"Oneness of Human and Robot"

Grant Jun Otsuki

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In a 2013 newspaper interview, Mamoru Mouri, the director of the National Museum of Science and Technology and Japan's most celebrated astronaut, spoke about how a uniquely Japanese capacity for connection and empathy will help the country survive into the future. "[Japan's potential contribution to the world] can be seen in the refinement of its traditional arts, or in our attention to even the small detail." He continues, "the individualism of the West has become the norm around the globe, but the mature culture of Japan, which is based on a deep, moral sense of empathy for others, will resonate with people the world over." In recent years, Japanese technologists and policymakers have become increasingly concerned with the idea of social connectivity. The keywords of "tsunagari" or connection and "kizuna" – interpersonal bonds or emotional ties – have been mobilized in state and popular discourses which are both nostalgic and future-oriented: they lament the loss of Japanese cultural uniqueness in the face of technological modernization and economic globalization, and imagine its recovery as the means to Japan's cultural and economic survival. Rather than continuing to pursue material wealth, many are imagining ways of enriching "spiritual well-being"; society, they maintain, should promote comfort rather than convenience; and resilience rather than efficiency. A renewed emphasis on empathy is a key part of this transition beyond the modern.

In this paper, I describe how a sense of empathy is built into interfaces between humans and machines. The principle that guides the design of the interfaces in the WTL is "jin-robo ittai" or the oneness of human and robot. Jin-robo ittai derives from "Jin-Ba Ittai" or the oneness of horse and rider, which originates in Japanese equestrianism. Jin-ba ittai is a state of unity between horse and rider, in which "below the saddle there is no horse, and above the saddle there is no rider." Jinrobo ittai signifies the hope for the achievement of a similar state through interfaces between humans and robots, in which the combination of the two makes possible behaviors and achievements that are impossible for either entity on its own. On one hand, jin-robo ittai is a technical goal for the lab's work. When the interfaces are successful, they will be as comfortable and intuitive for their users as their own limbs and sensory organs. The ideal represents the interweaving of the machinic with the human. At the same time, jin-robo ittai is also an empathetic relationship through which machines and people might better sense and understand each other. In what follows, I describe how empathy and oneness are articulated. My aim in this paper is to explore how the bodily relationship between human and machine is made, and how through the mediation of novel interfaces people come to sense the possibility of social change.

A focus on the capability of machines to empathize with humans through non-verbal and embodied modes of communication is a central focus of a nationally funded, multidisciplinary research initiative called the Founding of the Ambient Information Society project. The WTL is one of several labs spanning interface technology, network and sensor development, and cellular biology, in which the WTL was a participant. One of the main goals of this project is to develop the theoretical and technological tools for establishing the "Ambient Information Society." In contrast to the "Ubiquitous Information Society", in which any information is available at all times to anyone, in the Ambient Information Society, individuals would be presented with the information relevant to their specific surroundings and needs. These technologies would not only

be highly context aware, and able to assess the social and material atmosphere around a user, but also provide them with appropriate information in ways that are minimally disruptive to the person in that atmosphere. Precisely echoing Mouri's advocacy of the possible Japanese contribution of an empathetic sensibility to the global community, the Ambient Information Society initiative seeks to make technologies that can understand and guide people towards the fulfillment of their needs in all their specificity, as a means to maximize their comfort and well-being and to contribute to Japan's future social and economic prosperity.

There are two prototypes for the human-machine relationship imagined in the WTL. The first comes from the cellular biology researchers within the Ambient Information Society collaboration. This team's role is to provide theoretical inspiration and models for thinking about networks of humans and machines. In the processes of mutual adjustment and adaptation of different species living in the same environment, researchers found, for instance, models for thinking about the co-existence of different types of entities within shared surroundings. For these cellular organisms, co-existence was not the result of intentional or planned action or explicit communication, but an emergent outcome of the bodily interactions of the organisms.

Another model was evident in the daily social interactions of the WTL. In order to be successful in the lab, students are constantly pushed to observe, understand, and predict the demands and situations of the senior members. This includes foreseeing issues and shortcomings in their own academic work, as well as understanding the work situations of the senior members. The lab is replete with indirect methods for each lab member to be aware of the current location and situation of the others. The most visible of these is a large grid on a white board, upon which each student must place a magnet bearing their name under the column marking their current location (eg. "In the lab", "On campus", "At home", "Out of the country".) Through such means, students were expected to be aware of and make others aware of their respective situations without explicitly stating or asking another person.

In addition, students had always to be judging the appropriateness of explicitly bringing an issue to senior lab members' attention, whether it had to do with research or personal matters. In practice, this is performed by strict but tacit restrictions on what can be verbalized by the students in the lab, and what must be expressed through non-verbal means. For instance, students are extremely reluctant to bring individual concerns, such as family issues, individual mental or physical problems, or other personal circumstances to the professor's attention verbally. When students did verbally express these issues to professors, they were harshly admonished in front of their peers, as one Master's student who missed a paper deadline because of a family emergency learned. In the absence of verbal means to express these personal challenges to senior lab members, students resorted to less explicit means.

A common one among the students was to use the visual design of the Powerpoint slides they created for weekly seminar presentations to present their personal interests, as well as the fears and anxieties they felt to their professors. Some of these would be playful, such as the inclusion of favorite anime characters or tropes in their slides, while others were more disconcerting. One student included in the background of one of his slides an image of a sign placed near a famous 'suicide point' in Japan. It carried a message imploring people considering suicide to think of the effect it would have on their families. Through such means, senior lab members were able to become aware of the students' circumstances and make adjustments and allowances, without being publicly and explicitly called to acknowledge or respond to them. The use of non-verbal means by the students to raise such issues was essential to their performance of their role as

good and mature lab members, and the maintenance of the coherence of the lab as a single social unit.

