Smart Spaces

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Human Information Interaction that transcends the desktop

Information Appliances

- Develop novel room-based and portable information appliances
- Develop protocols for appliance discovery and for configuring virtual controls
- Develop software to manage interactive information walls

Activity Recognition

- Develop multi-modal algorithms for sensing people, gestures, and intents
- Develop multi-media gisting and meta-data extraction techniques for summarizing activities

Personal Information Projection

- Develop techniques for projecting personal information from cyberspace into smart spaces

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Novel Room-based Information Appliances

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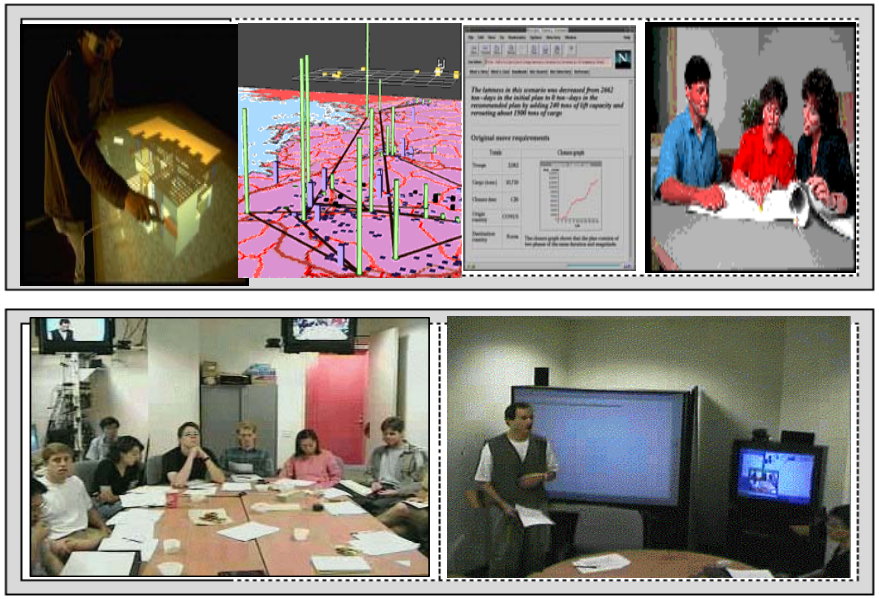
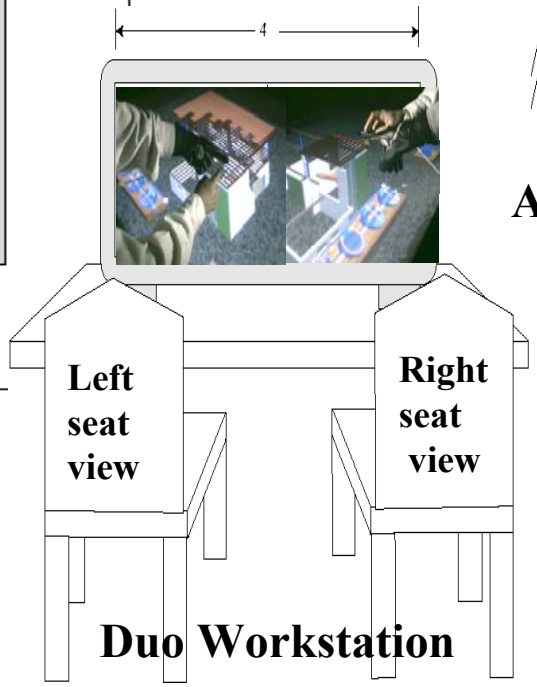
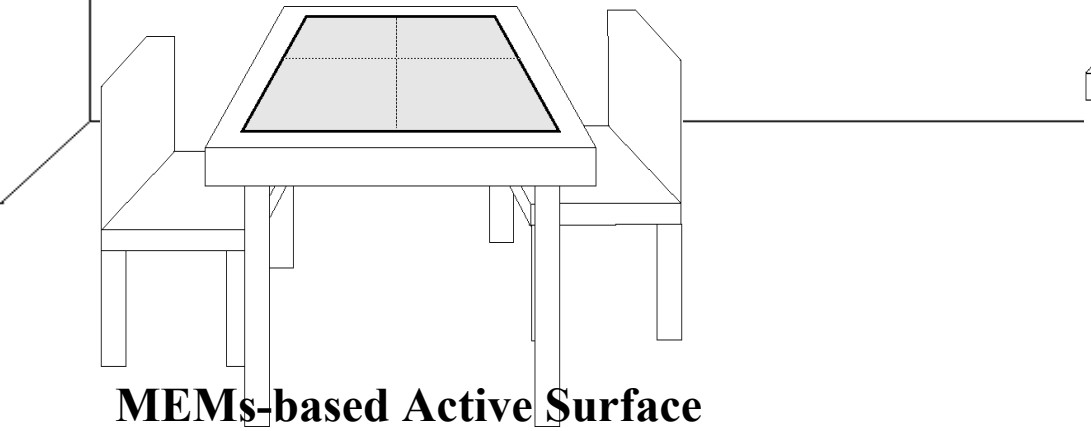
Virtual Sliding White Board



