Playing with Robots: An Interactive Simon Game

Mısra Turp, José Carlos Pulido, José Carlos González y Fernando Fernández

Planning and Learning Group

Overview

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

Introduction

Universidad
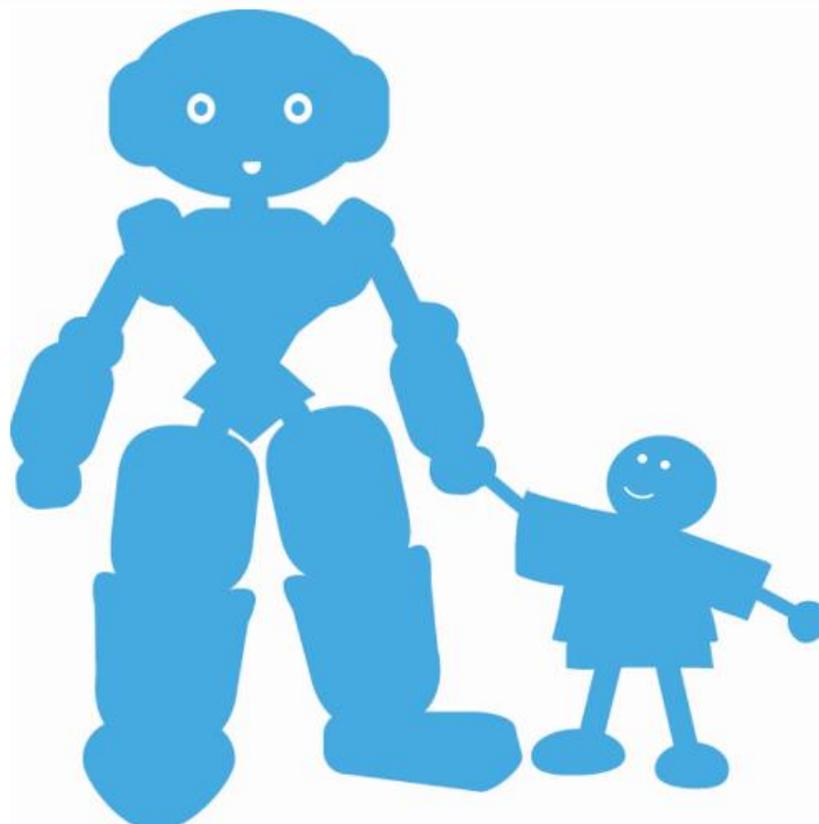Carlos III de Madrid

- http://www.freesimon.org

- Electronic memory and exercise game

- Arms postures, instead of colors

- With a NAO robot
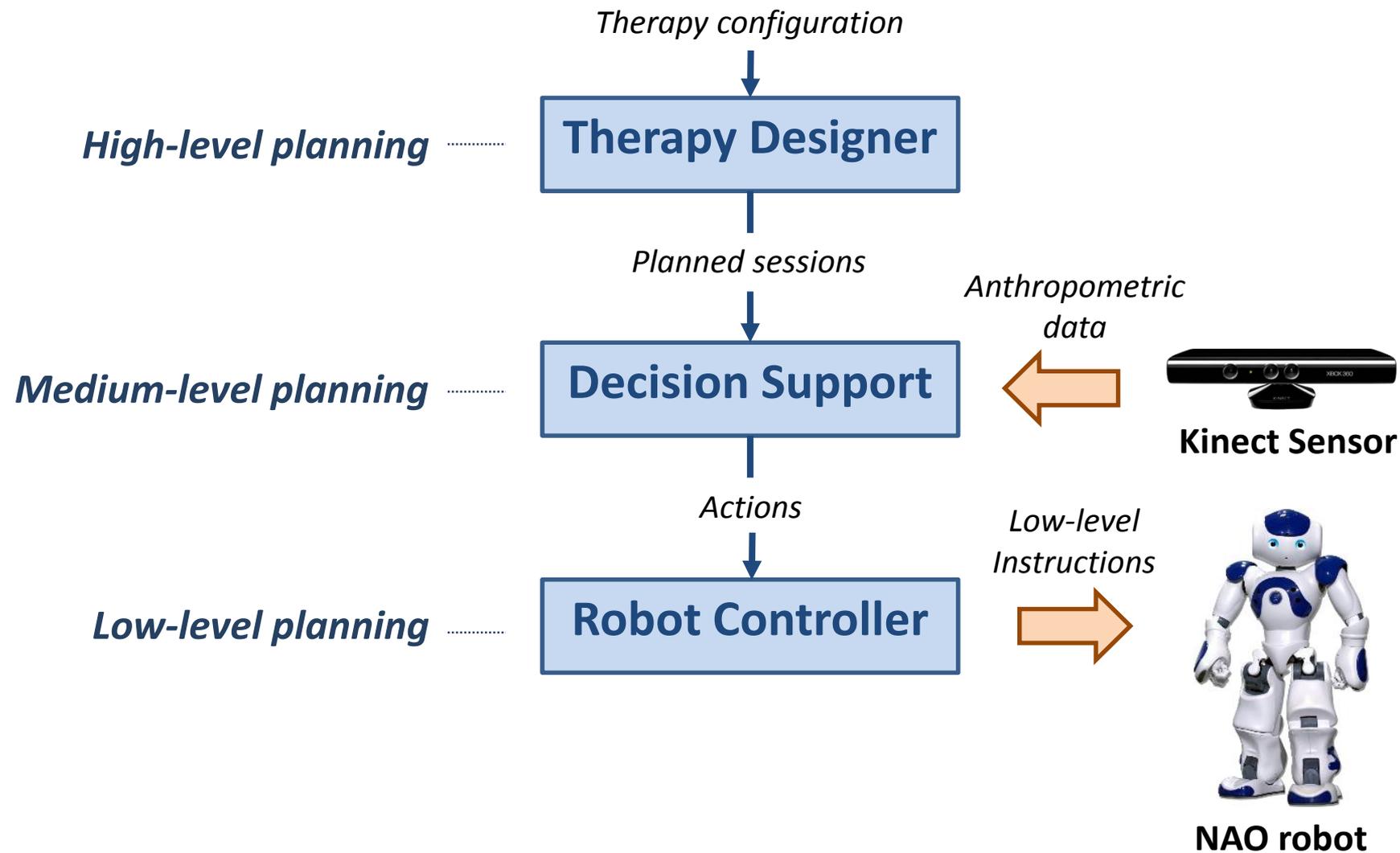
Playing Simon with NAO

