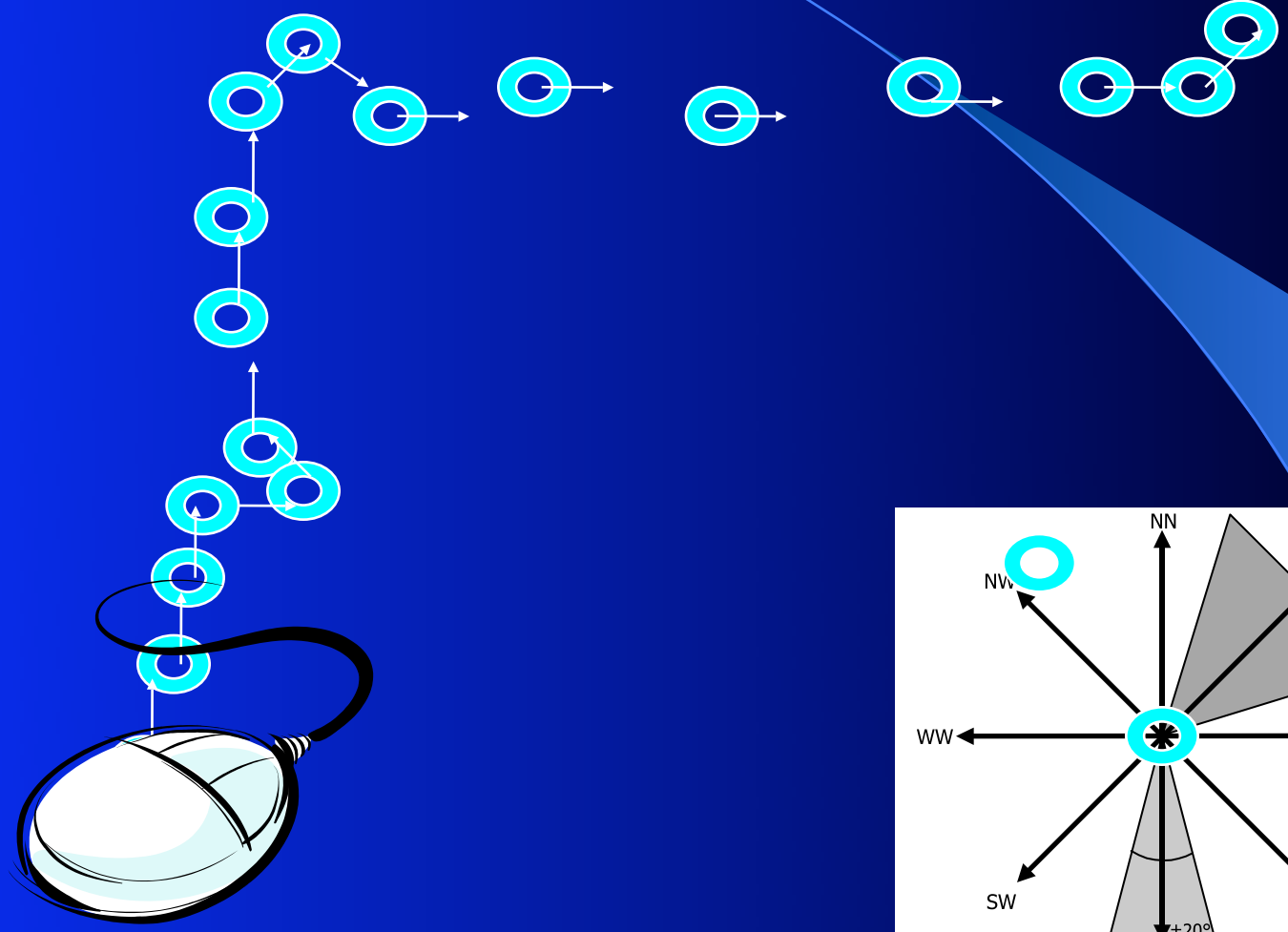
Interacting with pervasive systems

