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Introduction

Abstract: In order to prepare the reader for an analysis of human interactions with a wide variety of forms of robot, the introduction first explores what constitutes a robot. It then goes on to outline the different traditions of communication theory that are employed in the book's analysis. Finally, it explains the structure and scope of the book.

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This book considers human-robot interactions as models of communication with the aim of re-evaluating the presence of otherness in communicative encounters. Its focus is therefore on finding ways to *value* the differences between communicators as opposed to regarding them as *problems* that must be overcome. This re-evaluation is difficult to achieve because, from its etymological roots to its metaphorical articulation in everyday language, communication is often linked with the accurate transmission of information and/or the construction and re-construction of shared social understandings (Reddy, 1979; Lakoff, 1980; Chang, 1996; Peters, 1999). From these perspectives, successful communication is positioned as a bridge between self and other, founded on their commonalities and seeking to develop those commonalities further.

In terms of reconsidering the value of difference, robots are intriguing communicators because they appear in such a variety of forms. Robots are sometimes created to be as humanlike as possible, but on other occasions are ‘overtly other’ in design. Within the continuum between these two extremes some robots are animal-like, while others resemble everyday objects that move and respond to people and their surroundings in unexpected ways. Therefore, at one end of the spectrum human interactions with humanoid robots illustrate the effects of accepting that commonality is key to effective communication, as well as exposing some of the limitations of this perspective. Towards the ‘other’ end of the spectrum, human interactions with robots that are not humanlike (or even animal-like) demonstrate the possibilities of communication that values difference, while nonetheless supporting effective collaborations between humans and machines. It is difficult to know how best to refer to the ‘overtly other’ end of the spectrum of design as a group, since broadly these robots cannot be defined simply as machinelike or object-like; they might not resemble anything familiar at all. Represented in this book are blimp-like, wheelchair-like, lamp-like and tank-like robots, along with one that is shaped like a shallow box (the iRobot Braava). For the purposes of this book I have therefore decided to refer to this disparate group of robots as ‘non-humanoid’, as a shorthand for ‘not overtly humanlike or animal-like’, because much of the book focuses on considering the possibilities of communication between humans and nonhuman others.

The decision to examine communication between humans and many different types of robot, from humanoid to non-humanoid, was inspired by John Durham Peters’ suggestion that ‘[b]y exploring our strangest partners’ it is possible ‘to illuminate the strangeness that occurs in the

most familiar settings' (1999, p. 231). An exploration of the interactions between humans and robots, and the interplay of familiarity and strangeness within those interactions, supports this book's argument that difference can be of value in communication, and collaboration, with all kinds of others.

Before moving on to provide an overview of the book's parts and chapters, it is worth discussing briefly the origins and varied present-day uses of the term 'robot', as well as offering an overview of the categories of communication theory that are employed in its analyses of human-robot interactions.

What is a robot?

The word 'robot' was first used in 1920 in Karel Capek's play *R. U. R.* (*Rossum's Universal Robots*), although Karel credited his brother Joseph as the originator of the term (Capek, 1933). The robots in *R. U. R.* are not metal machines, the construction that typifies many recent robots in fiction, as well as those in real life; instead, Rossum's robots are 'artificial people', constructed from organic components (Capek, 1920/2006, p. 7). While their internal structure is far simpler than that of a human, externally they look very much like the human factory workers they have been designed to replace (Capek, 1920/2006, p. 9). The term robot has, therefore, been associated with humanlike form from the very beginning, and the figure of the robot, which became more closely associated with human-shaped machines as opposed to organic artificial people, has become an icon for many science fiction writers, screen writers and film-makers.

In real-world contexts, the word robot is now used to describe a huge range of different forms of machine, some of which are radio-controlled, while others are partially or completely autonomous in their movements and actions. In fact, the use of the term has become so broad that it is difficult to define exactly what is meant when a machine is described as a robot. It is also very difficult to clarify, in any universally accepted way, what attributes or abilities differentiate a robot from any other machine.