- Poses use one arm at a time

- Enough time/tries to achieve the pose

- Encouraging and supportive speech
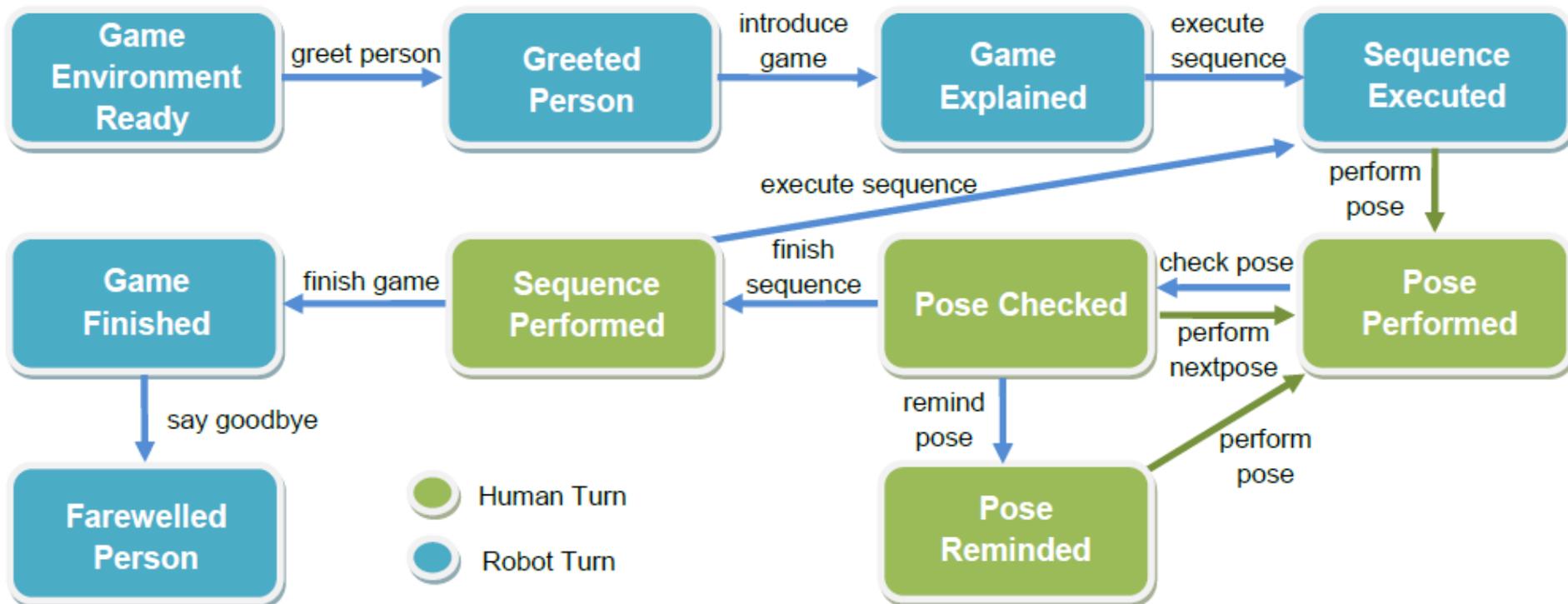
- Based on NAOTherapist architecture

Simon in NAOTherapist

The NAOTherapist Architecture

Game Flow

Game Environment Ready —greet person→ **Greeted Person** —introduce game→ **Game Explained** —execute sequence→ **Sequence Executed**

Sequence Executed —perform pose→ **Pose Performed**

Sequence Performed —execute sequence→ **Sequence Executed**

Pose Checked —finish sequence→ **Sequence Performed**

Sequence Performed —finish game→ **Game Finished**

Game Finished —say goodbye→ **Farewelled Person**

Pose Performed —check pose→ **Pose Checked**

Pose Checked —perform nextpose→ **Pose Performed**

Pose Checked —remind pose→ **Pose Reminded**

Pose Reminded —perform pose→ **Pose Performed**

Legend:
- Human Turn (green)
- Robot Turn (blue)

- **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

Medium-level Actions

detect-patient	check-pose
greet-patient	pose-correct
start-game	sequence-correct
execute-pose	add-pose
findnext-id	finish-game
decrement-id	farewell-patient
sequence-done	finish-session

Executive

Robot

Instructions

Universidad
Carlos III de Madrid

- https://youtu.be/Wd7TPXWOnog

a) shows first pose

b) shows second pose
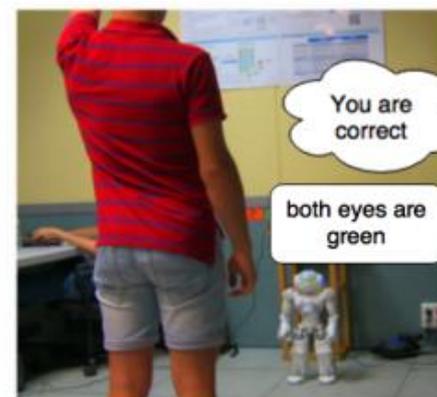
c) person performs the pose correctly