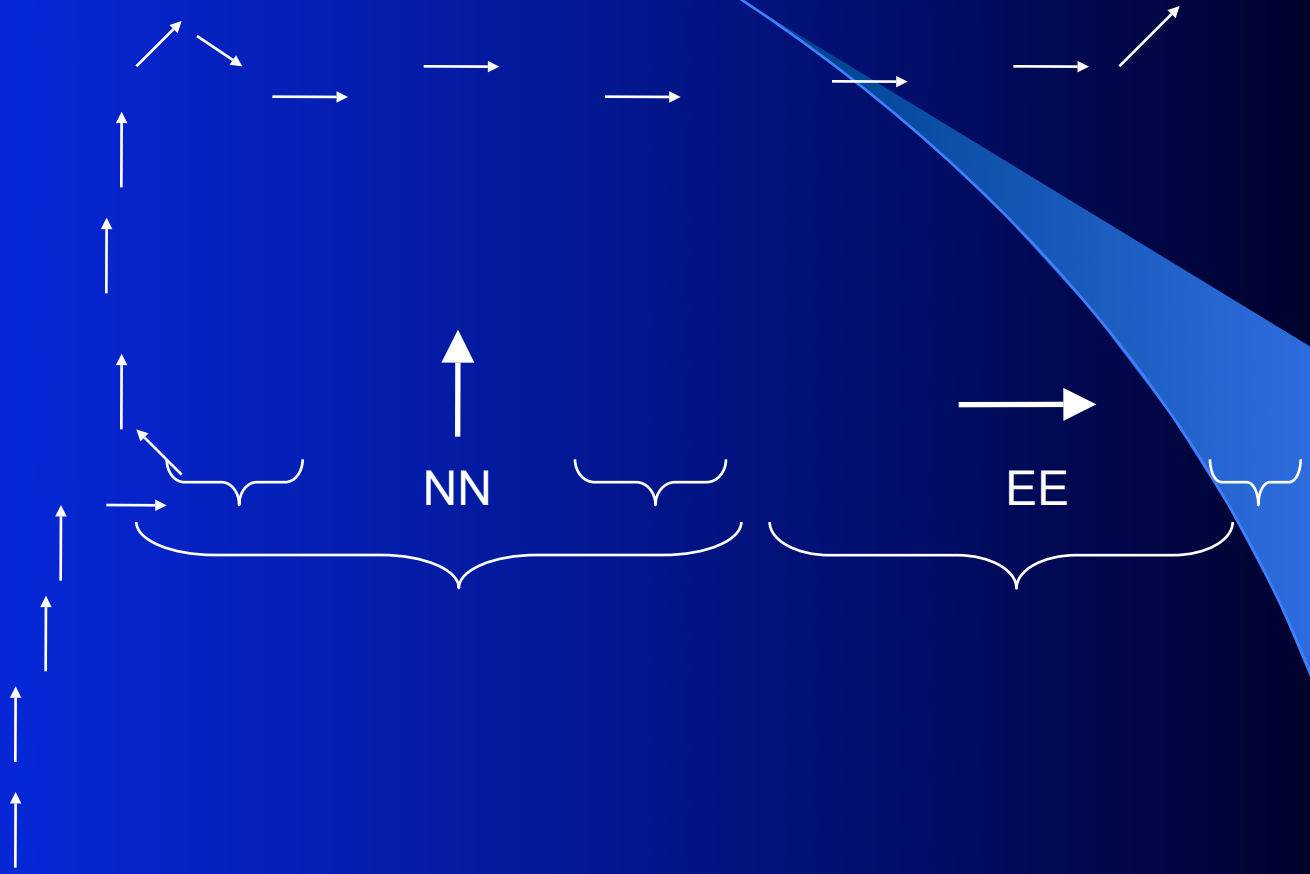
What is stroke recognition?

