Call to Redefine Human-Robot Interaction: From Social Robots to Gun Shooting Humanoids

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Abstract

This paper reviews the human-robot interaction literature in the scope of recent technological progress. It gives various examples of emerging human-robot interaction and calls upon a re-definition of the interaction concept.

Call to Redefine Human-Robot Interaction: From Social Robots to Gun Shooting Humanoids

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Abstract—**This paper reviews the human-robot interaction literature in the scope of recent technological progress. It gives various examples of emerging human-robot interaction and calls upon a re-definition of the interaction concept.**

Keywords—**Human-robot interaction, robot philosophy, social robots, humanoids**

I. Introduction

In their frontier study, Goodrich and Schultz (2007, p. 204) defined human-robot interaction (HRI) studies as being "*dedicated to understanding, designing, and evaluating robotic systems for use by or with humans.*" Perhaps their pioneering approach proved sufficient about a decade long (Sheridan, 2016) up until the rising needs of re-visiting the definition of 'interaction' that assumed communication to take place between humans and robots only in two forms, namely "remote" and "proximate." Spatially and temporally separated in the first, and co-located in the latter, these two forms seem deficient in encompassing the recently rising conditions.

A. *Forms of Proximate Interaction*

In terms of proximate forms of interaction, some researchers argue possible human-robot partnership building opportunities via deeper social and emotional interactions with a robot teammate (Lohani, Stokes, McCoy, Bailey, & Rivers, 2016), especially by the socially aware navigating robots (Mead & Matarić, 2017). However, close proximity would not be sufficient in re-defining the interaction of today. For example, there are nano-robots taking on certain assignments in some patient's bloodstream to repair a damaged cell back to health (Felfoul et al., 2016). In these cases, an intact state is observed rather than some proximity. On another note, there are other robots (Barnes & Jentsch, 2010) skilled in aiming guns to shoot flawlessly at targets that were used to train military personnel. These encounters might not involve friendly social interactions for obvious reasons. Moreover, some artificial intelligence bearing robots that were trained to negotiate had begun modifying the language that they were introduced (Meegan, 2017). Therefore, a robot-robot interaction unbeknownst to humans is possibly in the horizon. Last but not the least, some robots understand human muscle movements via sensors placed in the human forearm (Akhtar, 2016) as well as the homo-kinetic joint assembly of collaborative human–robot manufacturing cell (Cherubini, Passama, Crosnier, Lasnier, & Fraisse, 2016) are observed. Akin to a second skin, these robotic sensors are neither integrated nor within a distance of proximity. All these different types of technological progress are swiftly taking place. Therefore, the term interaction deserved to be re-defined as a concept to comprehend the human-robot interactions better. There is an emerging literature on social robots, and how their registered habits and attitudes effect the perception of intimacy, privacy, bonding and emotional support (Lutz & Tamò, 2016; Syrdal, Walters, Otero, Koay, & Dautenhahn, 2007). Yet, all human-robot interaction studies need to assume a wider lens with rather nano-scale focus to explain the emerging various interactions.

B. *Anthropomorphic Features*

Interestingly, public concerns tend to increase as the forms of robots are improved to resemble more anthropomorphic features. Humans' assumed preference to interact with agents that are similar, and inclination to avoid machine-like creatures could be among the reasons. Masahiro Mori who was then a robotics professor at the Tokyo Institute of Technology was the first to hypothesize on the similarity factor. Also known as the uncanny valley, Mori (1970) thought that as the robots turned similar to humans, more humans would tend to avoid them. However, it has been more than 40 years since his ideas were spread. The robots developed today not only look like humans, but they also move like humans, which further increases the similarity he proposed. Therefore, the effect of movement – a fundamental characteristic to all animals - needs to be accounted for, too. Perhaps the discussion would not be complete by including neither the appearance nor the movement, but also the learning and creating abilities. Robots ability to learn quicker than an average human (Rossi & Lee, in press), even the gestures (Ehlers & Brama, 2016) and the social cues by often mimicking the Human-Human-Interaction (Wehle, Weidemann, & Boblan, 2017), needs to be accounted, too.

