Easy collaboration on interactive wall-size displays in a user distinction environment

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A brainstorming with 11 participants produced 149 items in 19 minutes (Herrmann and Nolte, 2010)
How did we get ourselves into this?

- **Origin:** Walkthrough-based process modeling
- **Problem:** Integrating phases of ideation for processes or process parts that have no pendant in reality
- **Content as well as process related clustering important**

Brainstorming areas

- service agency
- user
- service provider
- prepare service
- conduct service
- electronic form
Creativity and process design

Divergence

Brainstorming

Convergence

Clustering

Voting

Herrmann & Nolte 2010

Herrmann, Nolte, Turnwald 2011

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How to cope with it?

Facilitated clustering simply takes too long.

Do it collaboratively!

Three seamlessly interconnected interactive large screens (4,8 * 1,2m)
Observation

- Users constantly switch positions in front of the wall

→ Drag-and-drop is not sufficient, because users have to stay in touch with the display
→ Multi-touch is not sufficient
Multi-user distinction

• First approach: Distinction via *additional interaction*

• Not feasible because it slows down the process significantly
Other distinction systems

- User distinction through attachments or mobile devices

- User distinction on interactive tables
Requirements for our setting

• Distinguish multiple users
• No additional attachments
  ▪ Extends preparation time and has to be initialized
• No need for identification
  ▪ Additional interactions for identification significantly slow down the clustering process
• No space limitation
  ▪ Multiple people work on the same artifact at the same time
  ▪ Distinction via working area not feasible
• No initialization required
  ▪ Minimizing preparation time

➔ Using a Microsoft™ Kinect placed in front of the large screen
Prototype - Idea

• Participants can **pick** an item, **move around** other participants **and drop** the item into a cluster

• The pick and drop events are detected by the smart wall precisely *(IR-optical touch detection)*

• The **kinect** tracks the movements of the participants in front of the wall
Prototype - concept

Multi User Clustering Application Client

1. Touch detected
   - Send 2D coordinates

2. Transform 2D in 3D coordinates

3. Detect nearest User

4. Enrich coordinates with user ID

5. Execute Event

User Distinction Sensors Server

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Prototype – technical concept

1. Touch detected

Send 2D coordinates

5. Execute Event

Multi User Clustering Application Client

kinect

Easy collaboration on interactive wall-size displays in a user distinction environment
Prototype – technical concept

1. Easy collaboration on interactive wall-size displays in a user distinction environment
Prototype – technical concept

Easy collaboration on interactive wall-size displays in a user distinction environment
Prototype – interaction concept

• Each participant can **pick an item (card or cluster)**, move around (while **keeping the item in her hand**), and **drop it** somewhere else on the display

• So when a (position, userid) is received...
  – unknown userid -> create new user object with received user id and empty „pick up slot“
  – pick up slot represents the state of the users hand (either empty or holding item) == null pointer or reference to item
Prototype – interaction concept

• So when a (position, userid) is received...
  – the context of the received position is evaluated (empty canvas, an other item, a tool)
  – The system reaction is determined by the state of the context and the state of the pick up slot
Prototype – interaction concept

- System reaction matrix

<table>
<thead>
<tr>
<th>hit area</th>
<th>state of user's pick up slot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>empty</td>
</tr>
<tr>
<td></td>
<td>occupied by card</td>
</tr>
<tr>
<td></td>
<td>occupied by cluster</td>
</tr>
<tr>
<td>empty</td>
<td>do nothing</td>
</tr>
<tr>
<td>occupied by cluster</td>
<td>pick cluster</td>
</tr>
<tr>
<td>occupied by card</td>
<td>pick card</td>
</tr>
<tr>
<td>occupied by tool</td>
<td>do nothing</td>
</tr>
<tr>
<td>occupied by tool button</td>
<td>press button</td>
</tr>
</tbody>
</table>

- System reaction matrix:

  - **empty**: do nothing
  - **occupied by card**: drop card
  - **occupied by cluster**: drop cluster
  - **occupied by tool**: drop card on tool
  - **occupied by tool button**: press button (anyway)

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Prototype – interaction concept

Items:

– a card:

– an empty cluster:

– a filled cluster:

Items:

– a card:

– an empty cluster:

– a filled cluster:
Prototype – interaction concept

• Items (continued):
  – a cluster stack:

  – a tool (example):
Prototype – preparation

• Positioning the kinect sensor
  • The kinect must “see” the whole display
  • In order to avoid reduce the chance that participants cover each other the kinect should be placed as high as possible
Prototype – preparation

• Calibration:
  • Necessary for the transformation of display positions (2d) into room positions (3d)
Prototype – in action

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Remaining Issues

- Mutual covering of participants -> 2 or more kinect
- Reidentification of users during a session -> height, mass, clothing (color overlay)
- … between sessions -> biometric methods (face recognition, gait recognition)
- Other applications? -> process modeling
Thank you for your kind attention

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