d) person can not achieve the pose

e) robot reminds the pose

f) checks again, if correct pose is not achieved in 5 seconds, skips the pose
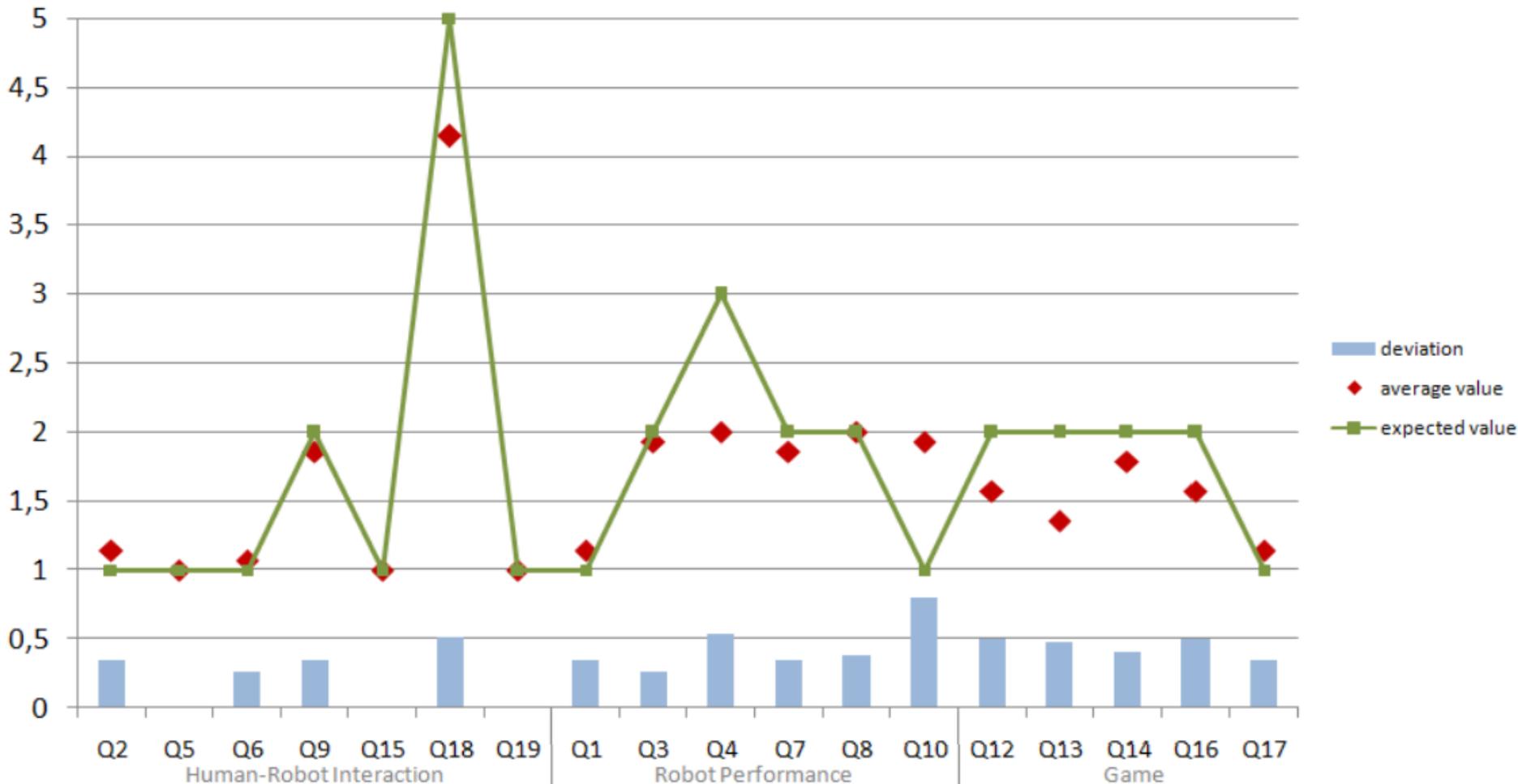
Evaluation

Test Sessions

| Number of participants	Age	Game-1 duration (s)	Game-2 duration (s)	Number of poses per session	Reminder average per session	Reminder std. deviation per session	Skipped poses average per session	Fails average per session
14	20-50	235.19	231.83	30	4.23	2.85	1.31	0.08

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.