Active Easel



Duo Workstation



MEMs-based Active Surface

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Novel Portable Information Appliances

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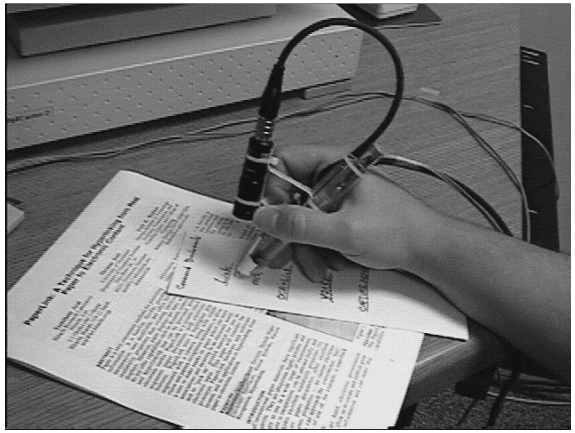
Foldable Computers

Computer, Projector & Camera in One

Digital Ink

Handheld Media Board



Smart Paper

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Discovering Information Appliances

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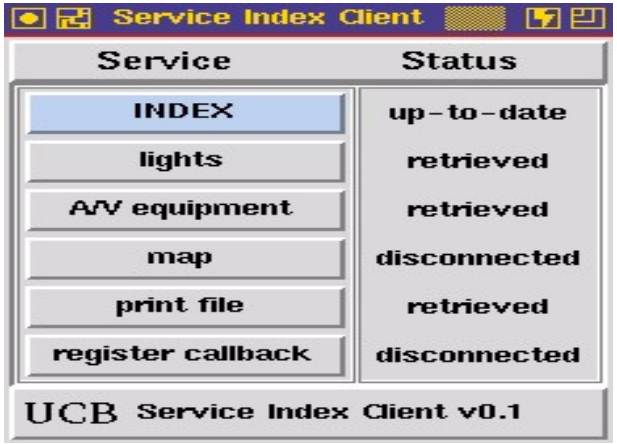
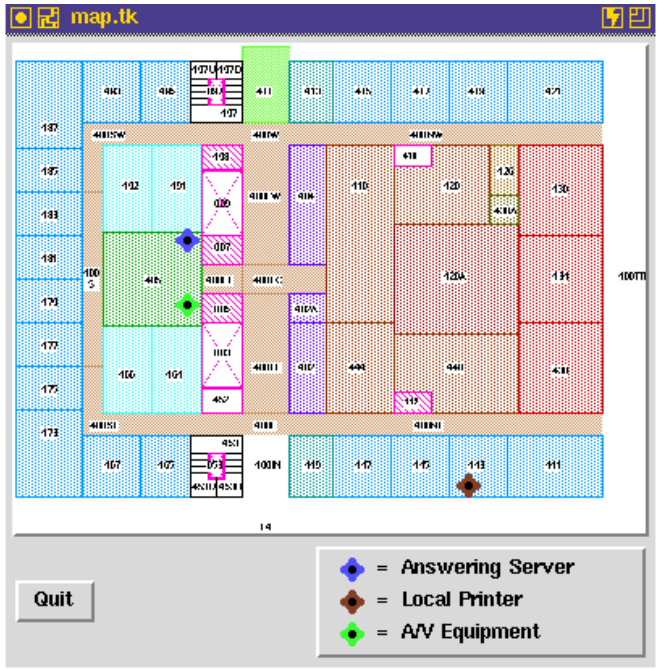
Prototype Smart Space

Monitors, Cameras, VCRs, Computers, A/V Switches, Echo Canceller, Scan Converters, Serial Muxes, LiveBoard, Speakers, Mic Amps, Receivers, Wireless LANs, . . .

List of Discovered Appliances



Map with Location of Appliances



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Configuring Virtual Controls

