

Technology and its Role in the Home

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December 8th, 2005

- Introduction
 - Motivation
 - Basics
- Identifying Prime Sites
 - Routines
 - Pathes
 - Locations
 - Significance for Ubiquitous Computing
- Challenges
- Summary & Outlook

- Last week: Augmented Space
- We spend most of our time in our homes:
 - ... Augmented Home?
- Ubiquitous Computing
 - [Philips HomeLab](#)

- Introduction**

- Identifying Prime Sites
- Challenges
- Summary & Outlook

Ubiquitous Computing:

- *“A method of enhancing computer use by making many computers available throughout the physical environment, but making them effectively invisible to the user.”*

(Mark Weiser 1991)



His vision:

- Make computers omnipresent
- **Invisible in use !**

Introduction

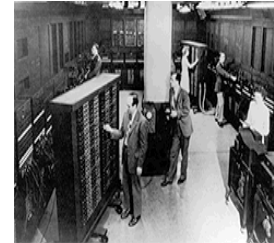
Identifying Prime Sites

Challenges

Summary & Outlook

Mainframe Era

- 1950 – 1980



Personal Computer Era

- 1980 – *Present*



Ubiquitous Computing Era

- (Future Vision)



Introduction

- Identifying Prime Sites

- Challenges

- Summary & Outlook

Introduction

Identifying Prime Sites

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The *Smart Home*:

- Home environment with Ubiquitous Computing
- Components are communicating via local network
- One may integrate:
 - Safety Systems
 - Energy Control Systems



Previous research:

- Focus on work environment
 - Hawthorne-Experiments
 - Taylorism
- Not applicable to the home
 - Why?

New approach: Ethnomethodology

- Sociological Discipline
- “The study of people’s methods”

Research Method:

- Disrupt routines to make them visible!

Introduction

Identifying Prime Sites

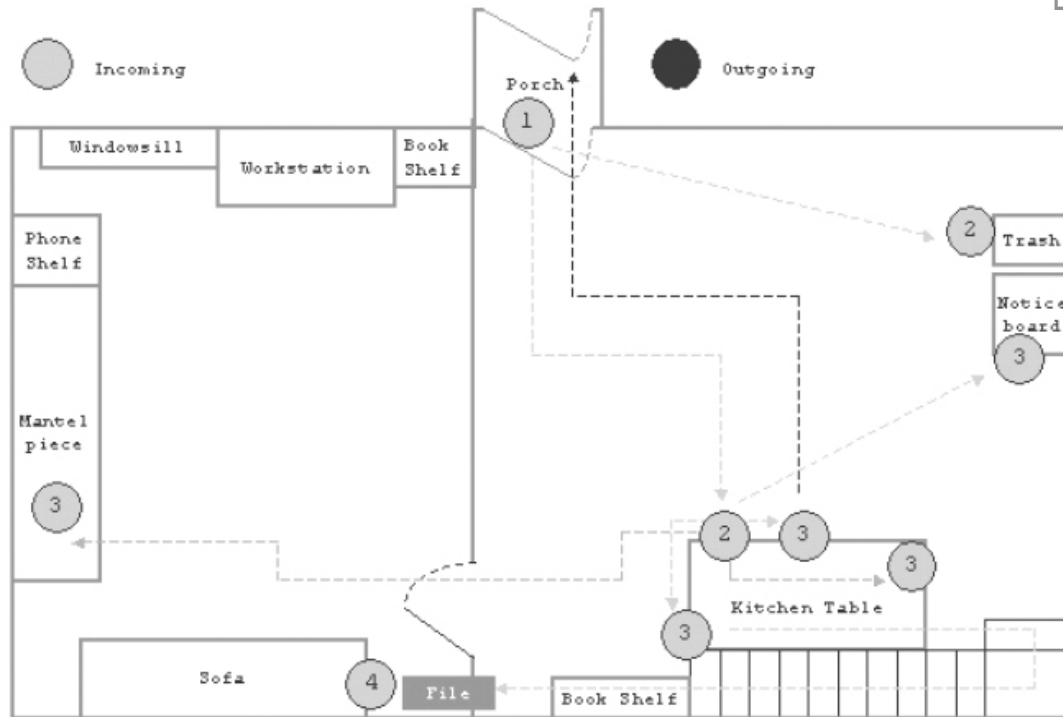
Challenges

Summary & Outlook

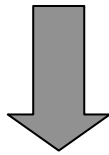
Identifying Prime Sites

- Ethnomethodology
 - Monitor households over period of time

- Introduction
- Identifying Prime Sites**
- Challenges
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- Repetitive tasks form *Pathes*
 - Familiar from own experience
 - Keys? Bag?



