

Alignment in Asymmetric Interactions

First Thoughts and Ideas

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Abstract

This short document contains the first thoughts and ideas on the experiment on alignment in asymmetric interactions and its data. Firstly, referring directly to the existing report, some questions of understanding are posed for clarification. Then I tried to organize some thoughts and ideas in the experiment which were partly developed in discussion with Katharina and Britta. And at the end of the document I present an idea two colleagues and I had about an experiment also aimed at studying interaction protocols in tutoring interactions.

1 Questions on the Report

Setting:

- Was there a reason why you decided to use ten buttons?

Button-Symbol, Button-Position Mapping:

- In your report, you write that the mapping of buttons to symbols and location on the learner's screen is random. I assume, there is one fixed mapping of a certain button to a certain symbol at a certain position for the entire duration of one interaction. Is this correct? Or are the symbol associated with the button and the position of the symbol randomly changing during the interaction?
- In the report, it is stated that only the timing in button presses and the video the teacher saw were recorded. This seems to include which buttons were pressed, did you also hold on to the mapping of buttons to symbols and positions? And do you have the information which target configuration of blocks the tutor was trying to communicate?

Instructions:

- Does the learner know that the tutor does not perceive his/her own feedback (in terms of which symbol, which position) the same way as the learner?

Results:

- In Figure 6 of the report, you present the number of participants who understood, misinterpreted or ignored the nine categories of instructions. The 14 participants who understood, positive tutor feedback, were they the same ones also understanding negative feedback and the end? Are they the learners involved in an interaction that ended successfully?

2 Ideas and Thoughts

In the report, three main points about the goal of the experiment are described:

1. In the experiment, HRI is simulated in a restricted setup to investigate human performance for later use in robotic systems. In a second step, then, identified generic frames should be integrated into a robotic learner or the robot learns the frames in an interaction.
2. The study investigates alignment in tutoring interactions.
3. In the same setup, different tasks could be studied to get a more precise idea about generic strategies and generic frames.

2.1 Existing Data

As a first step of analysis, I would suggest to do a qualitative analysis of the data to get an idea of the strategies and types of strategies employed and generate hypotheses for a quantitative analysis. Are there for example phases of the interaction, where the learner initializes the interaction by providing an area of presentation (by clearing the area seen by the tutor for example) and then proceeds with probing one item at a time which item is part of the tutor's goal configuration or which group of items are part of the configuration and so on. In this specific case, the learner would establish a frame in which he/she presents the tutor with a slot for confirmation or negation.

2.1.1 Rhythm

Other than the nine signals already identified and described in the report are there any other signals in other modalities? For instance which role does rhythm or speed of multiple button presses play?

This point is also related to the comments on the experimental design in the report about the duration for which a button is pressed and the analysis of consecutively pressing one button.

It might also be worth considering the temporal relationship between the tutor's signals and the learner's actions.

2.1.2 RESET Signal – Leader vs. Follower

Which behaviors cause the tutor to signal a reset of the setup? This seems to be a crucial point. In the report you state that you observed that the need for a switch of the meaning of signals was more frequently realized on the learner's side than on the tutor's side and that this often happened after a reset instruction of the teacher. I assume that this means that it actually was the tutor who realized that the learner was misinterpreting the signal and instead of adjusting the meaning of the signal, the tutor communicated a RESET to the learner. An interesting thing to look at in this line would be to investigate who is the leader and who is the follower in each of the dyads. In other words: Who adapts or aligns to whom? Is the learner the one testing different hypotheses and sticking to his or her strategy assuming that the tutor will understand or is the tutor presenting a tutoring strategy without adjusting to the learner's attempts. Is this personality specific? At which points in time is who leading and who following? Do these roles change?

2.1.3 Success

Are those interactions more successful, i.e. come quicker to a successful end, where one interaction partner is clearly leading? Are those interactions more successful, in which the tutor and learner quickly negotiate a strategy right at the beginning?

2.2 New Data

2.2.1 Child Development

One could also envision a complementary study with children, as adult-child interactions are also asymmetric. In this study an infant could play a game with a parent. The game would have to be designed in a way that the child has to learn a frame and to fill a slot presented by the parent. It would be interesting to see in how far parents in this situation can rely on and use known elements. And also to investigate how the adults know, when the child has understood, i.e. which cues signal understanding.

Joanna Szufnarowska, a colleague from Bielefeld University who is also in the RobotDoC project in her work has conducted a study with 3 to 6 months-old infants. She recorded videos of mothers playing a peek-a-boo game with their children in a natural setting. In a cooperation with her, we might be able to shed light on the above questions.

One clear difference between the proposed studies and the experiment conducted in Bordeaux is the transfer of emotion. Whereas positive emotions are certainly a great reward in adult-child interactions, it is difficult if not impossible to convey emotions in the current setup of the experiment.

2.2.2 Autistic Disorder Symptoms (ADS)

Are persons diagnosed with ADS less capable of playing this game than people without impairment? The ability to put oneself in the position of someone else might be crucial for a successful outcome of the game. A follow-up question could then be whether persons with ADS perform equally well when they play with another person with ADS? Are persons with ADS better tutors or better learners?

3 Experiment on the Emergence of Interaction Protocols

In this section I will briefly present an idea for an experiment which might be of interest. This idea has been developed in May 2013 in Plymouth, together with two colleagues (Paul Baxter, Nikolas Hemion). We had the idea of an experiment to study the emergence of interaction protocols. The experiment was designed to study interaction protocols in a simple scenario where the interaction is not artificial, but preferably natural. In the experiment, the teacher has to transfer information to the learner, but part of his demonstration is not important for the learner and should be ignored. How do tutors signal what is an important part of a movement and what is not important? So far it has only been tested with a few pilot participants.

3.1 Method

Two participants (two adults) sit in front of computer screens in different rooms. A simple interface shows a 1-dimensional world on both screens. One of the participants is the tutor and the other participant the learner. When the game starts, the tutor's and the learner's perception of the world (line) differs. The tutor and learner both see two agents represented as squares of different color on the line. Each of them is able to move their respective agent along the line with a mouse. The tutor additionally sees two fixed goal positions also shown as squares. Each goal position has the color of the agent that it is intended for. It is the tutor's task to communicate to the learner the learner's goal position and move his/her own agent to its own goal. Each interaction is only 15 seconds long. After this time, the participants receive a reward in form of a score displayed above the line on both screens. This score is accumulated over the whole duration of the interaction. It is highest, when both agents spent the entire interaction on their respective goal position. This score is only increased when both agents are close to their goal positions.

After one iteration, the positions of the goals change. They are randomly chosen on the line.

3.1.1 Instructions

This is a collaborative game. You can move a point on this line with the mouse. There is another player and you will be playing together. After each round a score is displayed. The goal of the game is to maximize this score.

Additional Instruction to Tutor: The score is maximum, when both you and the other player are on your respective goal positions, indicated in your players' colors. Try to teach the other player what this game is about.