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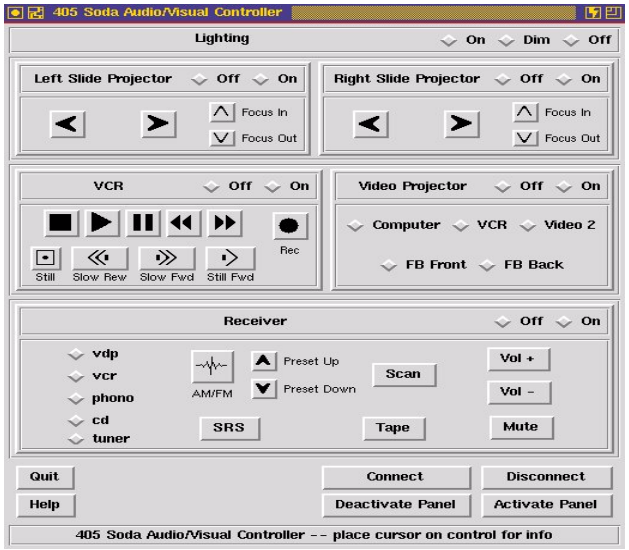
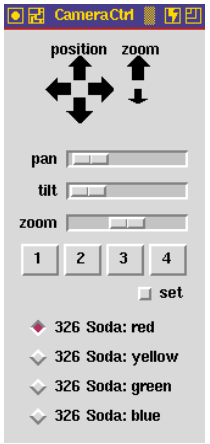
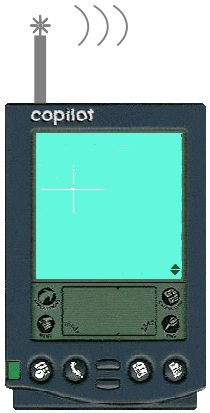
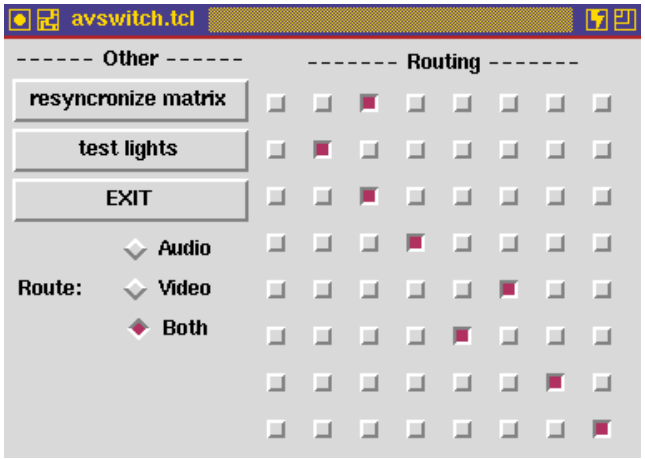
THIS? **OR THIS?**







Composable, Virtual Controls