- Pathes involve *Locations*
 - Affect other's routines
 - E.g. Post-It on your monitor

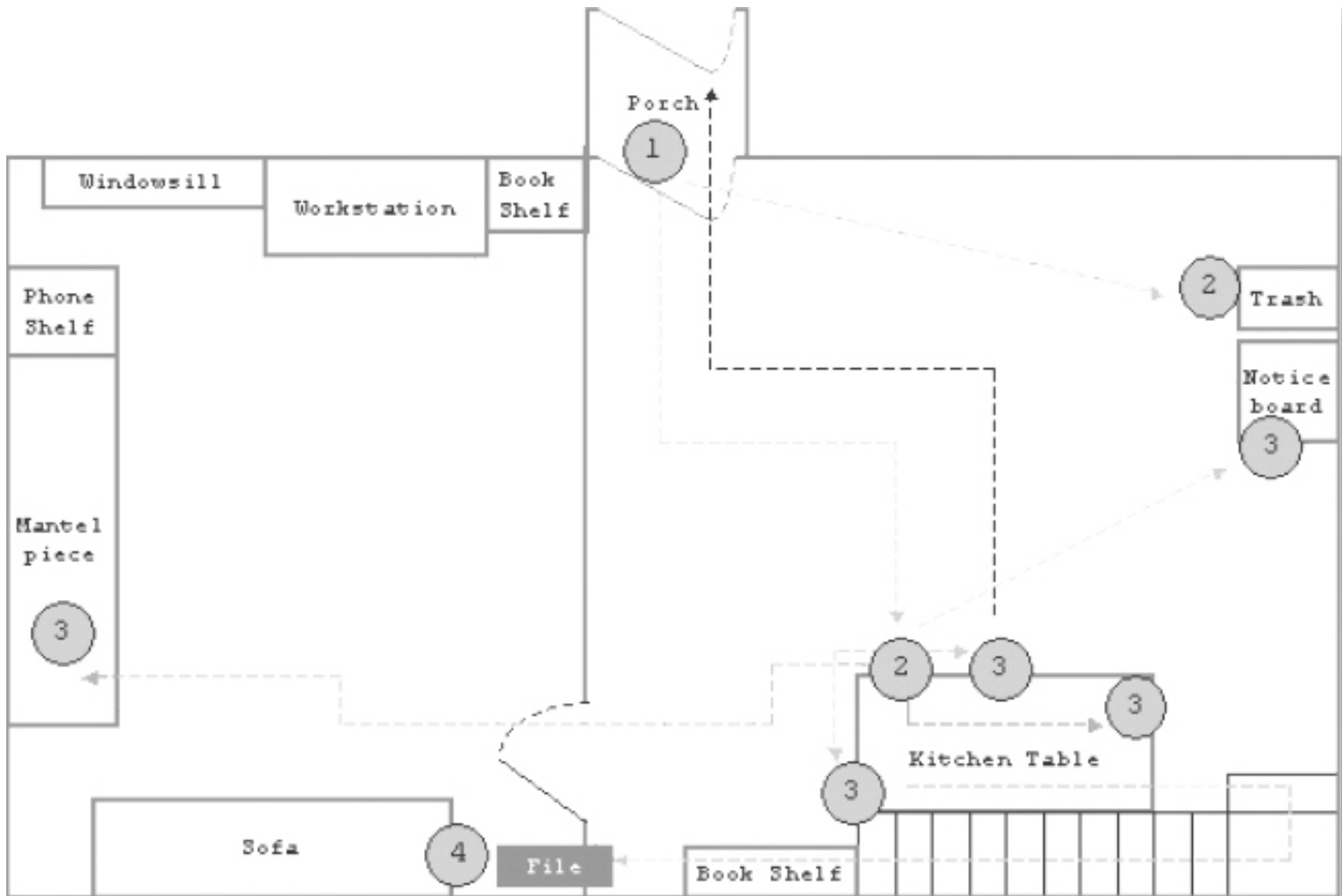
- Introduction
- Identifying Prime Sites**
- Challenges
- Summary & Outlook

