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Discussion on the Rise of the Self in a Conscious System

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Abstract

What is human self? Some argue that there is no such thing as self. However, the subjective feeling that "I am writing these words" makes it hard to deny the existence of the self. We assume that as long as there is the term "self," there must be some collection of neural networks that represents the concept of the term. Although the whole picture is still a mystery, we have taken a step forward to unraveling the mystery by introducing the idea that "the emergence of a new behavior that prioritizes the body underlies the rise of the self." When performing imitation behavior, a person can encounter a situation in which he feels pain and tries to avoid it. In this instance, the person engages in two types of behavior almost simultaneously, which are in conflict with each other. Also in this instance, it is assumed that the person gives priority to the safety of his own body and reflexively chooses to respond with avoidance behavior. However, as the imitation behavior continues, the process of imitation and avoidance is repeated many times, making it increasingly difficult to ensure the safety of the body. To address this scenario, we have come up with an idea that enables a conscious system to generate a new rational behavior—that is, voluntarily stop the imitation behavior. We consider that the generation of this new behavior is a significant process that can explain the first step for the development of the self.

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Key words: the self, conscious system, subjective feeling, pain, conflict, body

1 Introduction

Robots make such a huge contribution to modern society that it is difficult to image life without them. However, there are calls for robots that have enhanced capabilities such as being able to make autonomous decisions, take actions, and communicate with people, in order for robots to become a more integral part of daily life. In short, robots are required to be more like humans. Attributes of human likeness include thinking, feeling, and acting, all of which are reasonably considered to arise from the working of human consciousness. For these reasons we consider that robots can be more like humans by acquiring functions of consciousness similar to those of humans.

This idea raises the question of how robots can acquire consciousness, but what is consciousness anyway? This problem has long been investigated in many disciplines including psychology, philosophy, and medicine. Among these studies, we sought reports of consciousness from mirror neurons (Gallese, 1996) and mimesis theory (Donald, 1991). Based on these studies we defined consciousness by stating that "consciousness is generated by consistency of cognition and behavior" (Takeno, 2005) (Igarashi, 2007). Based on this definition, we have proposed a consciousness model using MoNADs, which are consciousness modules mimicking the brain's nerve cells (Takeno, 2005) (Igarashi, 2007). Robots equipped with a consciousness model using MoNADs have succeeded in performing avoidance behavior in mirror tests (Gordon, 1970) and using episodic memories (Komatsu, 2011) in previous studies.

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This paper studies the "development of the self" using a consciousness model. People learn to recognize their own reflection in a mirror as themselves at some point in childhood, which suggests the development of the self in humans (Lacan, 2007). What processes do we go through after birth until learning to recognize ourselves? It means the question "When and how does the self arise and why?". We have sought to answer this question using a conscious system.

2 Conflict of Actions

The consciousness model using MoNAD modules consists of the Reason, Emotion & Feeling, and Association subsystems (Takeno, 2013). The Reason subsystem perceives information from outside and inside the system and decides how to act. The Emotion & Feeling subsystem decides how to act based on changes in the internal condition and on external stimuli. For example, the Reason subsystem performs imitative behavior whereas the Emotion & Feeling subsystem performs a reflex movement in response to pain. The Association subsystem receives cognitive information from the Reason and Emotion & Feeling subsystems and settles on an action. Here, "reflex movement" refers only to those output from the Emotion & Feeling subsystem.

The consciousness model perceives external information—in this case, the object to imitate—and performs an imitative action. There is no problem if there is only one action to perform, but if the consciousness model simultaneously perceives a stimulus such as pain, the imitation behavior comes in conflict with the reflex movement to pain. At this point, the conscious system must choose either of the two actions. In this case, we designed the system to prioritize "safety of the body" over "imitation behavior." That is, the reflex movement is preferentially performed.

When actions come in conflict with each other, priority is given to the safety of the body, and a reflex movement is performed to avoid pain. After avoiding the pain by reflex, however, the conscious system again gets ready to perform imitation behavior. Naturally, the system performs imitation behavior and causes a conflict of actions again. The system avoids pain by reflex again, performs imitation behavior, and so on. If there is no solution to the problem of repeated pain caused by the actions currently available to the conscious system, the system is required to produce new behavior on its own to solve the problem. At this point the conscious system is shaping a new rational behavior.

3 Emergence of a New Rational Behavior

Let us examine further the conflict of actions using the example of imitation behavior and reflex movement to pain. We assume that one way to break this loop of repeated behavior created by the conflict of these actions is to shape a behavior that resolves the cause of the loop. In our example, the cause lies in the fact that imitation behavior itself brings about a situation that allows the conscious system to recognize pain. It can also be assumed that the system falls into this situation because it cannot anticipate the pain to come before performing imitation behavior. To resolve this cycle of information, a new behavior is needed to avoid pain when actions come in conflict by stopping imitation behavior before the next pain comes.

As in the example described earlier, humans and human-like consciousness models make an adjustment between the external conditions recognized by the Reason subsystem and information from the Emotion & Feeling subsystem, and perform a more rational behavior. The rationality of the conscious system here translates into increased speed of information processing in the system (internal processing) and reduced representation of unpleasantness by the Emotion & Feeling subsystem. Although the internal processing is actually related with the Emotion & Feeling subsystem, we do not consider this topic here. Children under development and conscious models with a limited number of available behaviors can encounter a situation that cannot be resolved by currently available behavior. In