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Interactive Information Walls

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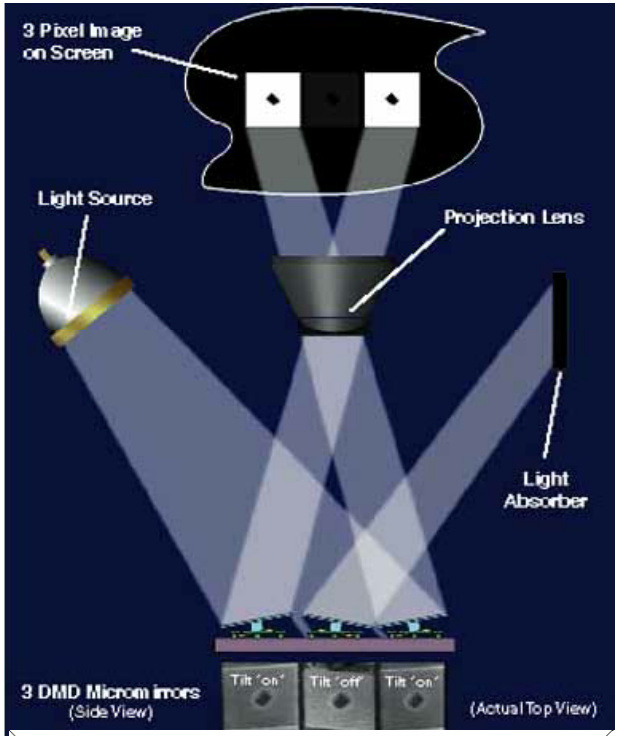
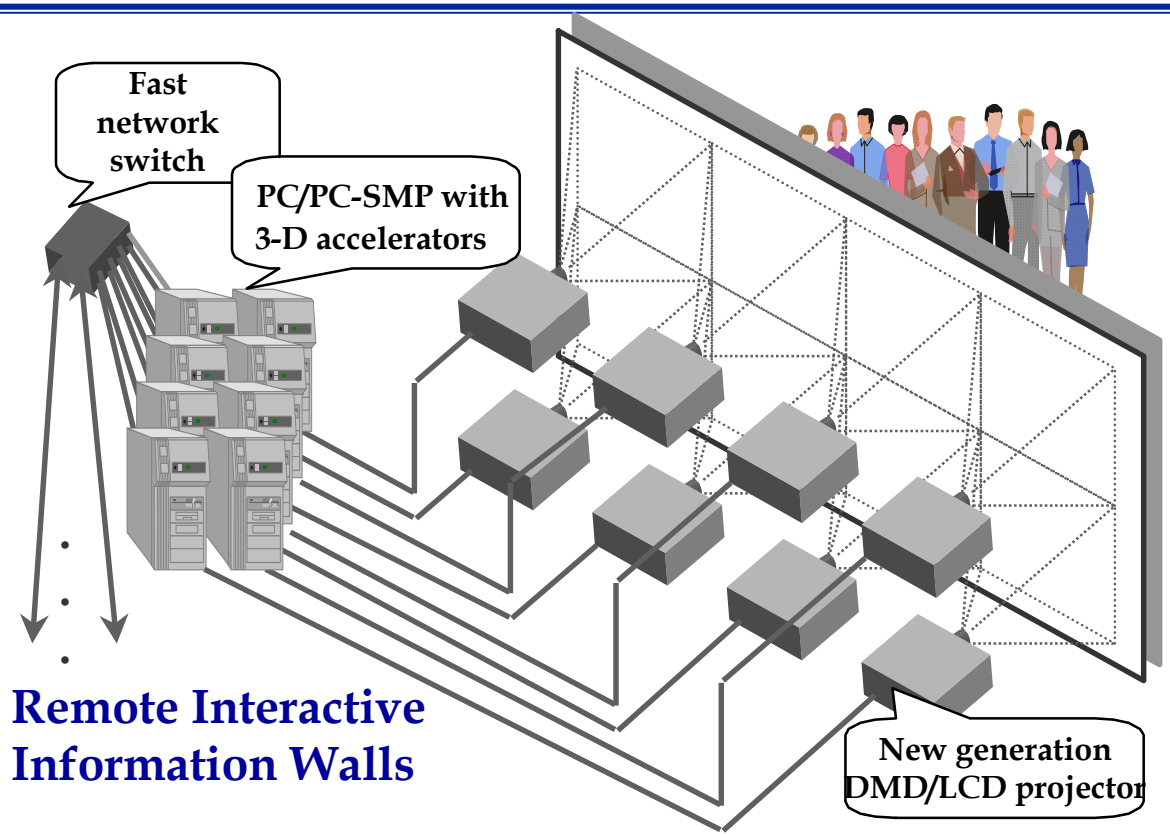
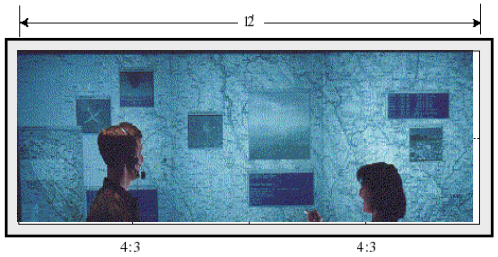