- Locations in the Home*:
 - **Ecological Habitats**
 - **Activity Centres**
 - **Coordinate Displays**
 - **Convergence of Media**

- Introduction
- Identifying Prime Sites**
- Challenges
- Summary & Outlook

* *Terminology following Crabtree*

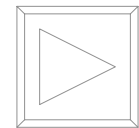
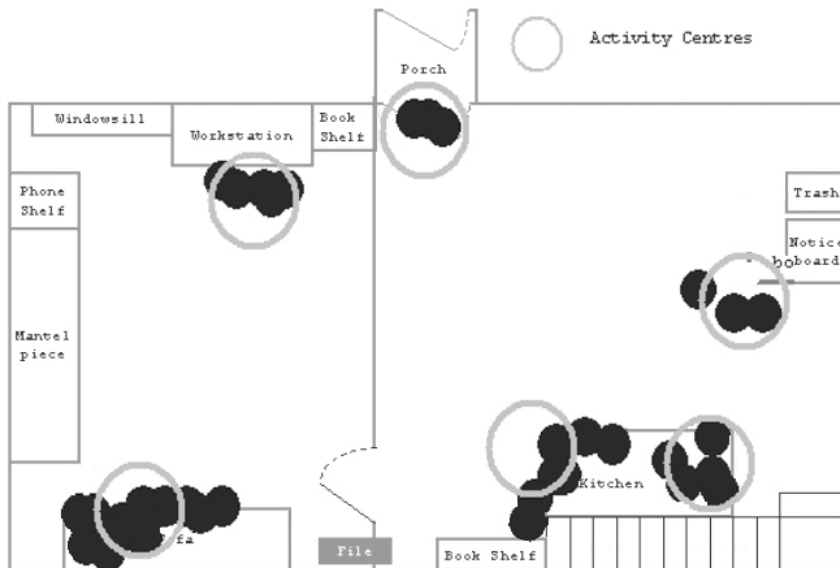
Identifying Prime Sites



Identifying Prime Sites

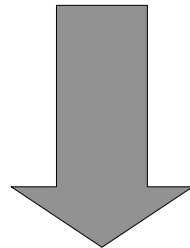
- Finally: To find *Prime Sites*:
 - Identify Locations
 - Identify Location Overlaps
- Augment the action!
 - Any ideas?

- Introduction
- Identifying Prime Sites**
- Challenges
- Summary & Outlook



Unpredictable Homes?

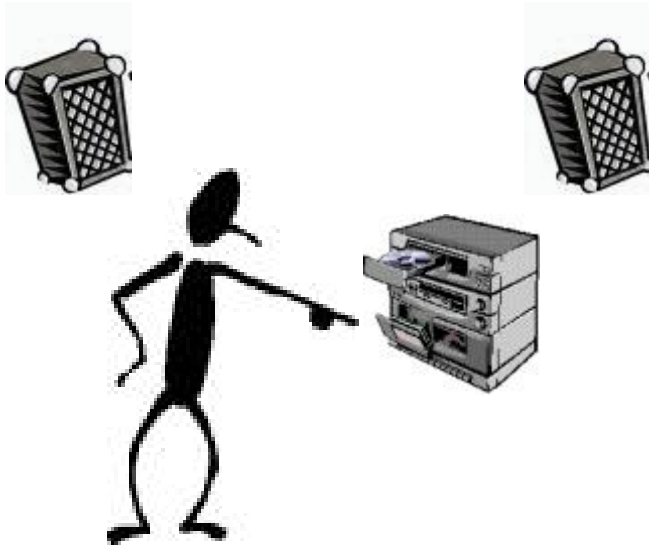
- Today's homes do not have the infrastructure for Ubiquitous Computing
 - New devices will be added
 - Old devices will be removed



