Reading 9: Form, Morphology, and Embodiment

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Discussion on Form, Morphology, and Embodiment
by Bo Cao - Wednesday, April 5, 2017, 12:08 AM

1. Duffy summarizes the question of anthropomorphism with: "Robots are learning to walk and talk. The issue is rather should they walk? Walking is a very inefficient motion strategy for environments that are more and more wheel friendly. Should robots become the synthetic human?" What is your answer? How does it relate to the concepts of strong vs weak AI?

It depends when addressing the question of whether robots should walk or not. From the perspective of purely efficiency, moving with wheels is dramatically more efficient than walking. However, obviously this paper discussed anthropomorphism from other aspects. A variation of Turing Test, i.e. walking version, can be used to determine whether a robot can really walk like a human. The ability of walking matters if a human cannot tell its action is conducted by a human or a robot, which supports the weak AI. The main way of adults of humans to move their bodies is by walking, to think in anthropomorphism, we have the tendency to map human's legs to robots to reason the way it moves in social context.

The author also argued that if a robot is perceived as a human, it should be a real human. He argued that robots are machines and humans are humans, even when robots achive Storng AI. How does it matters of robots become synthetic human? From the perspective of Utilitarianism for human, having a synthetic human-form of robot should have positive social impact on human. One could be the efficiency of communication in the conventional organizational interface, an example could be the importance of secretaries from [1]. At this point if the apperance of the robot reaches the "uncanny valley" point, it might have negative impact. Otherwise robots can be developed as their own form or appearance such as better sensing system, more efficient moving system, to provide benefits to human, while still remaining the attributes of social interface when interacting with people.

1. How might the theories of embodiment discussed in Klemmer et al. impact our understandings of human-robot interaction? E.g., is it likely we would see evidence of "thinking by doing" as people interact with robots? Is the idea of "situated learning" applicable to traditional approaches in machine learning?

From the perspective of HRI, human and robot can learn each other by mutual interaction. On one hand, human could have a initial thought of the function of a robot at first glance based on its affordance. When he/she uses hand to manipulate it, speak to it and perceive it via visual/audio cues, the robot can provide the visibility of commands that humans can give. This visibility can be done via many ways such as a GUI on a computer wirelessly connected to the robot, a virtual interface from a projector. By further interaction human can know more of the possible inputs that the robot can perceive and the corresponding behaviors that the robot has. Vice versa, by proper design and program a robot can learn humans through these interactions. This provides a dynamic interaction between human and robot.

In addition, human could even get a higer level of immersion when he/she gets high resolution of inputs from the robot's sensor. The more dimensions and input data a human can get, the more he/she understands the world that the robot perceives. Using VIVE HTC to see what a human-form robot see, getting tactile feedback, a human can feel the world that the robot is situated in, and finish task like he/she's the robot itself.

In terms of whether "situated learning" applicable to traditional approaches in machine learning, I would argue that it is applicable. Traditional machine learning approaches take datasets as input, change the internal models to provide the optimal output. A human can learn the social conventions by interacting with other humans in different situations from knowing nothing. Similarly in supervised learning, putting a learnable robot in the everyday social situations, say a waiter robot in a restaurant, when cheated as a human, it gets both positive and negative feedback as new input from interacting with humans, whether doing good job or not. By using unsupervised learning, a robot can clusters the most common behaviors in the social environment. Furthermore it would be capable of classifying behaviors based on the roles of human it meets like customers or manager.

[1] Bilge Mutlu. Jodi Forlizzi. Robots in organizations: the role of workflow, social, and environmental factors in human-robot interaction