This basic emphasis on non-verbal modes of communication is reflected in the aims of the Ambient Information Society initiative, and the WTL's role in it in particular. The WTL's contribution to this project is the "Parasitic Humanoid" system, or PH. Designed with the goal of Jinrobo ittai, the PH is a system in the early stages of development which would be worn on the body of a user to monitor and intervene in their interactions with the world. This system would work through non-verbal interfaces that do not explicitly command or suggest courses of action to a user, but alter their perceptions of their surroundings so as to induce a person towards new behaviors. It would mediate the information feedback loops of the person with the surroundings, becoming part of ordinary processes through which people sense, perceive, and act in the world. In order to do this, the PH would have to take on a human-like embodiment, hence the "H" in PH. Just as the students must do their best to observe and predict the professor's circumstances, the PH must sense the world as a human being senses it – cameras are placed in the same position as a person's eyes; haptic sensors and displays are mounted on a person's fingers; and the PH must be able to move in the same environments as a human body. For this reason, it is envisioned as a 'wearable robot', one that depends on a human being for its structure and mobility, hence the "Parasitic" in Parasitic Humanoid.

For instance, one of their most interesting devices is called the Galvanic Vestibular Stimulation device, or GVS. It applies a weak electric current to the mastoid processes, the bony protrusions behind each ear. Depending on the direction of the current, a person will feel a loss of equilibrium, as though the ground has suddenly tilted beneath one's feet, causing a bodily correction. If the signal is applied while a person is walking, then the direction of their walk will change, helping them perhaps to avoid an oncoming motorcycle or better navigate a set of unfamiliar streets. The GVS also has effects on eye movement, and its use as a way of unconsciously directing a person's gaze is also being explored in the WTL. Through the use of the GVS, the PH gains a means of mobility. The human body can be induced to move in a particular direction by the PH. In combination with other non-verbal interfaces (which operate on the senses of sight, hearing, touch, and proprioception), the WTL aims to create the PH as a wearable 'robot' that merges with the body of a user to create a symbiotic "high-performance organism."

The possibilities are both tantalizing and frightening. A reporter for the Associated Press wrote, after trying the GVS, that she did not like the feeling that she might be under the control of a machine, immediately after speculating about the possibilities of the use of these devices as non-lethal weapons or crowd pacification technologies. I myself, when trying the GVS, was confronted with the sensation of having my eyeballs tugged back and forth and my body veering into a nearby wall as a student nudged the stick on a remote control. Some members refused to volunteer as subjects in experiments for the GVS because they detested the loss of control they felt.

The anthropologist Jennifer Robertson has trenchantly pointed out the reactionary cultural effects of human-like technologies in Japan. She shows that the way household robots are imagined by scientists and the state in Japan embody a form of revanchism or salvage anthropology, reinscribing the highly gendered heterosexual nuclear family as the ideal social unit. Oneness, as it is imagined in the WTL, produces similar effects. Just as the lab seeks to reproduce its own hierarchy through the performance of specific non-verbal relationships, human-machine empathy is viewed as a social and technological means for reproducing and expanding an idealized form of traditional Japanese social relation, as advocated by Mouri. Imagine the possibilities

for perfectly straight queues at every ticket booth and train station thanks to GVS-equipped headsets.

But taking bodies, either those of robots and of humans, as entities upon which politics or culture are inscribed, draws our attention away from the agency of the body itself. For the organisms studied by the Ambient Information Society project's biology team, a state of co-existence comes not from the imposition of order from above, but from the bodily interactions of different cells with each other and their surroundings. In the same way, the WTL researchers look at how the body becomes active when mediated by their interface technologies. At the same time that they produce the possibility of machinic control over humans, the WTL's interfaces also provide means for imagining alternative pathways. Through their intimate physical connections with human bodies, the WTL's interfaces turn bodies into unexpectedly lively social and political actants that can affect how human relations are imagined. I describe one such instance below.

Among the lab's professional activities are many artistic or experiential projects designed for the public. Though they differ in their implementation, they each employ a novel interface technology to join a person with a machine or another person. Often, they are meant to reproduce the lab member's own moments of bodily discovery with various interfaces. Through these experiences, people are induced to consider their own embodiment and selves from new vantage points.

One of these was called "Save YourSelf! [sic]" Created by the second-most senior member of the WTL, it used the GVS interface linked to electro-mechanical sensors on a tiny screen which displayed an image of a person. The display was mounted on a small buoyant platform and placed on top of water in a large bowl, and participants had to carry the bowl through the exhibit area. Each time they jostled the figure or were bumped by another person's careless movements, the GVS transmitted the disturbance to the human participant, causing them to experience a loss of balance as well. Participants protected these avatars as though they were a part of their own bodies. Save YourSelf! was a visceral demonstration of the extension of a bodily sense to a floating computer display. The creator hoped that this piece, as well as all of his other artistic pieces, would help people experience the relationship that they have with their own bodies and with other people in new ways kinds, and engender forms of empathy for humans and non-humans that might help them imagine a differently connected, more prosperous, and "spiritually rich" society.

Jin-robo ittai – the oneness of human and robot – is not a state of fusion or ultimate connection between human and robot. It refers to an analytic space in which social and political questions can be considered as questions concerning embodiment – what behaviors and motions feel comfortable? What actions cause bodily anxiety? Where and when do we feel fear or familiarity? Beginning from embodiment can reproduce existing social structures and cultural norms, but in the novel, peculiar, and strange sensory and perceptual possibilities of the human body made evident through interfaces with machines, embodiment might also lead to new social and cultural imaginaries, different empathies, and towards comfort and resilience. An important task for cultural analysts studying the way humans and technology interact will be to feel new sensations with our bodies, and imagine with our interlocutors the societies that might emerge.