Remote Interactive Information Walls



Interactive Information Mural

Smart Spaces

Sensing People, Gestures, and Intents

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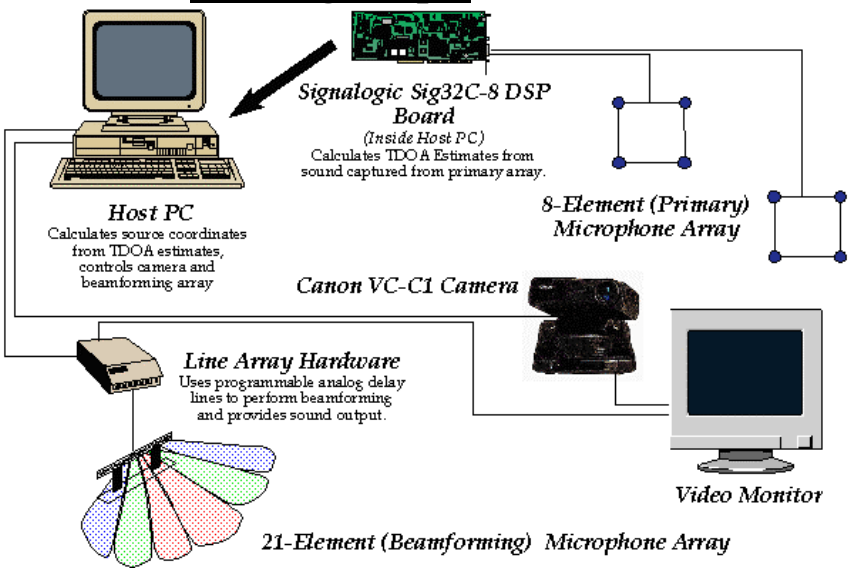
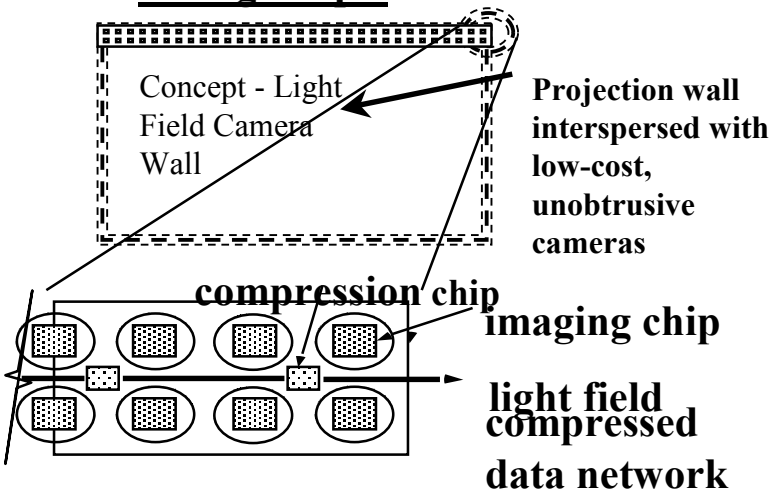
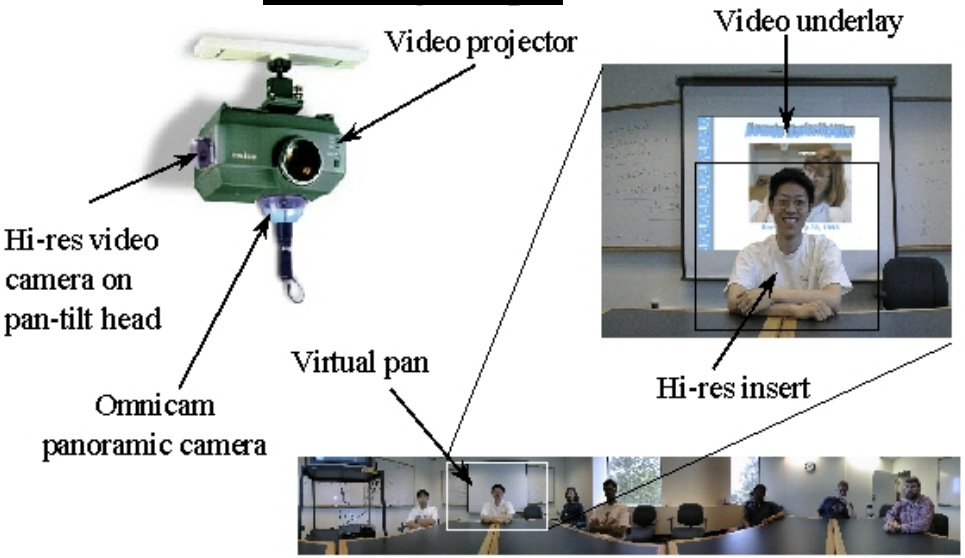
Hearing People

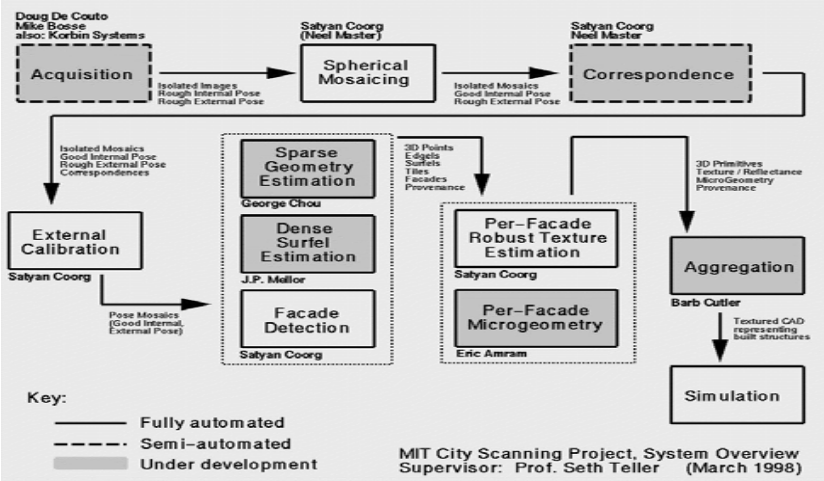


Seeing People



Tracking People





Modeling Spaces

Smart Spaces

Activity Summarization

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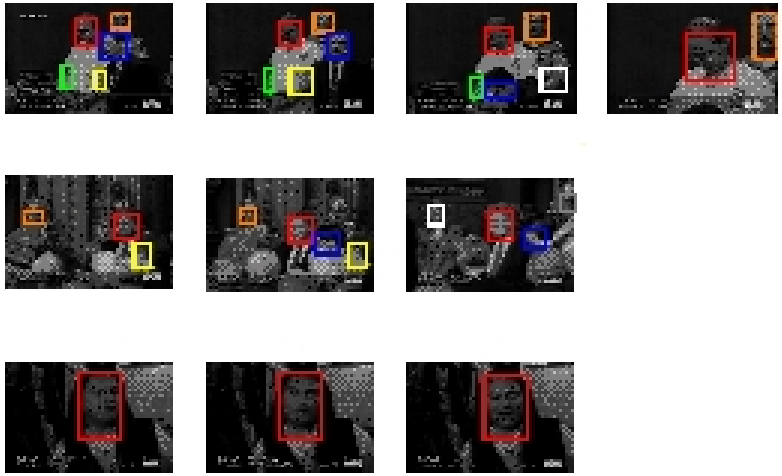
Recognizing Speakers and Detecting Topics, People, Places, and Things