- Even mundane technologies can cause problems

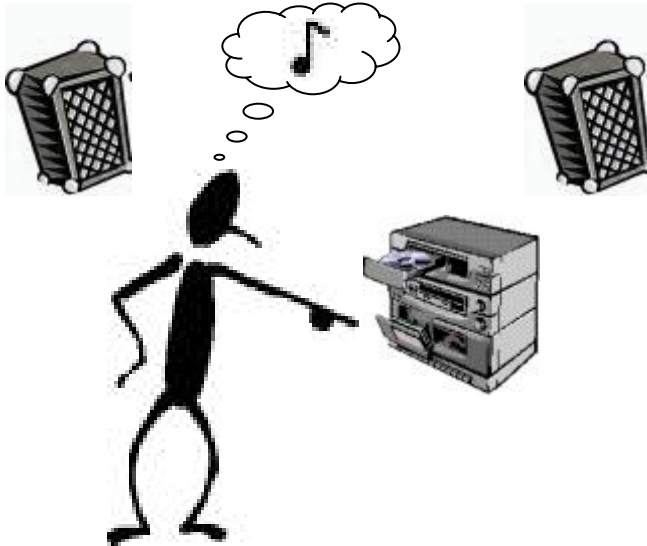
- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Unpredictable Homes?



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

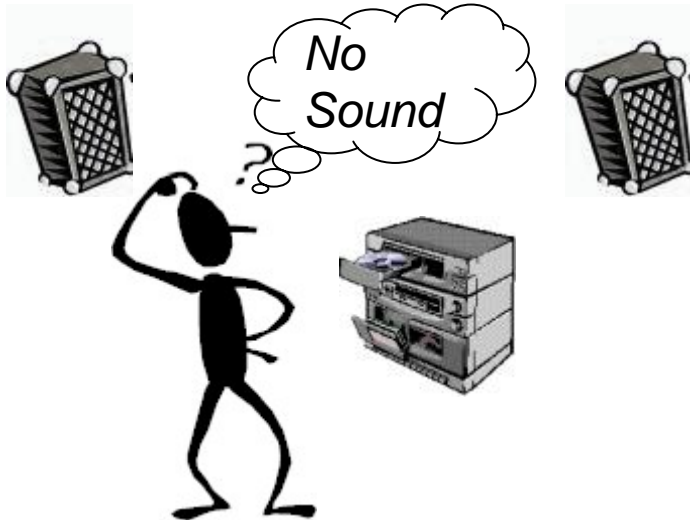
Unpredictable Homes?



He wants to test the wireless speakers...

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Unpredictable Homes?

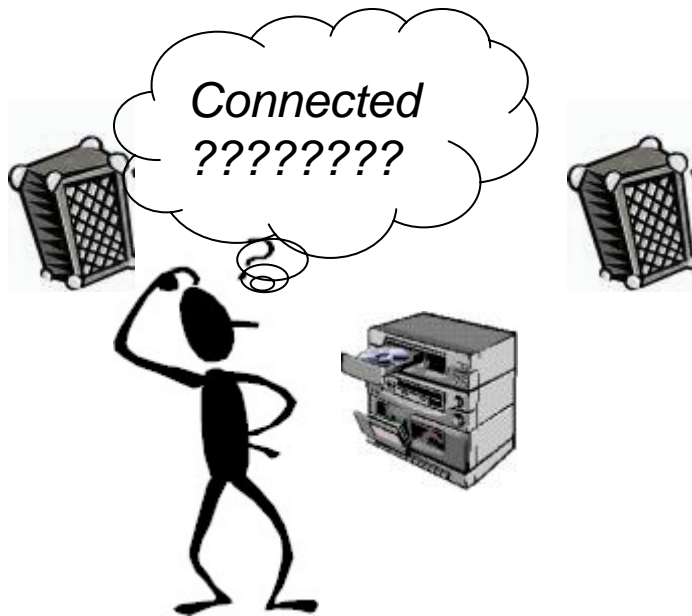


No sound because ...