- A stroke is a recorded path of a motion performed by an input device
- Identify pre-defined paths
- Execute command assigned to a particular motion

The DSR
(Directional 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


NN
NE
±25°
WW
EE
SW
SE
±20°
SS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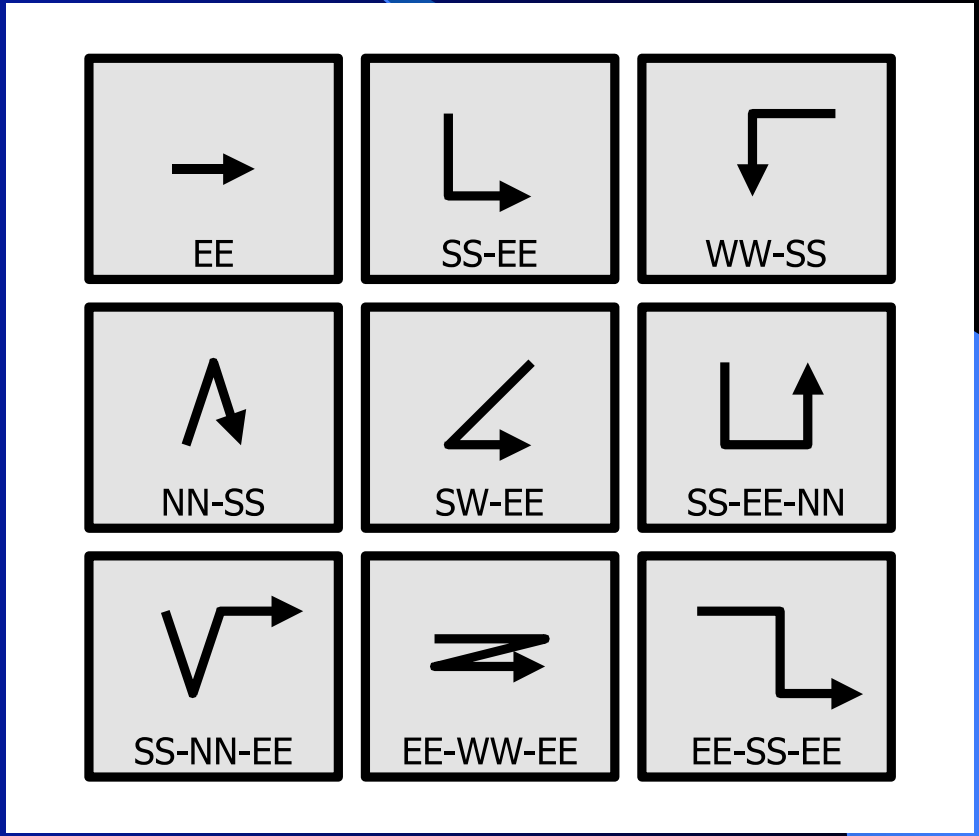
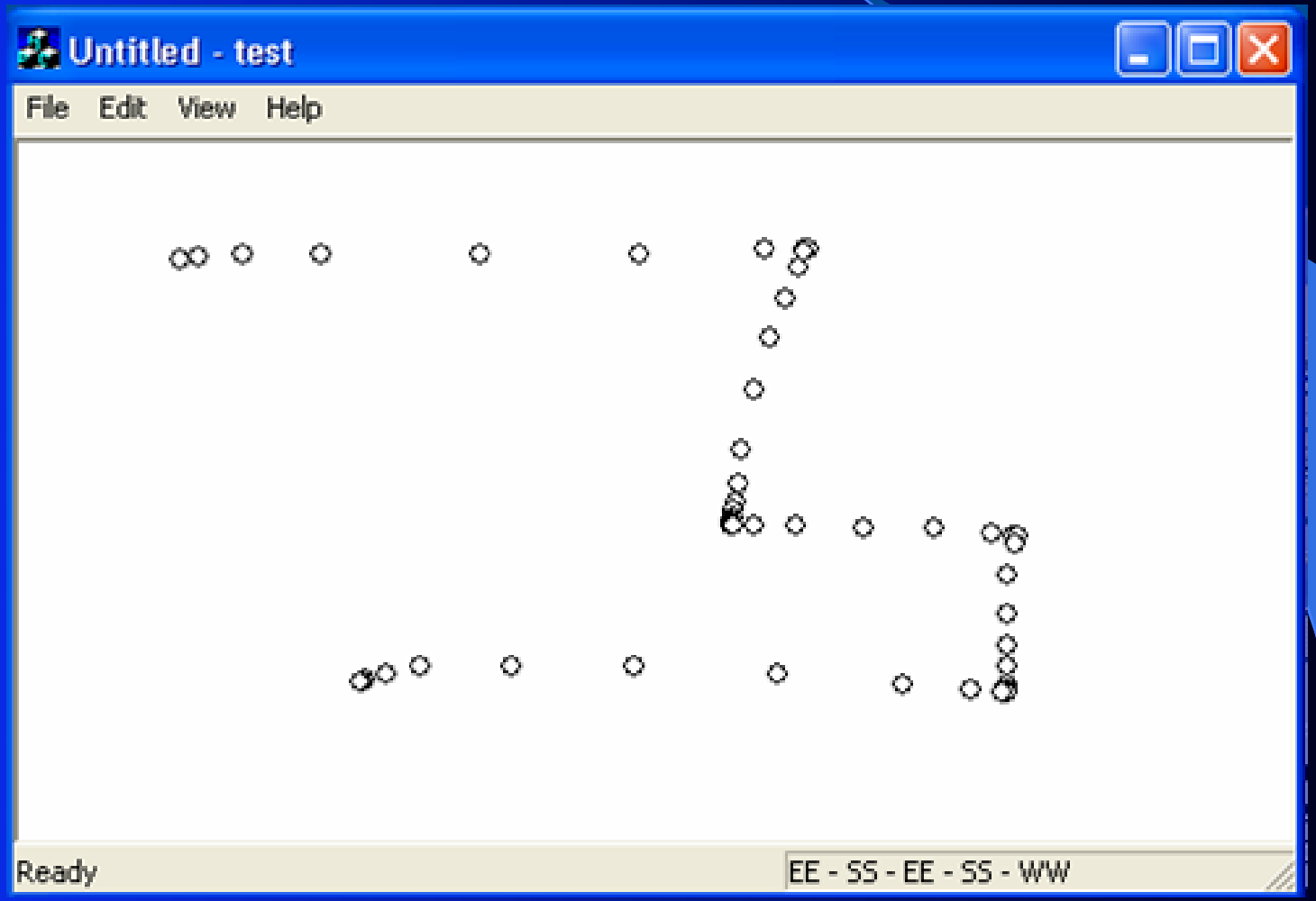
Examples of Strokes