In general, a robot might be best regarded as a machine that appears to have some level of agency, and therefore seems to sense and respond to its surroundings. This is the case for all of the robots discussed in this book. However, given that this is a book about communication and

robots, it should not be surprising that my particular interest is in robots that people regard as communicating with them in some way. Contrary to what might be assumed, a robot does not need to have a high level of autonomy to be regarded as a communicative partner. This is made particularly clear in Chapter 7, during the discussion of the relations between soldiers and Explosive Ordnance Disposal (EOD) robots that are currently almost always under the direct control of a human operator.

Stories about robots and developments in robotics are now reported on a regular basis, not only in technology-focused news media, but also in mainstream television and news publications. Even having a robot in the home is no longer just a technological fantasy for some people, although robotic vacuum cleaners are still a long way from the humanoid robotic helpers described in some science fiction. Robots are becoming more visible in workplaces as well and are sent into dangerous situations such as war, rescue or exploration. The use of robotic technologies is also increasingly directed towards providing care robots in hospitals and for assisted home living. In addition, robots have been introduced into educational environments and are encountered in public spaces, where they may be part of interactive art installations, or may act as informative museum and exhibition guides. As robots become more commonplace, the question of how people and robots can communicate with one another becomes increasingly important, whether robots simply encounter people in shared spaces, are required to work with them in teams or are positioned as their rescuers, carers or companions.

In order to explore the possibilities of human interactions with robots – from familiar to radically other – this book employs a range of communication theories to offer different perspectives on what happens when humans and robots meet and communicate, whether in scientific laboratories, art installations or science fiction. This exploration of human-robot interactions also circles back and provides new ways to think about communication in theory and in practice, offering some useful ways to rethink the presence of otherness in communicative processes and systems.

What is communication?

In discussing communication, this book draws upon the seven traditions of communication theory identified by Robert T. Craig (1999): rhetorical,

concerned with all forms of discourse; semiotic, studying the use of signs for intersubjective mediation; phenomenological, acknowledging the experience of otherness in authentic relationships; cybernetic, describing communication in terms of information processing models; sociocultural, analysing social and cultural contexts in the production and reproduction of social order; sociopsychological, concentrating on the context of subjective reactions to expression, interaction and influence; and critical, concerning the development of reasonable and rational discourse.

These traditions of communication ‘offer distinct ways of conceptualizing and discussing communication problems and practices’ and therefore provide different lenses through which to analyse communicative events (Craig, 1999, p. 120). In this book I follow Craig’s suggestion that it is valuable to explore the ‘dialogue’ between these theories in an attempt to more ‘fully engage with the ongoing practical discourse (or metadiscourse) about communication in society’ with a particular focus on questions about otherness and difference (1999, p. 120). Of course, a book of this length cannot hope to provide an exhaustive analysis of the human-robot interactions it discusses from all seven points of view, but all traditions play their part in what follows, with a particular focus on the interplay between the cybernetic, semiotic, sociocultural and phenomenological traditions. In addition, since the rhetorical tradition has ‘shifted from a focus on oratory’ (and therefore the use of spoken language) to cover the use of ‘every kind of symbol’ it would seem to have a part to play in all communication, and is not overtly mentioned here (Littlejohn and Foss, 2011, p. 64).

Whether communication is understood in terms of rhetorical force, the accurate transmission or exchange of information, gaining influence through persuasion, rational argument towards agreement or the adoption of shared social understandings, it is most often judged to rely upon and to foster similarities between communicators. However, thinking about communication in this way reduces one’s awareness of the potential of the other’s point of view and devalues the importance of understanding and knowledge about the world that is different from one’s own. As a number of communication scholars have argued, taking this stance against diversity can be seen as violent to the other, forcing them to conform to what is judged as the norm, as opposed to being open to their otherness (Peters, 1999; Pinchevski, 2005). In terms of robot design, these understandings of communication form part of

the reasoning behind the drive to create humanoid robots, because it is assumed that human-robot interactions will be easier and will work better when robots are designed to be familiar, humanlike others.

