Making Blossom Robots – LASIGE Summer of Research

User Study Script

# Goal

Investigate how external robotic stimuli mimicking user’s movement and /or align robot’s movement with music and dancing (e.g., position and movement) influence user’s visual attention during interactions with social robots, with potential applications in educational and therapeutic contexts.

# Research Questions

* How do external robotic stimuli (such as position and movement) affect user’s visual attention during interactions with social robots?
* Does the presence of a secondary moving robot affect a user’s ability to maintain focus on the primary robot?

# Participants

* Children aged X to Y years.
* Voluntary participation with informed consent from parents or legal guardians.
* Exclusion criteria: severe visual or motor impairments preventing interaction with robots.
* Recruitment conducted at LASIGE.
* Sample size: 20 participants.

# Preparation

Required Materials:

* Mimicking robot (TOM) capable of imitating head and shoulder movements.
* Dancing robot (JERRY) capable of performing predefined and random movements.
* Video recording camera
* Consent form.
* Behavioral observation sheet (distraction scale 1–5).
* Stopwatch or time-tracking software.
* Written consent

Pre-Session Checklist:

1. Test and power on both robots.
2. Ensure cameras are charged and recording.
3. Have the observation scale printed or displayed digitally.
4. Confirm signed parental consent.

*Software Setup:*

Follow this guide

<https://github.com/DiogoSaraiva/blossom-lasige-research/wiki/Running>

# Procedure

1. Play music file
2. Seat the user facing the mimicking robot (TOM).
3. Instruct the user: “Look at this robot while it imitates your movements.”
4. Habituation phase (2 minutes): TOM imitates the user’s head and shoulder movements; JERRY remains stationary.
5. Experimental phase: activate JERRY to perform a sequence of random movements, dancing rhythm (3 minutes)
6. Observe and record the user’s visual attention using the distraction scale: via log

Fully focused on TOM.  
2 – Occasional glances at JERRY but returns focus to TOM.  
3 – Attention equally divided between TOM and JERRY.  
4 – More time looking at JERRY than TOM.  
5 – Fully distracted by JERRY.

1. Total session duration per user: ~15 minutes.
2. After the trial, thank the user and conclude the session.

# Apparatus

* ***Mimicking robot (TOM):* Blossom robot configured for real-time mimic.**
* ***Dancing robot (JERRY):***Blossom robot configured to mimic the rhythm of the music played.
* Video camera for session recording, for later analysis.
* Computer running the Blossom robot control scripts.

# Dependent Measures

* **ID: anonymized participant identifier**
* **time\_mimic**: total attention time (in seconds) directed at TOM (mimicking robot).
* **time\_dancer**: total attention time (in seconds) directed at JERRY (dancing robot).
* **switches**: number of gaze shifts between TOM and JERRY.
* **dancing\_time (%)**: percentage of time spends dancing relative to total session time.
* **distraction\_scale (1–5)**: observer’s rating of attentional focus, where:  
  1 – The user maintains continuous attention on TOM with no signs of distraction.  
  2 – The user briefly looks at JERRY but promptly returns focus to TOM.  
  3 – The user alternates attention equally between TOM and JERRY.  
  4 – The user spends more time attending to JERRY than to TOM.  
  5 – The user focuses exclusively on JERRY, disregarding the instruction to attend to TOM.

# Design

* Within-subject design: each user participates in the same experimental sequence.
* **Experimental conditions:**
  + Habituation phase (TOM active, JERRY stationary).
  + Distraction phase (TOM active, JERRY mimicking music rhythm).
* All sessions are video-recorded for observation validation.

# Analysis

* **Comparison of attention between robots**
* Compute the mean attention time directed at TOM (time\_mimic) and JERRY (time\_dancer) during the experimental phase.
* Perform a **paired t-test** to verify whether there is a significant difference in attention directed at the mimicking robot (TOM) versus the dancing robot (JERRY).
* Directly addresses RQ2 (Does the presence of a secondary moving robot affect a user’s ability to maintain focus on the primary robot?).
* **Shifts in visual focus (gaze switching)**
* Count the number of gaze switches between TOM and JERRY (switches).
* Analyze whether the frequency of switches increases significantly once JERRY begins to dance.
* Captures the extent of distraction induced by external robotic movement.
* **Distraction scale analysis**
* Examine the distribution of scores on the distraction\_scale (1–5) assigned by observers.
* Apply descriptive statistics (means, standard deviations, histograms) and, if necessary, non-parametric tests (e.g., Wilcoxon).
* Provides a general overview of attentional tendencies (continuous attention to TOM, divided attention, or full distraction).
* **Exploratory analysis of child’s dancing behavior**
* Relate the percentage of time the child spends dancing or moving (dancing\_time %) with their attention to TOM.
* Addresses the question: does physical engagement increase or reduce attention to the primary robot?
* **Qualitative / Observational data**
* Include spontaneous comments, emotional expressions, and signs of enthusiasm or frustration.
* Complements the quantitative measures and helps address RQ1 (How do external robotic stimuli affect user’s visual attention?).