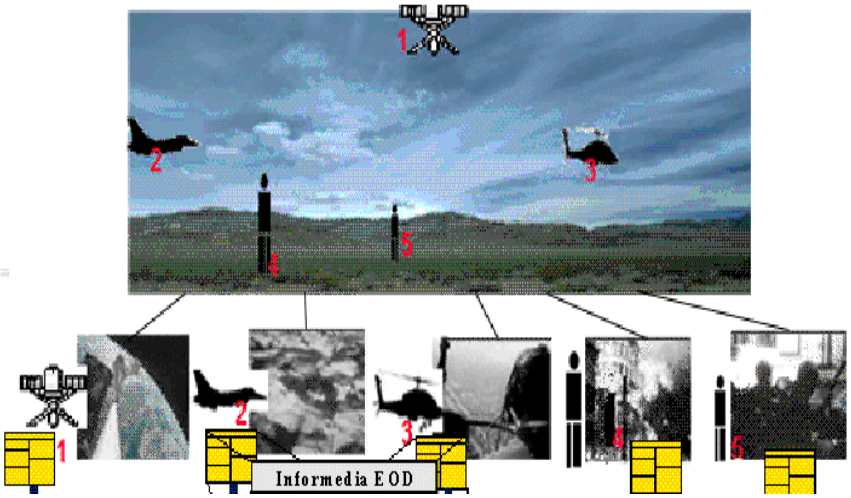
Generating Activity Descriptions

```
(Region Train
  (Color Red)
  (Position ((4 and 5) or (5 and 6)))
  (Shape MajorAxis(0 30)))
(Region GrassLand
  (Color Green)
  (Size > 50%)
  (Position (7 and 8 and 9)))
(Region Sky
  (Color Blue)
  (Size > 10%)
  (Position (1 or 2 or 3)))
(Object BackGround
  (ConsistOf (GrassLand, Sky))
  (Relation Top(Sky, GrassLand)))
(Scene MovingTrain
  (ConsistOf (Train, BackGround))
  (Motion Train Right))
```

Detecting Faces and Associating Faces and Names



Integrating Multiple, Multi-modal Perspectives



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Moving Through Smart Spaces

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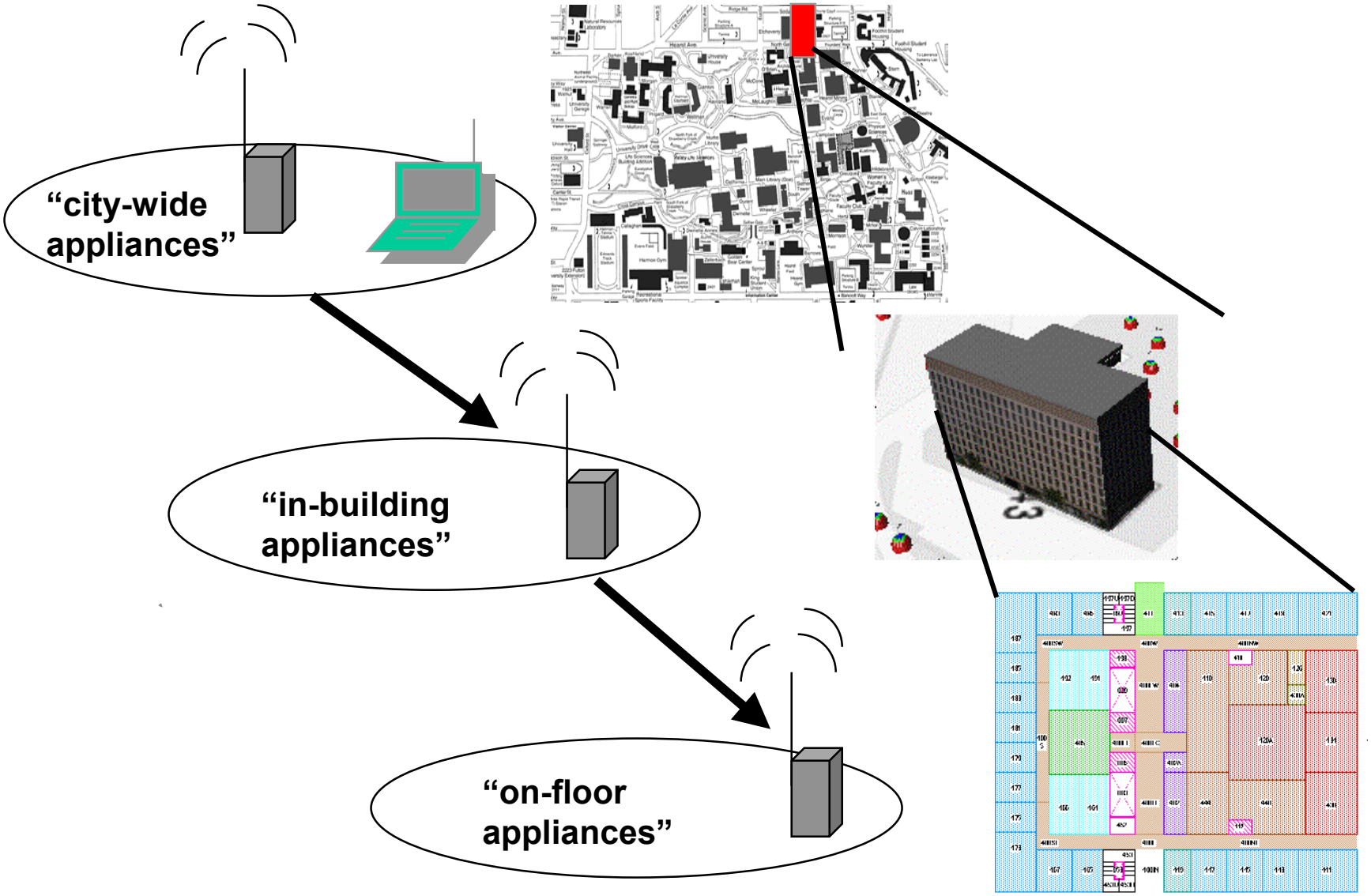