The careful recognition of otherness is most clearly valued by the phenomenological tradition of communication theory (Peters, 1999; Pinchevski, 2005). Theories within this tradition are focused upon the development of ethical communication with the other, and therefore with the view that difference is an integral part of communicative processes, as opposed to a difficulty that must be overcome in order for successful communication to occur. However, the way that this tradition focuses on being open to otherness, while acknowledging the impossibility of ever completely comprehending the other, makes it very difficult to consider in relation to other theoretical traditions in the field. As Craig notes, '[p]henomenology, from a rhetorical point of view, can seem hopelessly naïve or unhelpfully idealistic in approaching the practical dilemmas that real communicators must face' (1999, pp. 139–140). Extending this observation, it seems reasonable to suggest that an appraisal of the phenomenological tradition as somewhat naïve and idealistic might be shared more generally from the perspective of all other communication traditions that focus upon success, whether in terms of passing information accurately, influencing others or creating social cohesion.

It is also noticeable that scholars who write about the phenomenological tradition tend to use emotive examples to illustrate the call of the other from a position of need. This strategy emphasises that the self is in a position of responsibility, having a choice over whether to take an ethical stance towards the other (Levinas, 1969, p. 251; Lingis, 1994, p. 12; Smith, 1997, p. 332). These discussions of communication are therefore distanced from the more usual everyday concerns of communicators. In contrast, although they are easily placed as others, the robots discussed in this book are not emotive in the same sense as a sick child, for example. In addition, although these robots in themselves are not everyday objects, examples of their communication with humans are clearly positioned within this space. Thus, the use of robot illustrations offers various ways to draw out phenomenological concerns, in particular relating to responsibility and respect, within contexts describing communication that might take place as part of everyday life. An analysis of the phenomenological tradition through human-robot examples therefore opens up ways to value phenomenological ideas alongside more familiar, or traditional, conceptions of communication in those situations.

Craig also argues that ‘from a phenomenological point of view’, the rhetorical tradition, and given the contention that it underlies other theories I would also suggest many other traditions, ‘can seem unduly cynical or pessimistic about the potential for authentic human contact’ (1999, p. 140). Amit Pinchevski’s work in particular can be associated with such a phenomenological perspective, since it suggests not only that traditional communication theory suffers from a ‘conceptual blindness’ to otherness, but also that, as a result, it is overtly violent to the other (2005, pp. 29–62). Craig notes that ‘[w]hen rhetoric and phenomenology are combined, the result is typically an antirhetorical rhetoric in which persuasion and strategic action are replaced by dialogue and openness to the other’; or, sometimes ‘a hermeneutical rhetoric in which the roles of theory and method in communicative practice are downplayed’ (1999, p. 140). In this book, I do not generally attempt to combine theories, but rather analyse human-robot interactions from a number of perspectives. This approach helps to draw out the broader possibilities of each communicative situation, by considering communicators, their relationships and the communication systems of which they are a part, in ways that preserve otherness and difference, even while acknowledging the partial connection that develops between human and robot.

It is the non-humanoid robots discussed in Part II, with their overtly recognisable differences from humans, that are particularly helpful in moving phenomenological ideas away from contexts stressing human need, and towards a more general sense of the importance of otherness in encounters. In particular, robots that are created as part of art installations can be understood to push the boundary of what constitutes communication. Such robots are designed in part to entertain visitors, but they also raise questions relating to the possibilities of encounters with very different and unexpected others. There is less of a sense that such machines must communicate clearly and directly with their visitors, combined with more openness to the expectation that different people might interpret the robots in very different ways from one another. In the context of art installations there is therefore an understanding that the wide range of reactions non-humanoid robots might provoke is desirable.

The perspective on communication in this book regards both verbal and nonverbal communications as being equally worthy of attention. In addition, while viewing communication in terms of discrete moments or static processes can be valuable, considering dynamic systems of

communication offers new ways to explore what happens during interactions. Regarding communication as a dynamic process of overlapping interchange is particularly relevant when thinking about nonverbal communication channels and the way that partial understandings develop between communicators (as opposed to the level of complete comprehension favoured by traditional theory with its goal of increasing what communicators have in common). A sense of partial understanding is supported by the recognition that aspects of a non-humanoid other can be read by comparison with past experiences of human or animal interactions, while also acknowledging the importance of the alterity of the machine. Partial understanding can therefore be linked with the ideas of tempered anthropomorphism and zoomorphism set out in the later chapters of this book. Thinking about dynamic systems of communication also leads to the consideration of communication over time, the importance of history and backstory as well as the value of shared experience gained when communicators train, learn and work together.