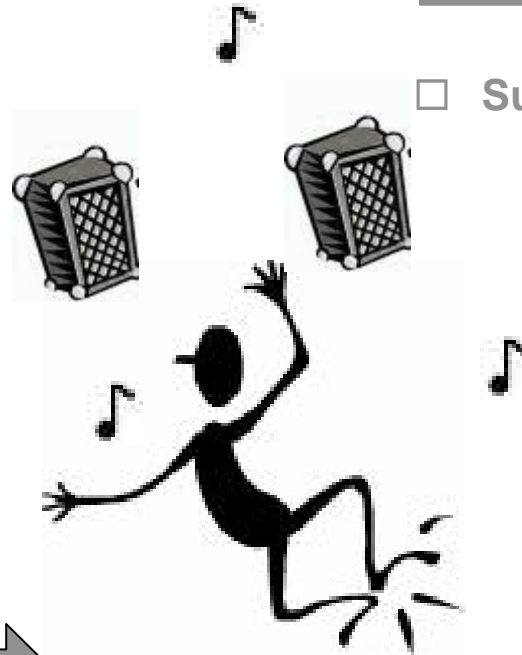
- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

The Challenges

Unpredictable Homes?



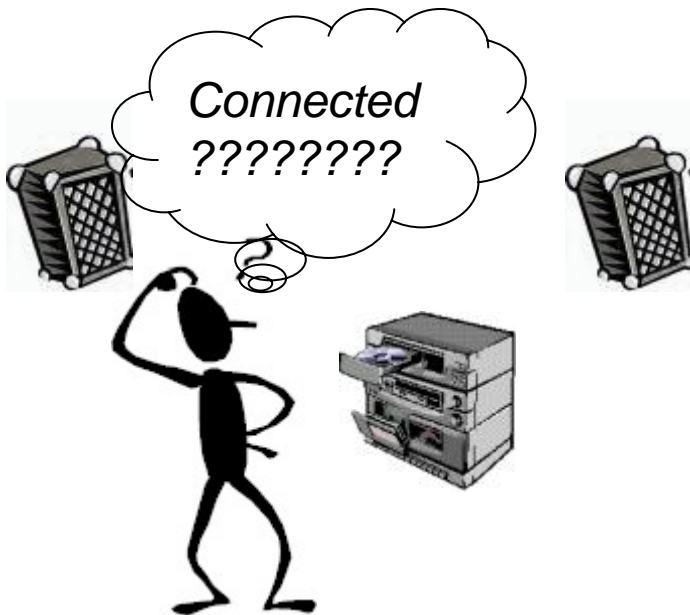
No sound because ...



Neighbor uses the stereo

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Unpredictable Homes?



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Understanding the connectivity between speakers and stereo is difficult ...



... because it is not touchable

Unpredictable Homes?

- Challenge for designers:
 - How to make a system intelligible?

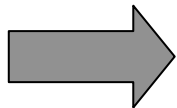
- Challenge for homeowners:
 - To understand the transition of a house from *dumb* to *clever*

- Introduction
- Identifying Prime Sites
- Challenges**

- Summary & Outlook

How much administration is required?

- Average computer user has to perform administration tasks:
 - Software installation
 - Hardware upgrades
 - Network / Security Administration



Do we need to be “experts” to live in a Smart Home?

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How much administration is required?

Two approaches:

- Traditional Model
- Utility Model

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How much administration is required?

- Traditional Model:
 - Single-function devices
 - No complex administration
 - Easy to use
 - Experts set-up / repair



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How much administration is required?

The Challenge:

- Allow interactions with other devices without losing simplicity



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How much administration is required?

Utility Model:

- Easy functionality
- Necessary technology is located in the network



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How much administration is required?

The Challenge:

- To design solutions that help to protect the network against malicious attacks

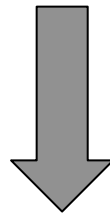


- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

Devices in households afford high reliability:

- They nearly never crash
- Unlike PCs ...



Why?

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

Challenge is to understand the reasons:

Differences in ...

- Development Culture
- Technological Approaches
- Market Expectations
- Regulations

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

- Different Development Culture:
 - Developers are much more wary about system crashes
 - Difficult to patch or upgrade
 - Costs substantial time and resources
 - Influence the system architecture

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

Different Technological Approach:

- Approaches in connected domestic technologies
 - Functionality lies in the network
 - New functionality can be used without an update
 - Utility approach



