Users Want Simple Control over Device Selection

A User Study

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Introduction

- Ambient Intelligent environments will contain many devices of potential interest to the user.
- Many applications will involve an ad hoc combination of devices (e.g. a digital camera and a public screen).
- Problem: how to combine these devices ?
  - How to identify and select the appropriate devices?
  - Technical difficulties; protocols, semantics.

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Experimental design - Smart Room

- User input: 2 keyboards and 2 mice, Bluetooth.
- Displays: 2 tablet PCs and 1 beamer.
- Subjects carry a PDA for manual selection or feedback about automatic selection.
- All connected in a WiFi network

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Experimental design - Task & Conditions

- Task: group the devices needed for:
  - Single user: a photo annotating application.
  - Multiple users: a photo rating application.
- Comparing single and multiple user interaction.
- Comparing 5 different interaction styles.
  - Assign
  - Button
  - 2 manual variations
  - Dummy

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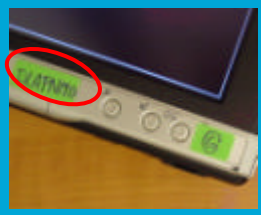
Condition - Assign

Assign: Devices are automatically assigned to user, user gets list of device names on PDA. (la_au)

PDA	
The selected devices	
Mouse	M23as
Keyboard	K33jm
Display	DLAPNMO



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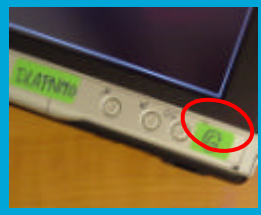
Condition - Button

Button: User presses button on device to select it. (si_au)

PDA	
The selected devices	
Mouse	ok
Keyboard	-
Display	ok



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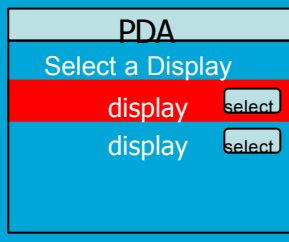
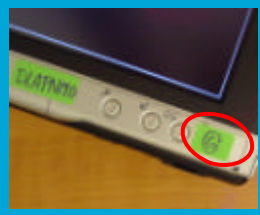
Condition - Button + PDA

Button + PDA: User presses button on device which causes the associated device to highlight on PDA (si_ma)





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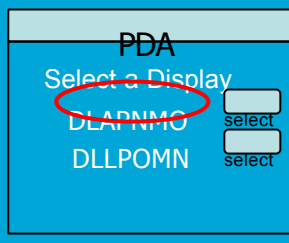
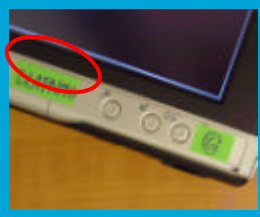
Condition - Label

Label: User compares labels on device and on PDA (la_ma)





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Experimental design - Measurements

- 23 subjects, 11 pairs
- Questionnaires about usability, trust and cooperation per condition
- Final subjective ranking of interaction styles, for single and multiple user case
- Observations
  - Subjects like the idea of a smart room.

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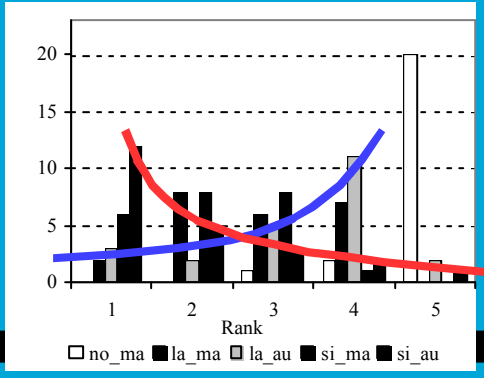
Results - Ranking preferences

- For single user interaction
- Subjects prefer the Button-press interaction style, they least prefer the Assign interaction.



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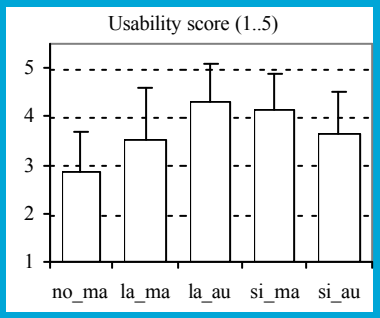
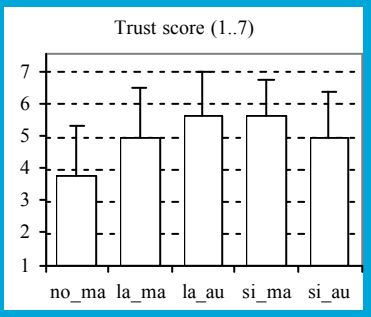
Results - Questionnaires

- .... even at the expense of usability.





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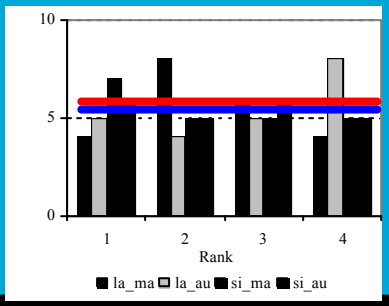
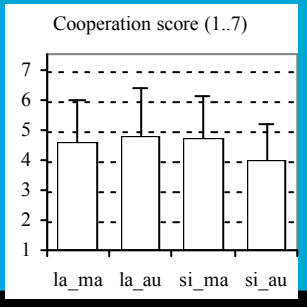
Results - Multiple Users

- Ranking preference disappears.
- No significant differences in cooperation scores.





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Experimental Conclusions

- Users are willing to spend effort in exchange for control.
  - Assignment of devices is ranked below Button-press selection.
  - Usability of full automatic is high, but apparently not what users want.
- Subject often coordinate the allocation of resources verbally: e.g. "You go first." etc.
- Multiple user interaction needs further development.

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Questions and Answers

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Future directions

- Incorporate other resources: services, content.
- Consider the context when choosing an interaction styles, adaptive & adaptable.
- Focus more on multiple user interaction.
  - People **meet** and want to do 'something' (what?).
  - Environment consists of what is in the room and of what the people bring with them.

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Current Research

- More realistic setting
  - Multiple users, multiple activities
  - Expand resources to include content
  - Living room setting, resources are in the room or brought by the users
- Employ a token based approach
- Social factors
  - NO embedded social model
  - Instead leave choice for the users

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Current Research - Questions

- Will subjects understand the dynamics of a smart environment? Can they put it to use?
  - Multi-tasking is known to users, but not always employed?
- How is a group of resources perceived? Private, shared? Differences within a group?
  - Is it **my** display, or the photoviewing display
  - Measurable when switching a resource to another group.