

# Shared perception in mutual visual orienting: A comparative study

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## Abstract

In their everyday collaborative tasks, people share a common ground with their partners and progressively align with them on it. The lack of such a basis would cause serious interaction issues; since childhood, humans learn to influence and be influenced by others. Shared Perception (SP) study those, putting together social cognitive processes like joint attention, perspective taking and affective perception. SP elements have been investigated isolating them from each other. Nevertheless, these cognitive processes are very related to each other. We wanted to investigate a more high-level cognitive process in human-robot interaction (HRI): how SP mechanisms, including logical inference, works in synergy.

We designed an experiment to observe a particular SP mechanism: the ability to make a partner aware of hidden objects' characteristics, giving information about other objects, visible by everybody. This interaction involves social mechanisms like gaze cueing and cognitive processes such as prior knowledge and joint attention.

During the task, two participants sit at a table facing each other. On the table lie eight coloured bricks. Four bricks are visible by both, while the other four are hidden: each participant can see just two of them. Each colour has a value: the goal is to build a tower maximising its value. Participants have different roles: one builds the tower, while the other can only suggest the bricks to take (*suggester*). We ask both to use only non-verbal signals: often, the more efficient collaborations are speechless. Hence, the participants have to collaborate since all of them can perceive bricks the other cannot.

The study aims to understand the strategies adopted by the participants. Through videos, we observed whether participants used SP mechanisms; as we expected, they exploited some of these. In particular, we noticed that the *suggesters* always succeeded in communicating their hidden bricks' value.

We think that introducing SP into HRI we can go further in building a positive human-robot cooperative relationship, based on trust.

Hence, we decided to give an iCub robot the role of *suggester*. We expect that participants will employ SP mechanisms with a robot in the same way they do with other human partners.

*Keywords:* Shared Perception, Human-Robot Interaction, Affective Perception, Joint Attention.

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