



Annual Review of CyberTherapy and Telemedicine

CyberTherapy meets COVID-19:
The Potential of Positive Technology
Against the Burden of Coronavirus

Editors:

Brenda K. Wiederhold, Ph.D., MBA, BCB, BCN

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**ANNUAL REVIEW OF CYBERTHERAPY
AND TELEMEDICINE 2020**

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Virtual Reality Meets COVID-19:
The Potential of Positive Technology Against the
Burden of Coronavirus

Edited by

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Robotic vision and embodiment. A social and educative hypothesis of experience with robots

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Abstract. The proposal is based on considering the robot (social and educational) as a medium; in this way and through it, we could be in relationship with the environment. Particularly, we want to concentrate on the robotic vision and how it could be useful as mediator in emergency contexts, such as current pandemic COVID-19. We hypothesize that the human-robotics relationship can allow the co-built of several visual, social, performative, and meaningful experiences. The paper aims to highlight the theoretical framework and some empirical and heuristic guidelines to use educative robots in this modality, as a methodology to enhance visual, expressive and communicative competences.

Keywords. Social Robots, Educational Robotics, Audio-visual Language, Embodiment, Vision

1. Introduction: a Human-Robot peer-relationship?

The relationship between man and robots, as a technological form, has been depicted many times over the years in a variety of narrative media. The earliest known of these depictions is *R.U.R.* by Czech playwright Karel Capek (1920); robots created in Dr. Rossum's laboratory are a form of primitive hybridization between human genes and technological elements, creating a sort of cyborg *ante litteram*. Since then, robots have been portrayed in many literary works—Isaac Asimov² dedicated his collection *The Complete Robot* to these machines, and Philip K. Dick's *Do Androids Dream of Electric Sheep* is one of the most famous of these stories. Cinema has also often used man-robot relationships as an inspiration, highlighting and translating into images some of the natural inclinations of humanity to place (conditional) confidence in its potential substitute simulacra. In general, many of the narrative works mentioned here are responses to the need to focus on robots' ability to see; all of the entities involved in these different productions are able to see, perceive and cognitively process reality, and therefore to propose their own point of view. This hypothesis is based on an interdisciplinary approach, according to philosophy of media and post-phenomenological theories [1-2-3-4-5]; studies on technological vision [6-7]; human-robot interaction (HRI; IEEE); aesthetics and media experience [8-9-10]; cognitive and technological theories [11-12-13]; and obviously, educational and interactive robotics, and studies on robots used to create cultural objects [14-15-23-24]. Nowadays, the question of a relationship between humankind and robotics is expressed mainly in terms

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² One of the first films inspired by Asimov's works was *The Forbidden Planet* (Wilcox, 1956), followed by *The Invisible Boy* (Hoffman, 1957), both of which starred Robby the Robot.

of HRI and from the point of view of engineering approaches, and computer-based studies; however, some inquiries follow the ontological and phenomenological directions. Thus, according to Breazeal [19], we can individuate four typologies of robotic interactions: the robot as a tool, cyborg extension, avatar and sociable partner. In this brief paragraph, we focus on these typologies. Social robots, like Nao and Pepper, can represent a technological avatar of humans because they are an ‘organismoid embodiment’; they could be considered a reflection of the human cognition, agency and performance, and are also useful to sustain identity processes of self-adaptation. Obviously, robots can be tools and extensions to man: they are both tools with which it is possible to make something and they could be a cyber-replacement of a part of the body; but they can also be a perceptive extension and an upgrading of human skills, such as increased vision perception, or as an embodiment of robotic touch. Certainly, robots are intermediaries between a human user and the environment because robots and humans can act reciprocally, modelling and motivating one another’s reactions using technology; and, from the point of view of the post-phenomenological theories, robots are technologies with which it is possible to interact in several modes. According to Ihde [12] and Rosenberger and Verbeek [21], robots could be technologies with which we can acquire a ‘hermeneutic relation’, that is, they can interpret reality and provide us their perspective. At the same time, we can have an ‘alterity relation’ with them, that is, we can have a similar relationship with robots as we have with other humans. This aspect also allows both the reflexive processes hinted on above and to investigate a hypothesis of a relation of intentionality between humans and robots. In this case, a human-robot relation could construct a sort of media ‘dispositive’ that allows the enrichment of human skills and to feel a sense of being ‘in’ the robotic body [2].

Based on these guidelines, and previous quantitative surveys on robotics [16], we want to propose the heuristic hypothesis that the use of some robots currently on the market—especially those designed for educational and social use—can also provide their own interpretations of reality through their ability to see, possibly paving the way to a deeper relationship with humans. That is to say that social robots, i.e. Nao and Pepper previously mentioned, have the possibility of returning the image (via tablet or screen) of the person in front of them, thus allowing the chance of self-recognition through the robot-eyes perspective (cameras) in a sort of a mirror game. Moreover, the return is not only a fact of image, but it is something deeply connected with relational and social aspects. The social robots can “read, interpret, and tell” the surrounding reality through the algorithms: for instance, they can analyse the face of a person and try to associate some specific characteristics with a gender (female or male), an age category, or, additionally, to estimate some emotional expressions (i.e., a certain degree of happiness, sadness, anger, or surprise).

All these pieces of information, together with others eventually collected during the interaction, can be stored in the robot memory and used for future meeting, augmenting the feeling of a real social experience [25]. In this way, it should be possible to realize educational products in which children and robots could interact and co-build media and educative tools, also choosing the audio-visual language as a synthesis of potential—and complex—semiological generation and integrative system. This study will theoretically explore this prospective, also referring to some applied experiments ‘on the field’. Due to the COVID-19 emergency, we have not been able to test this hypothesis the way we would have liked. Besides, to illustrate how our research continues despite the lockdown, we want to present a heuristic use of the social robot Nao as YouTuber as a form of mediation for children during the pandemic quarantine.