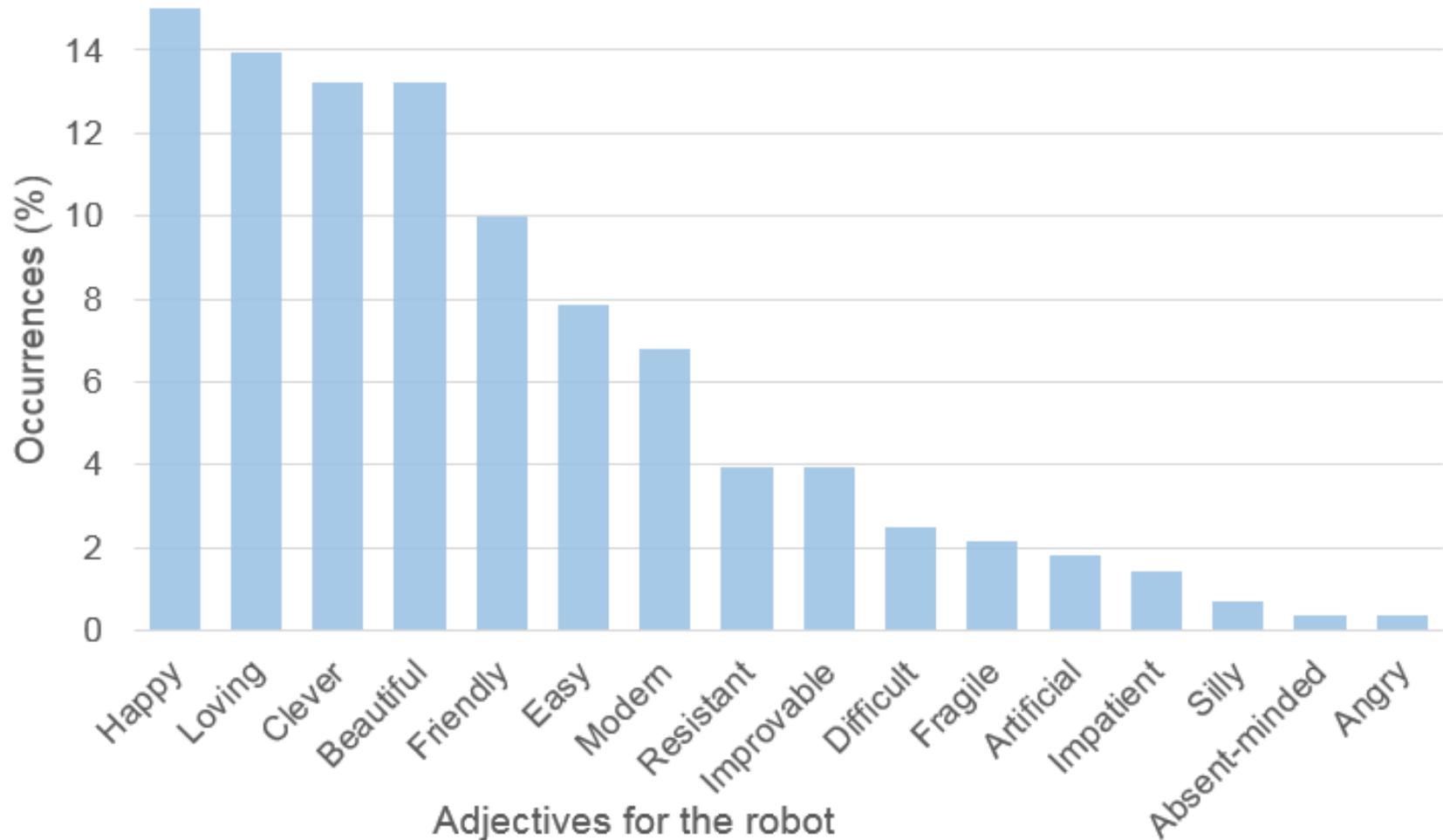- Half the participants never skipped a pose.

