Playing with Robots: An Interactive Simon Game

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Planning and Learning Group

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Overview

1. Introduction
2. Simon in NAOTherapist
3. Evaluations
4. Conclusions
Introduction
The Simon Game

- http://www.freesimon.org
- Electronic memory and exercise game
- Arms postures, instead of colors
- With a NAO robot
Playing Simon with NAO

- Poses use one arm at a time
- Enough time/tries to achieve the pose
- Encouraging and supportive speech
- Based on NAOTherapist architecture
Simon in NAOTherapist
The NAOTherapist Architecture

High-level planning

Therapy Designer

High-level planning

Therapy configuration

Planned sessions

Medium-level planning

Decision Support

Low-level planning

Robot Controller

Playing with Robots: An Interactive Simon Game
Playing with Robots: An Interactive Simon Game
Medium-level Planning Domain

- **PDDL language**
  - Problem: Initial and goal state of the world
  - Domain: Actions with preconditions and effects in the state

- **Iterative loops of the domain**
  - A sequence consists of consecutive poses
  - A game consists of consecutive sequences

- **Pose shuffling mechanism**
  - Pseudorandom seed
### Medium-level Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>Medium-level Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>detect-patient</td>
<td>check-pose</td>
</tr>
<tr>
<td>greet-patient</td>
<td>pose-correct</td>
</tr>
<tr>
<td>start-game</td>
<td>sequence-correct</td>
</tr>
<tr>
<td>execute-pose</td>
<td>add-pose</td>
</tr>
<tr>
<td>findnext-id</td>
<td>finish-game</td>
</tr>
<tr>
<td>decrement-id</td>
<td>farewell-patient</td>
</tr>
<tr>
<td>sequence-done</td>
<td>finish-session</td>
</tr>
</tbody>
</table>

**Executive**

**Instructions**
Medium-level Actions

- [https://youtu.be/Wd7TPXWOonog](https://youtu.be/Wd7TPXWOonog)

1. **a) shows first pose**
2. **b) shows second pose**
3. **c) person performs the pose correctly**
4. **d) person can not achieve the pose**
5. **e) robot reminds the pose**
6. **f) checks again, if correct pose is not achieved in 5 seconds, skips the pose**
Evaluation
Test Sessions

<table>
<thead>
<tr>
<th>Number of participants</th>
<th>Age</th>
<th>Game-1 duration (s)</th>
<th>Game-2 duration (s)</th>
<th>Number of poses per session</th>
<th>Reminder average per session</th>
<th>Reminder std. deviation per session</th>
<th>Skipped poses average per session</th>
<th>Fails average per session</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>20-50</td>
<td>235.19</td>
<td>231.83</td>
<td>30</td>
<td>4.23</td>
<td>2.85</td>
<td>1.31</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Statistics of the test sessions

- Despite the raise in the know-how in the second game, the difference of durations are not wide, as a consequence of increased difficulty.
- Only in some cases there were high pose reminders. Thus the high standard deviation.
- After 70% of the pose reminders, participants managed to perform the pose.
- Half the participants never skipped a pose.
Questionnaires outcomes
Feelings average rating (from 0 to 5)
• New evaluations with 56 schoolchildren of 5-6 years old
Long-term evaluations!

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Conclusions

• Outlook
  – The **anxiety factor** should be addressed with a solution.
  – To prevent **faulty perception of self pose**, necessary actions should be developed.

• Improvements and alterations can take place on the current version such as **mirror correction** or **reversed Simon**.

• Even though the main target audience was fairly limited to children with physical disorders, we have seen that the project can go beyond the initial goal.
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