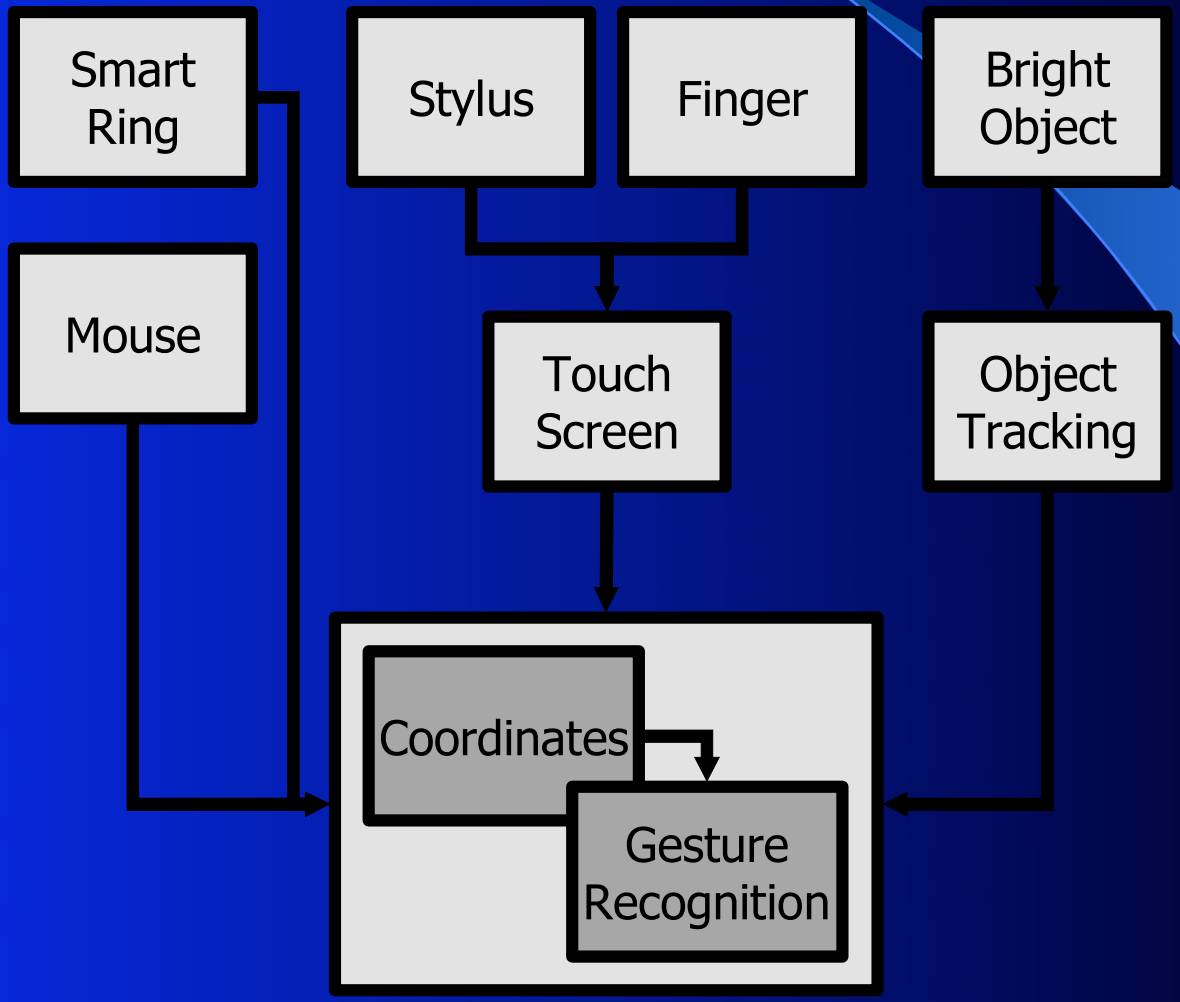
- Single Strokes
- Multiple Strokes



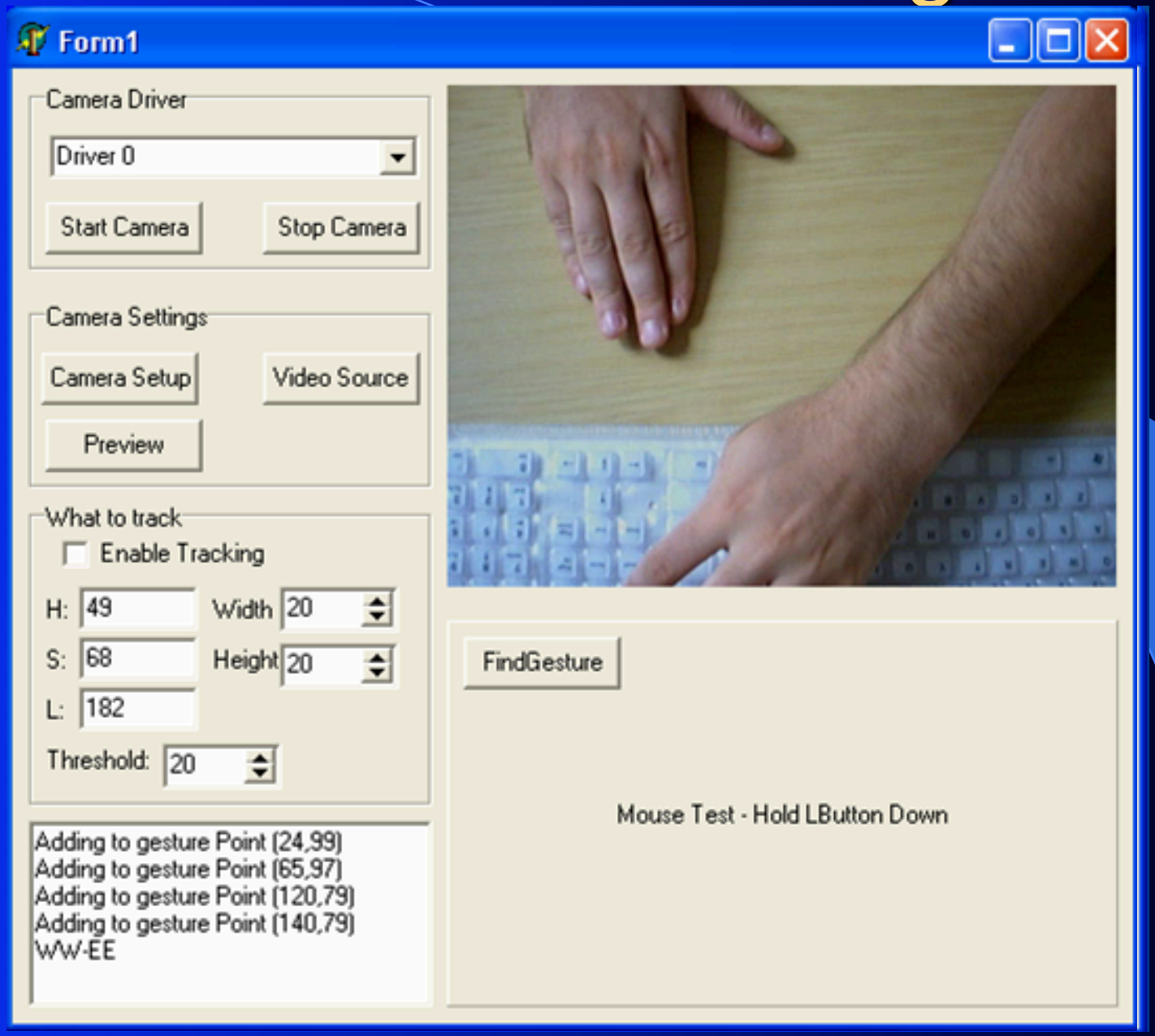
Touch-Screen Strokes



Flexibility of Directional Strokes

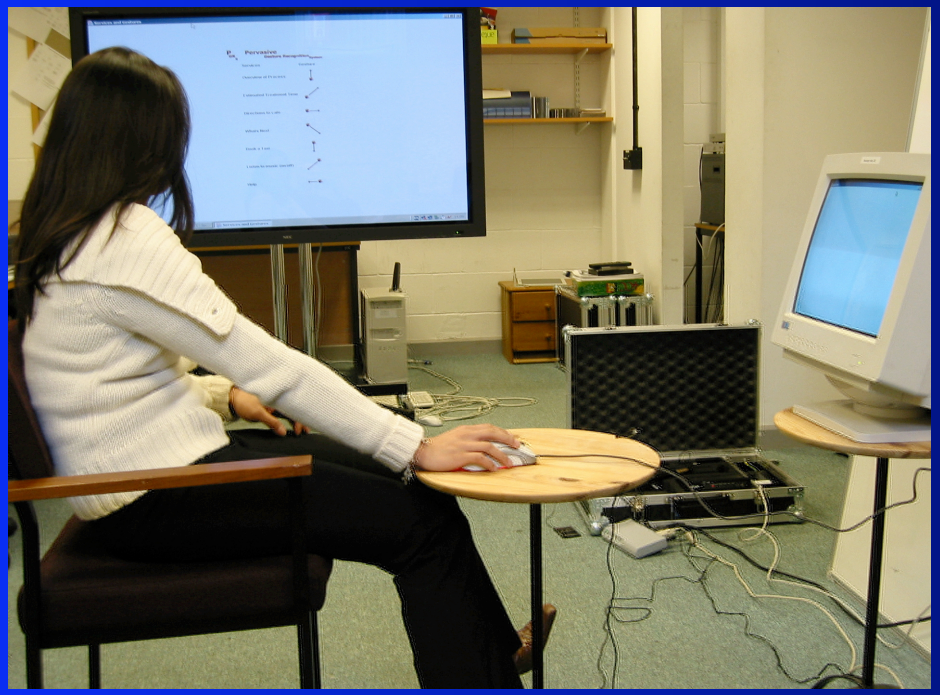


Camera Tracking



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?
- Multiple object tracking?

Research for immediate future

To do…

- CHI ’05 Workshop
  - “Social implications of ubiquitous computing”
  - ETH Zurich, Fraunhofer, Bartlett
- Journal Special Issue
- Chapter on “Public pervasive systems”
  - In “Pervasive Information Systems”, Advances in Management Information Systems
- Space syntax of public pervasive systems (Bartlett)
- Cityware (Bartlett, Imperial, HP, Vodafone, etc.)