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Personal Information Projection

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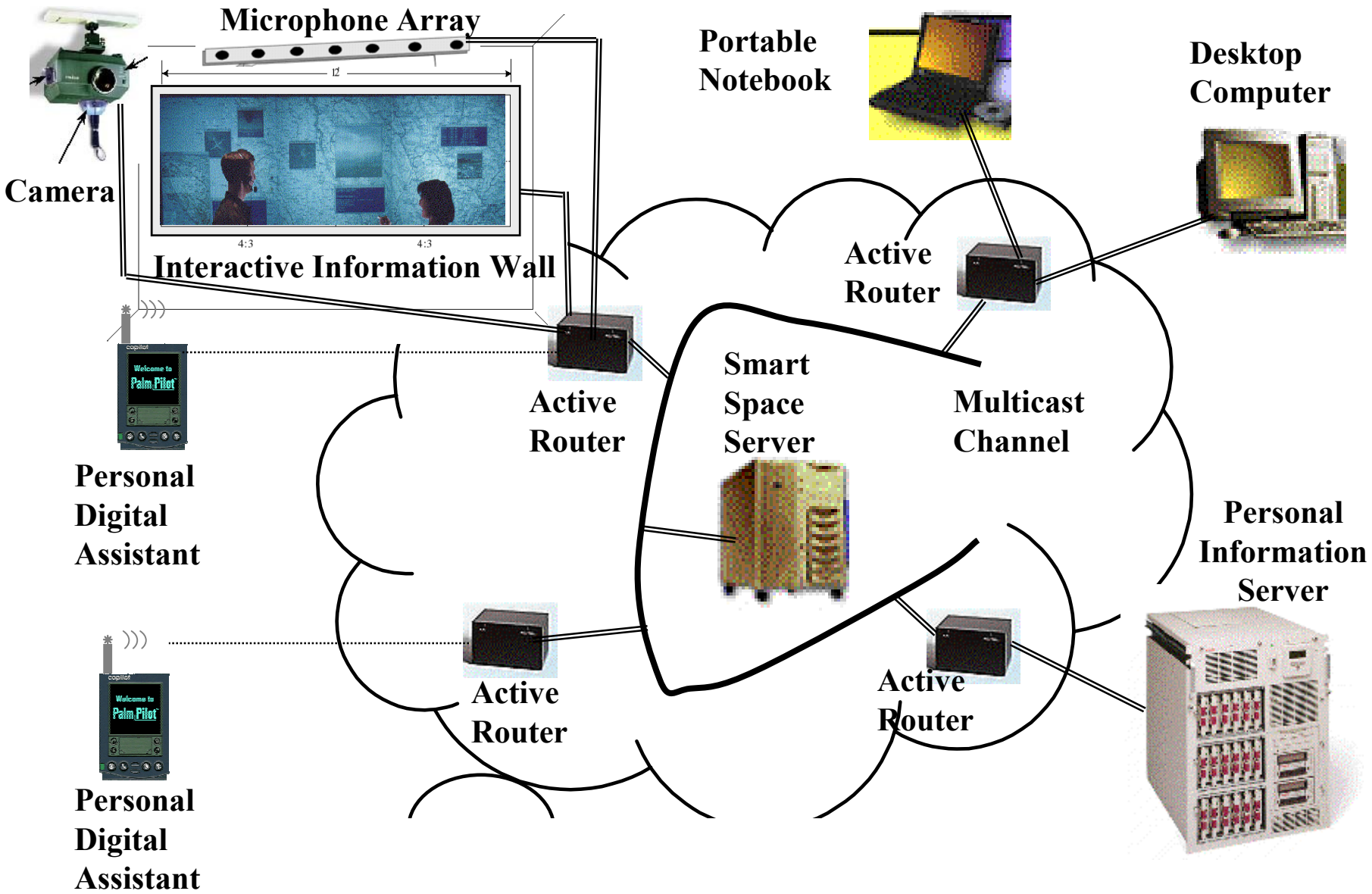

