Making Sense of Agentic Objects and Teleoperation: In-the-moment and Reflective Perspectives

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AGENTIC OBJECTS

Agentic objects are those entities that are perceived and responded to *in-the-moment* as if they were agentic despite the likely *reflective* perception that they are not agentic at all. They include autonomous robots, but also simpler systems like automatic doors, trashcans, and staplers—anything that seems to possess agency. It is well known that low-level spatiotemporal information elicits in-the-moment responses that are interpreted as perceiving mentalism [8, 17], but people reflectively believe that there is a distinction between human and non-human agents. How are we to make sense of these agentic objects?

People have an innate ability to respond to agentic objects in ways not so dissimilar to interacting with other people [14, 16]. This may be mindless behavior [14] or part of our use of pretense and imagination [5, 19]. These agentic objects are evoking new forms of joint pretense [3] based upon older forms of play and theater. Beyond merely talking about the behavior of agentic objects anthropomorphically [8], this work addresses how people interact with agentic objects. An agentic object may be understood as a representamen in that it "stands for something, just as an ambassador stands for his country, represents it in a foreign country; just as a deputy represents his electors in an assembly" [4]. Likewise, agentic objects inherit authority and responsibility from people and institutions.

Categories and Subject Descriptors
H.5.2 User Interfaces; H.1.2 User/Machine Systems
General Terms
Design, Human Factors, Theory
Keywords: agentic object, teleoperation, human-robot interaction, in-the-moment, perceived agency

TWO PERSPECTIVES

While people respond to agentic objects as social actors in-the-moment, one can also study such interactions from a more distanced and reflective perspective. The first perspective is first person and in-the-moment. The second perspective is third person and reflective. By juxtaposing these two perspectives, we create a theoretical space for understanding agentic objects and teleoperation.

In-the-moment perceived agency (X-axis) is how agentic an entity seems to be in its most immediate sense. People typically talk about this as, "At the time, it seemed as if…" Reflectively perceived agency (Y-axis) is how agentic an entity seems to be upon further, more distanced consideration (Figure 1).
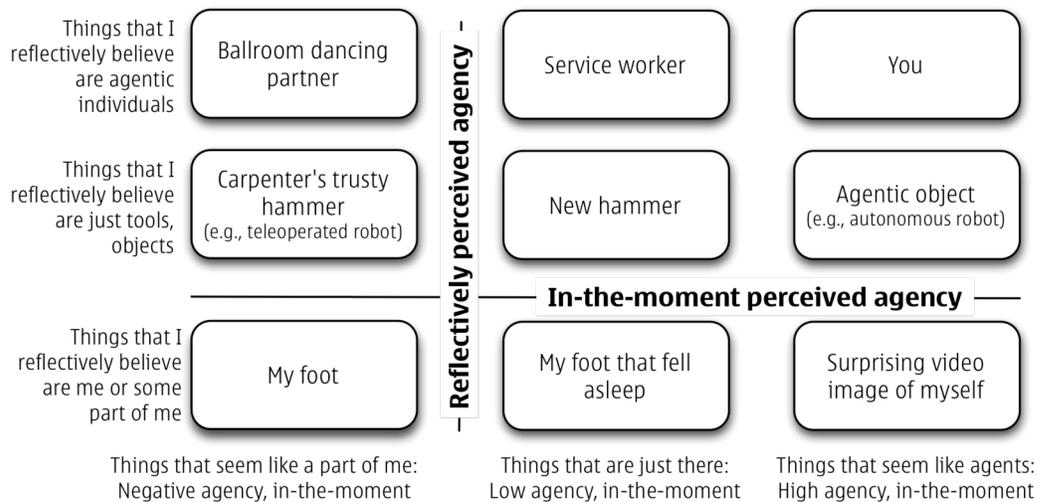

Figure 1. Theoretical space of in-the-moment vs. perceived agency, populated with nine examples

To better ground this framework, we provide a set of nine examples of entities within this space. The simplest of these are the ones that fall along the identity line: X=Y. Starting from the top right, you seem highly agentic to me both in-the-moment and reflectively because you are an individual: (high, high). A new hammer, seems to have low agency both in-the-moment and reflectively because it is in inert object: (low, low). My foot seems to have negative agency both in-the-moment and reflectively because it is a part of me: (negative, negative).

Moving to the misaligned situations, we find examples of things that seem to have more agency in-the-moment than reflectively: X>Y. My foot that

fell asleep is an example of something that I reflectively believe to be a part of me (Y=negative), but in-the-moment it feels like a dead weight on my leg (low): (low, negative). Seeing a surprising video of myself causes surprise because I realized it was me (Y=negative) only after initially perceiving it as being someone else (X=high): (high, negative). Agentic objects (e.g., autonomous robots) are examples of entities that I reflectively believe are just objects (Y=low), but in-the-moment seem as if they have a high degree of agency (X=high): (high, low).

Finally, shifting to the left, we find examples of things that seem to have less agency in-the-moment than reflectively: X<Y. Service workers are an example of people, who we reflectively believe are individuals (Y=high), but are often treated in-the-moment as having low degrees of agency (X=low): (low, high). An ideal ballroom dancing [3] is reflectively an individual (Y=high), but in-the-moment it seems as though we are one (X=negative): (negative, high). Finally, the carpenter's old hammer (like a teleoperated robot) is reflectively perceived as an inert object (Y=low), but in-the-moment of use, it feels like it is a part of one's sense of self, ready-at-hand [7] (X=negative): (negative, low).

IMPLICATIONS FOR THEORY AND RESEARCH
The current framework provides both distinctions between two typically confounded perspectives: in-the-moment and reflective perceptions of agency. It goes beyond existing theories that aim to dedifferentiate humans from others (e.g., nature [12], non-humans [9], or systems [20]) by making these agents *comparable* rather than indistinguishable.

Implication for Agentic Objects
In the realm of agentic objects, there is an inherent conflict between in-the-moment engagement with non-human social actors and reflective perspective that it is nothing more than a tool [14, 16]. This is an example of "ethopoeia" [15], which is an in-the-moment, human-like response to a non-human social actor. In contrast, "anthropomorphism" is a reflective description. The conflation of these two perspectives has caused confusion among researchers who lumped them into the category of "anthropomorphism." With the mounting interest in human-robot interaction, the distinction between in-the-moment and reflective perspectives is critical for avoiding the mistakes of the past.

Implications for Teleoperation
There are many names for the ideas behind teleoperation, including tools being ready-to-hand [7], invisible-in-use [6], and creating functional cyborgs [2]. We have found the most useful description to be one of *incorporation* [11] as typically demonstrated by the incorporation of the blind man's cane into his perception of the world [1, 13].

Perceived Realities
Both in-the-moment and reflective perspectives are perceived realities. Though perceptions are often dismissed in favor of "objective" measures, this is not reasonable when objective realities are contestable. Researchers ran into this problem in evaluating artificial intelligence systems. As a result, the most noted measure of success became the Turing Test [18], which favors perceived similarity over other measures of intelligence. Perceptions are not second best to objective measures; in fact, it is perceptions and subjective realities that people judge and act upon [as demonstrated by 10].

Implications for HRI Research Methods
What people say about their actions is often different from their actual behavior; this issue may be due to the difference between in-the-moment responses vs. reflective orientations. In-the-moment responses are most effectively measured in-the-moment, e.g., behavioral measures that do not require attentive and conscious thought. Reflective responses are most effectively measured when people have had time to sit back and think back upon their experiences, e.g., questionnaires, interviews. When possible, it is best to employ research methods that address both perspectives.

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