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II. Human Robot Interaction

A. Touch Distance Based Approach

The abundance of metrics in measuring human-robot interaction presents numerous challenges (Aly, Griffiths, & Stramandinoli, 2016). There is the infamous Negative Attitudes towards Robots Scale (NARS) developed by Nomura, Suzuki, Kanda, and Kato (2006), which was further improved by accounting for the touch distance (Walker et al., 2015). However, the act of touching itself and other integrated or intact states are amongst the topics yet to be visited. All in all, future studies are expected to focus not only on issues surrounding telepresence (Tsui, Desai, Yanco, Cramer, & Kemper, 2010) or proxemics (Mead & Matarić, 2016) of robots operated by humans, but also relate to concerns about autonomous or human operated robots.

B. Social and Combat Robots

As the paranoia surrounding the robot hype becomes more visible (Clifford, 2017; Smith, 2016; Young, 2017) it proves worthwhile to examine the recently launched popular humanoid robots more closely to better understand what are the possible factors nourishing different reactions across the global community (Sheridan, 2016). In this respect, Miklósi, Korondi, Matellán, and Gácsi (2017) assumed an ethological approach proposing that functional aspects of behavior and human-robot interaction should be considered for yielding a more plausible theoretical background for social robotics, for which they suggested various combinations of functional diversity and human likeness for industrial, assistant, sex, service, combat and pet robots.

In this respect, the combat robots deserve a special attention, as it is often the defense industry that has the rich resources needed for research and development in pioneering the technological advancement. In this regard, two examples are worth particular consideration, namely *Atlas* and *Fedor*, the combat robots developed by U.S. and Russia, respectively.

C. Recent Examples: Atlas and Fedor

Atlas, a 175cm tall humanoid robot, was developed by Boston Dynamics, owned by Google X, a subsidiary of Alphabet Inc., by the time it was made public via the YouTube video released in February 2016. As part of a U.S. Defense Advanced Research Projects Agency program, *Atlas* was able to handle number of tasks, including walking at a reasonable speed over uneven and treacherous snow-covered terrain, and getting up quickly when knocked over. The YouTube videos raised public attention beyond expectations. Some attributed the high popularity to the broadcasted tests that involved the beating of the humanoid robot by a human with direct hits and kicks. Other than being obediently beaten up by a human, Atlas was able to help a human actor in simple tasks like picking and stacking boxes.

Fedor, Final Experimental Demonstration Object Research, was designed by Russian firm Android Technics and later commissioned by the Russian government as its first domestically produced anthropomorphic robot. *Fedor* was publicly introduced by a video Tweet posted by the Russian Ministry of Defense in April 2017. It was to replace humans in high-risk areas, such as rescue operations, and the first robonaut candidate to ever aim visiting the International Space Ship, possibly in 2021. Released footage showed that not only could *Fedor* dual-wielded handguns, but it also drove and steered army SUVs, as well as performing various fitness exercise moves that are common to military personnel. In summary, the introductory video of *Fedor* described a soldier by all means.

D. Call to Redefine Human Robot Interactions

Both *Atlas* and *Fedor* were publicly introduced with videos released online. The two defense projects bore numerous communalities specific to humanoids, yet there was an important distinction. *Atlas* was depicted as a durable support robot to assist the human fighters, while *Fedor* was portrayed as the gun bearing and shooting fighter itself. This unique difference brings a new chapter to the robot philosophy that needs to be accounted, which is particularly important in re-defining the human-robot interactions. As Anton Chekhov's famous book writing advice reads, *"if in the first act you have hung a pistol on the wall, then in the following one it should be fired. Otherwise don't put it there."* Future research is needed to discuss the acceptable boundaries of human-robot interaction as well the emerging new forms of interaction.

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