2. Method’s hypothesis and its application¹

Since 2015, we have undertaken some heuristic forms of empirical applications of HRI at several primary school classes (among 150 grouped students, 8–11 year olds). Students were asked to realize robot-storytelling, in which robots were protagonists, or actants, in films. Through this, we could stimulate both the creativity and the expressive integration of languages and experiences (narrative, computational, audio-visual).

¹ Renato Grimaldi.

Therefore, students had to apply a kind of procedural logic that refers to the causal relation, typical of the empirical experiments. Students had to devise a narrative product developing the script and programming robots to be the video characters, communicating the message with their movements and the shooting frame choices. In this way, students can concretize their fantasies and, at the same time, they can practise their disciplinary goals: in fact, robot-storytelling objects should relate to school subjects and educational content. Therefore, this would require students to study deeply about a subject and think about how it can be transformed into a visual story. This is an integrative use of technological languages that allows them to work on multiple levels of abstraction; not only do they need to concentrate on programming, but they also have to think about how mini-robots can express something through their movement and, above all, through the chosen shots and the dubbing of the protagonists' voices. We set up a procedure for the realization of these products, enabling students to practice a number of parallel skills that belong to multiple disciplines. Thus, the HRI relationship manifests itself in two ways at the very least: according to Ihde [12] and Rosenberger and Verbeek [21], we think that there is an alterity relation in which the robot represents the avatar of the students and their intentionality; thus, the robot is the concretization of their agency as well.

Additionally, some robots can 'see' and transcode their perceptions into images (such as schemes, diagrams or real video recordings). These elements allow students to use the perspective of robots (such as a subjective frame), which is another reference to the post-phenomenological field: if robots are autonomous, they can provide an interpretation of realities. According to Virilio, they use 'sightless vision' [6] which allows them to establish a 'hermeneutic relation' with students. Since children can begin the creative process of a story from robotic visions and images from robotic depth cameras, we think it is possible to hypothesise a peer dialogue between robots and students into a technological and perceptive peer-relationship. At the same time, we think that this relation can also explicate a hypothetical embodiment [4-17] process of the children into robots; students can use robots as a means to enhance their cognitive and perceptive skills. When some robots (as Makeblock's mBot) interact with humans, students can perform with them using gestures or gazes mediated by smartphones or through an immediate perception by a robot's sensors.

2.1. *A Robot YouTuber?*²

During the pandemic lockdown, students have not been able to attend school or live their daily routine. Thus, it was important to provide an alternative to that situation. We used a Nao Robot as the mediator—or, simply, a medium—to help students (5–11 year olds) feel comfortable. Therefore, we think that Nao (and Pepper) can be a social partner, consistent with Breazeal's [19] findings, and, above all, an innovative and technological YouTuber. In this way, Nao has become an avatar and a reflexive body for students who interact with it, while from the post-phenomenological instance there is an 'alterity relation'; humans and robots interact with each other through the mediation of the video. This is the main aim of our experiment. During the lockdown, we noticed that some videos posted on YouTube were drawings and letters sent by students with email to Nao. Our idea started from the need to represent the lockdown emotions of students and, at the same time stay in touch with them, to favour a kind of identification in the robot. To enable this, we assumed a context: through email and Facebook we presented 'Nao's Quarantine', a YouTube channel, in which Nao is the protagonist. In each video, the robot answers questions sent by students and presents a cultural theme, taken from the school curricula or inspired by reality, resulting in Nao becoming a social mediator and a YouTuber. We are working on continuously updating the channel and building a transmedia story on other social media platforms, such as Instagram and TikTok, to realize learning objectives with the robot. In this case, the HRI is not based on a collaborative approach to produce a collective object, such as in the previous case, but to favour an empathetic identification and embodiment of the human in the robot.

² Silvia Palmieri.

3. Starting Results³

In our research work, we collected over 600 items of the Test of Relational Concepts (TCR) [22] to evaluate the basic spatial and temporal competences of the students involved. Moving from this data, our goal is to analyse the use of educational robotics oriented towards a technological competence and a form of technological thinking. From direct observation (also from teachers involved in the evaluation phase), we noted that students have a better recognition of some modalities of behaviour and a better modality of using communicative technologies; above all, a more functional ability of reasoning seems to emerge. Students are involved in a performative and interactive relationship with robots and, at the same time, they can reflect themselves in the robotic movements, allowing them to modify their cognitive approach to reality and learn new modalities. In the last four years, students had devised storytelling videos with robots and we evaluated some main soft skills, according to the EU competences: communication skills, creativity and analytical skills [18]. Here, we focused on the applicability of the procedural logics; in this way, we could verify the effective usability of the method to enhance cognitive and expressive abilities. From another perspective, we see that this strategy allows students to work together to realize cultural objects, which can be considered a modality of concretization of their creativity, that is, the possibility of concretely perceiving (i.e. see) their thoughts. Currently, we are testing the same activity with the social robot, Nao, because it can autonomously see and interact with humans and can instantaneously record anything. Thus, using Nao in the YouTuber modality (i.e. as an actor-medium) or in the collaborative process of building meaning (i.e. in hermeneutic and alterity relations) can also be interesting forms of video research because we can see the robot's perspective and how it interacts with students, in a dialogical and performative relationship. Due to the COVID-19 emergency, we could not initiate an evaluation path on both activities. Consequently, this article is more of a draft paper that needs further steps of analysis to corroborate or deny our hypothesis on HRI relationships.

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³ Sandro Brignone.

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