ProbonoWorld: Educating the Mentally Handicapped in a Virtual Environment using Props on a Board

Saskia Groenewegen, Stefanie Heinz, Anke Huckauf, Bernd Fröhlich

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Overview

- Motivation
- Existing Systems
- Input Device
- Navigation
- Learning
- Future Work
Motivation

- Computer-based learning common in schools
- Very few programs for mentally handicapped children
- Schools use unspecialized programs
Aim

- Develop education system for children with mental handicaps
- Topic: train planning skills for independent life
- Implementation: realistic virtual world
General Questions

- Which interface can we use?
- How to design the virtual world?
- How do we represent a whole virtual world on one graphics tablet?
- How do we navigate in this world using the graphics tablet?
- How is planning trained?
## Interfaces for Virtual Learning Environments

<table>
<thead>
<tr>
<th>Visual Interface</th>
<th>Interaction Device</th>
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<tbody>
<tr>
<td><strong>AS Interactive</strong></td>
<td>Mouse, Joystick</td>
<td>[Cobb et. al. 2002]</td>
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<td><strong>AVC</strong></td>
<td>Voice</td>
<td>[Geiszt &amp; Sik-Lanyi 2006]</td>
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<td><strong>ProBoNo</strong></td>
<td>Prop on a Board</td>
<td>[Schild &amp; Göttel 2005]</td>
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Our Interface

- Input device: Prop on a Board
General Questions

- Which interface can we use? ✓
- How to design the virtual world?
- How do we represent a whole virtual world on one graphics tablet?
- How do we navigate in this world using the graphics tablet?
- How is planning trained?
World Structure

- Representation of virtual world in layers
- Organisation follows tree-like structure
General Questions

- Which interface can we use? ✔
- How to design the virtual world? ✔
- How do we represent a whole virtual world on one graphics tablet?
- How do we navigate in this world using the graphics tablet?
- How is planning trained?
Navigation Strategies

Street Navigation Strategy

Button Navigation Strategy

Staircase Navigation Strategy

Position Navigation Strategy

Motivation    Existing Systems    Navigation    Planning    Evaluation    Future Work    Conclusion

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Street Navigation Strategy
Staircase Navigation Strategy

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Button Navigation Strategy

BUTTON PRESSED!
Position Change Navigation Strategy
# Navigation Strategies Evaluation

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<thead>
<tr>
<th>Navigation Complexity</th>
<th>Orientation</th>
<th>Board-&gt;World</th>
<th>Nav. difficulty</th>
<th>Haptics</th>
<th>Extensibility</th>
<th>Board usage</th>
<th>World layout</th>
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**Existing Systems**

- **Navigation Planning**
- **Evaluation**
- **Future Work**
- **Conclusion**
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| Ergonomics             | World layout |           |        |        |          |
|                        | *            | **        | *****  | **     |
| Board usage            | *            | *         | *****  | ***    |
| Extensibility          | *****        | *         | *****  | *****  |
| Haptics                | ***          | *****     | *      | *      |

| Overall Score          | **           | *****     | *****  | **     |

Motivation | Existing Systems | Navigation | Planning | Evaluation | Future Work | Conclusion | Bauhaus-Universität Weimar | Saskia Groenewegen, Stefanie Heinz, Anke Huckauf, Bernd Fröhlich
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**Motivation** | **Existing Systems** | **Navigation** | **Planning** | **Evaluation** | **Future Work** | **Conclusion**

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Board Setup
Navigation in the Virtual World

VIDEO
General Questions

- Which interface can we use? ✓
- How to design the virtual world? ✓
- How do we represent a whole virtual world on one graphics tablet? ✓
- How do we navigate in this world using the graphics tablet? ✓
- How is planning trained?
Planning Tasks

Deine Aufgabe: Bereite einen Obstsalat zu!

VIDEO
Assignment of Tasks

Motivation
Existing Systems
Navigation
Planning
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Planning Task Evaluation

- Usability of device, interface design and navigation strategy
- Learning effect
- 24 children
- Tasks:
  - Fruit salad or letter
  - Hard or easy
Planning Task Evaluation

Percentage correct [%]

1. Task

2. Task

1. Group

2. Group

Easy Task

Hard Task

Motivation
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Other Observations

- Inexperienced users embraced system
- Prop handling and grasping easy
- Orientation and navigation no problem
- Wooden indentations helpful
- Correct association with rooms
General Questions

- Which interface can we use? ✓
- How to design the virtual world? ✓
- How do we represent a whole virtual world on one graphics tablet? ✓
- How do we navigate in this world using the graphics tablet? ✓
- How is planning trained? ✓
Conclusion

- New system for mentally handicapped children
- Training of everyday tasks
- Intuitive interaction concept
- Appropriate navigation strategy for extendable world
- Evaluation showed great acceptance
Future Work

- Adjustability of interface & task difficulty
- Tasks in 3D & spanning several locations
- Feedback system
- Authoring tool
- Assess the impact of training on the improvement of real world skills
The End

Thank you for listening!

Virtual Reality Systems Group
www.uni-weimar.de/medien/vr