Smart Spaces

Military Application - Interactive Situation Room

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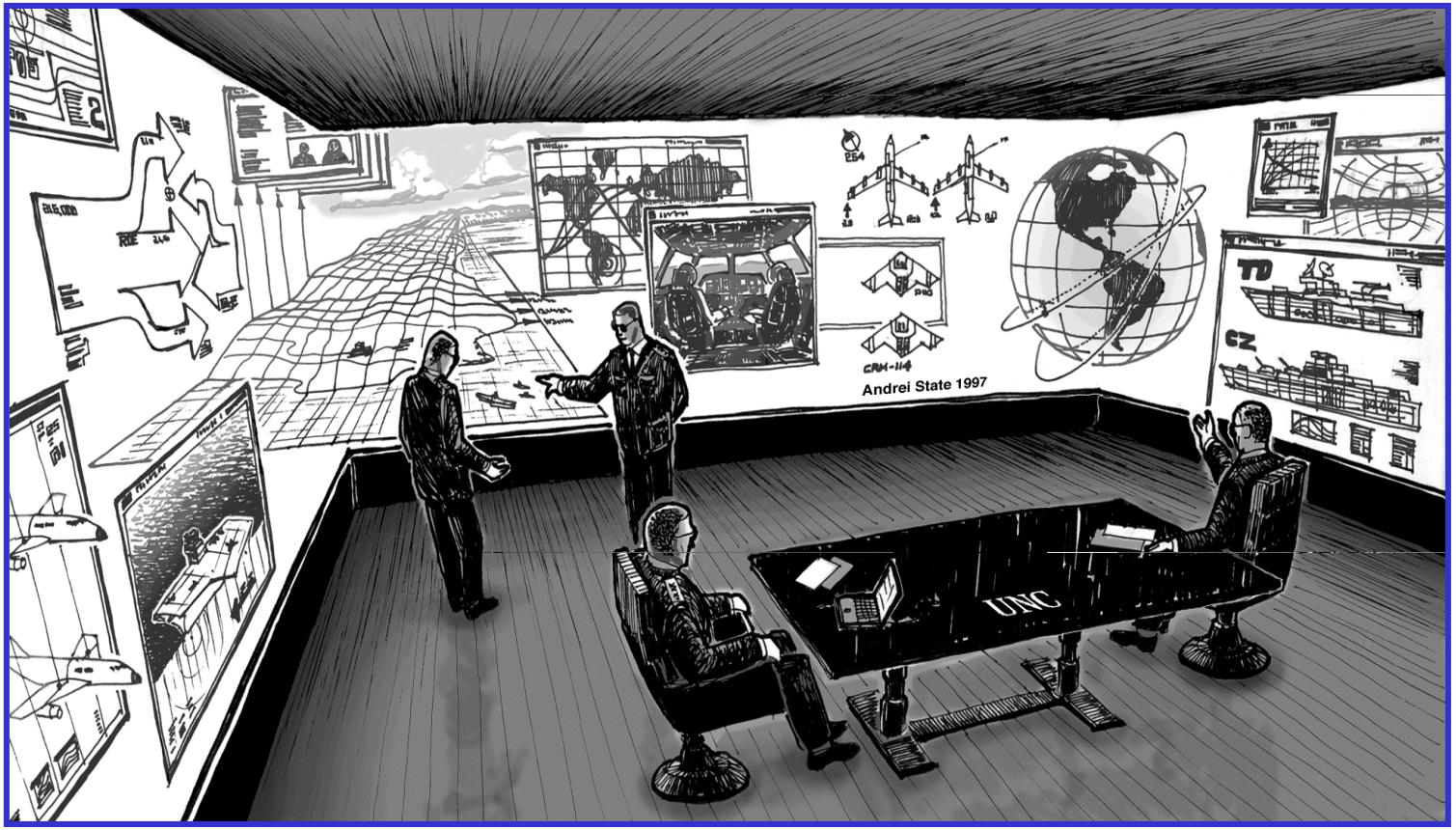

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Commercial Application - Collaborative Design Space

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Smart Spaces

2010: The Pentagon as Distributed Smart Spaces

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