Questionnaires

Questionnaires outcomes

Questionnaires
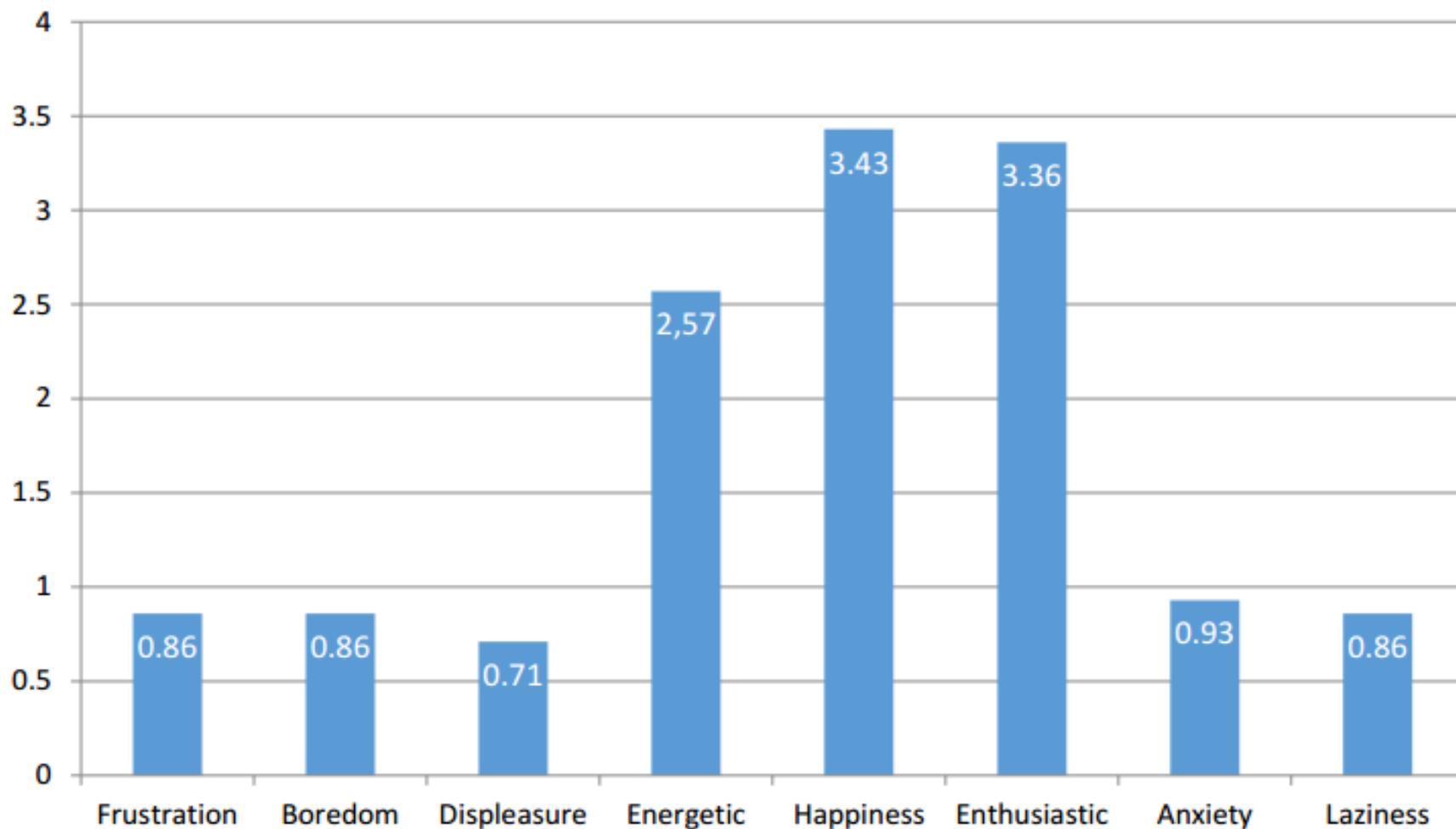
Feelings average rating (from 0 to 5)

- New evaluations with 56 schoolchildren of 5-6 years old

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.

Playing with Robots: An Interactive Simon Game

Mısra Turp, José Carlos Pulido, José Carlos González y Fernando Fernández

Planning and Learning Group