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

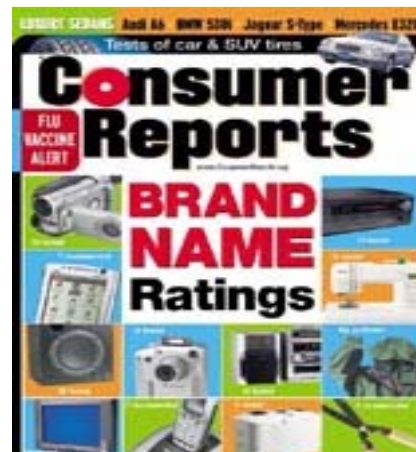
- Different Technological Approach:
 - Technological approaches in *Smart Homes*
 - Balance of Intelligence
 - Failure of one component in the system should not bring down the rest

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

Different Market Expectations:

- Consumers expect running devices
- Magazines like “Consumer Reports” identify reliable devices



- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Will the systems be reliable?

- Different Regulations:
 - Utilities must have certain
 - *Level of Service*
 - *Level of Security*

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Managing the Social Impacts

- Social implications of domestic technologies:
 - “Labor Saving”
 - Washing machine, irons
 - Changed the idea of “acceptable” washing
 - Raised the amount of work

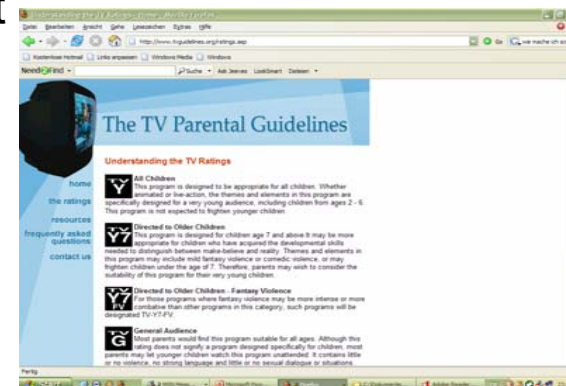
- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

Managing the Social Impacts

- Social implications of domestic technologies:

- “Good Parenting”
 - Influenced how parents think about good parenting
 - Debates about the content
 - V-Chip, rating schemes

- Introduction
- Identifying Prime Sites
- Challenges
- Summary & Outlook



Managing the Social Impacts

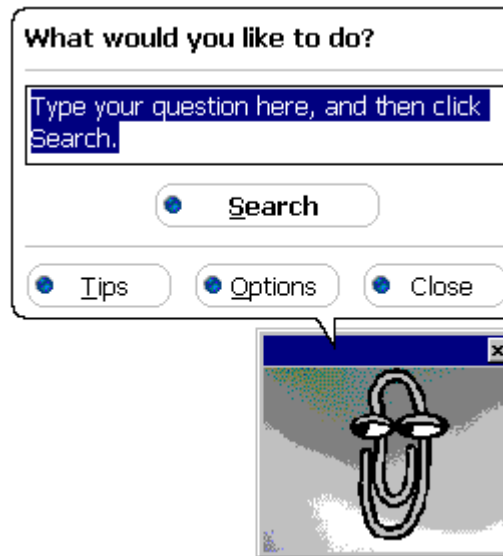
- Challenge for designers:
 - To be aware of social implications of technology

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How *smart* does the *Smart Home* have to be?

- Some current systems try to presume the actions of the user:

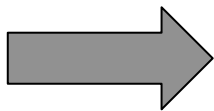
- *Clippit (Microsoft)*



- Introduction
- Identifying Prime Sites
- **Challenges**
- Summary & Outlook

How *smart* does the *Smart Home* have to be?

- Machine inference is an advantage for the *Smart Home*:
 - Systems that are aware of their surroundings
 - Systems that infer what the user would do



Based on sensor inputs or presumptions

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

How *smart* does the *Smart Home* have to be?

- Such systems can make various mistakes:

- A person is in a room because of the active badge



- Act on incorrect presumptions

- Introduction
- Identifying Prime Sites
- Challenges**

- Summary & Outlook

How *smart* does the *Smart Home* have to be?

- The challenge for designers:
 - Support users to understand these systems
 - Provide possibilities to override the system's actions

- Introduction
- Identifying Prime Sites
- Challenges**
- Summary & Outlook

- New approaches to research
 - Lots of challenges to be overcome
 - Our conclusion:
 - Augment the action, not the device
 - Invisible to use \neq Invisible for the eyes!
- Introduction
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And finally ...



Thank you for listening!