Structure and scope

This book is divided into three parts, the first of which contains two chapters and provides an overview of how communication is framed in relation to humanoid robots, as well as the possibilities of communication between humans and animals. In Chapter 1, the pursuit of humanlike form is analysed in both fictional and real-life contexts. Amongst other justifications, people committed to building humanoid robots argue that these robots are best suited to work in human environments and to communicate with humans. Two paths in humanoid robot design are considered, but both involve understandings of communication that value commonality over difference. This chapter draws on critiques of the pursuit of sameness found in the work of communication scholars, which is not much discussed in robotics, to destabilise the assumption that humanlike form is the best form for communicative robots.

Chapter 2 pauses the book's consideration of robots to explore human-animal communication, since nonhuman animals are an important part of many people's lives, acting for some not only as companions but also as co-workers. Human-animal communication is described in various, often idealised, ways in fiction, but in real-life situations an analysis of human-dog communication demonstrates the importance of attending

to the smallest of nonverbal signs over periods of dynamic communication. This chapter highlights the possibilities for humans and animals, in particular dogs, to work together in teams, employing their specific skills to allow the team to perform tasks that neither human nor dog could complete alone. The ideas about communication developed in this chapter, which demonstrate how communication does occur in the presence of overt otherness, support the possibilities of human interactions with non-humanoid robots. A brief appraisal of the design and development of animal-like robots is included at the end of the chapter.

Part II contains three chapters, which provide a progressive exploration of human interactions with non-humanoid robots from initial meetings to prolonged engagement in a working team. Chapter 3 concentrates on theorising the encounter between human and robot, identifying moments when communication occurs, often using nonverbal communication channels at least initially. The chapter discusses two versions of the Autonomous Light Air Vessels (ALAVs) art installation, within which blimp-like robots interact with one another and with visitors. This chapter extends Levinas' conception of self-other encounters to consider nonhumans, including robots, in order to emphasise how communication can be understood to draw the self and the other into proximity while retaining the differences between them.

In Chapter 4, the discussion moves beyond the initial encounter, to consider how dynamic interactions support communication with robots where those communications are also framed by a backstory. In this chapter the focus is on how interactions can be understood in terms of both dialogue and overlapping continuous systems of interchange. Levinas' theory is further extended in this chapter, to highlight the interruptions in being and in saying that occur during interactions with Fish and Bird, the wheelchair-like robots discussed throughout the chapter.

Finally, Chapter 5 considers what happens when humans and robots learn to complete tasks together as a team. In particular, the chapter considers human interactions with AUR, the robotic desk lamp. In this example, elements of verbal and nonverbal communication are combined in a dynamic communication that involves paying attention to each other as well as to the task at hand. The chapter considers communication with AUR in terms of the companion species relation proposed by Donna Haraway, which was discussed in relation to human-dog agility teams in Chapter 2.

The two chapters in Part III draw together some of the overarching ideas of the book. Chapter 6 considers the implications of human communication with nonhuman others for the categories human, animal and machine. This chapter argues that, while the boundaries between these types of being are becoming increasingly blurred, they are nevertheless still meaningful. The chapter goes on to consider ways of assigning agency to nonhuman others on the basis of their activity in situations, while also recognising the difference between human activities and nonhuman activities.

Chapter 7 concentrates on exploring some ideas about the relationship between individuals and systems in thinking about communication. The chapter discusses long-term interactions with robots outside of laboratories and art installations, identifying the value of respect and trust in collaborative partnerships with robots. This is developed into a consideration of how responsibility is shared across collaborative teams, even when the team members are in an asymmetrical relationship.

Finally, the short conclusion to this book explains the basis for its somewhat eclectic analysis, which uses a range of traditions of communication theory, as well as considering the overarching conceptions of discrete state and dynamic systems methodologies.

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