

The “social” of the socially interactive robot: Rethinking human-robot interaction through ethnomethodology

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Abstract. As social robots project socially interactive skills including speech and gestures, they are in a position to project normative practices that humans ordinarily rely upon in their everyday interactions with each other. Social robots enable experiences that are reducible to interaction as a normative practice, such as a sense of moral obligation to respond to a robot's greeting. This may have consequences both for the user experience and the design of social robots that are currently overlooked. We propose that theoretical-methodological tools from ethnomethodology should be applied to evaluate and investigate the experiences related to social interaction with social robots.

Keywords. socially interactive robots, social interaction, ethnomethodology, normative practices, moral order, sequences in interaction, cooperation, shared intentionality

1. Introduction

Some social robots are specifically designed to interact socially with humans. Such robots have been termed socially interactive robots [1]. Socially interactive robots are unique in the sense that they are designed to offer the possibility to interact with them similarly to how we interact with humans. They can mimic aspects of social interaction that involves communicative affordances such as speaking, gesturing and eye contact. These robots may be specifically geared for public settings, such as shopping malls and service points, where humans can engage in interaction with them for services or entertainment (e.g. [2–6]). Social robots occupy a physical space, and their embodied features evoke a social presence which is experienced by humans [7,8]. With the physical abilities for social interactions, socially interactive robots also mimic the structural and normative features of everyday human interaction, for instance greeting, thanking, apologizing, asking questions, and so on.

Currently, social robots and encounters with them cannot be considered mundane. Few people have encountered social robots, and the first encounter with a social robot can involve a “novelty effect” [4,9,10]. With lively body animations and speech, a social robot invites humans to engage in interaction. But what is this interaction with a robot? How should we approach social interaction with robots conceptually?

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In this paper, we first offer a perspective to human interaction using the theoretical tools of ethnomethodology. Our conceptual investigation focuses on the practical order of interaction as it is described in ethnomethodology. We then raise a practical-ethical concern that social robots that mimic features of human interaction – and thus provide structurally similar encounters as with human interactions – potentially “exploit” the moral grounds of human social interaction that involves cooperation as a requirement. Finally, we suggest that ethnomethodological research on social robotics may be beneficial to understanding human-robot interaction better. Ethnomethodology’s unique viewpoint to social action can provide useful tools for conceptualizing and studying interaction with social robots (e.g. [11–14]), but ethnomethodological research in social robotics is still quite rare. The aim of this paper is to contribute to the discussion about ethically sustainable human-robot interactions in society (e.g. [13]).

2. Ethnomethodological perspective on social interaction

Ethnomethodology is a tradition established by sociologist Harold Garfinkel [15]. In ethnomethodology, social interaction is not theoretically separated from the ordinary commonsense world of human beings. Instead, human beings are practical theorists of everyday life. They put effort into continuously maintaining sensible, understandable, familiar and normal conduct and environments. Garfinkel explains that we are, in daily life, taking for granted that we are complying to a normative order of events that constitutes the social world. When we encounter violations of this order, we seek to establish normalcy, a sense of what is going on. We are seeking explanations to restore the environment as what it was expected to be.

Garfinkel [15,16] takes an example of playing a game. During games such as tick-tack-toe, each player complies with the constitutive order of a game. The game consists of game rules, which in Garfinkel’s work are equal to “expected events” [16]. If a person breaks one of the basic rules which constitute the game, the game itself breaks. If a player erases their opponent’s mark on the paper and draws their own mark over it, the player has violated the game of tick-tack-toe as an order. If the player acts as if what they did is normal, another player may find the explanation that the other has misunderstood the rules, or that they are playing a joke and not taking the game seriously. Either way, the event calls for some interpretations to happen in order to establish “what is going on”.

According to Garfinkel, people see meaningful actions and not mere behaviors. People do realize that drawing “X” on the paper is a physical movement of the hand, but in the context of a game, they see it as a game move. Players see each other’s mere behaviors as game events. In an ordinary game event, people do not doubt what they see: they assume and take for granted that each behavior will be within a set of possible, expected events of game-as-an-order. The player acts in a way that presupposes the social, that is, the player takes it as a presupposition that when they draw “X” on the paper, it will be counted as a move in the game, and that others see this as a move in a game. Garfinkel [16] points out that games are “encapsulated events”, which means that upon encountering violations of game as an order, persons can exit such situations. In the case of games this means that the game ends and ordinary life continues. In ordinary life, however, “exiting” the normative order has more serious consequences. It would be closer to a situation that results in the re-evaluation of one’s social competence, or as Tomasello [17:92] has put it: “acting occasionally in this way will ruin friendships, and

acting consistently in this way will lead to some kind of psychiatric diagnosis and possible removal from mainstream society”.

Let us take an example from social interaction: greetings. Greetings are normative rituals that we conduct when we encounter each other. We know that when you are greeted, you should greet back. We do not do this only for the sake of blindly following the norm, but instead, by greeting the other person we maintain normalcy (e.g. [18:98]). According to ethnomethodology, norms are resources for individuals to make sense of actions. When a person greets another and both have become aware of this, there is “no way out”, and the other is morally obligated to greet back, not just because of the norm, but because if we do not adhere to this norm, we are changing the meaning of the co-constructed situation instantly, not just for ourselves but for others as well. What was thought to be a greeting situation has now become something else because the lack of greeting calls for an explanation: “Perhaps the other person is mad at me, or perhaps she did not see me”.

3. Is interacting with a social robot *social* interaction?

In ordinary social interaction, violating the normative order (for instance, of greetings) changes the sense of the situation permanently and changes the relationships we have with each other. Thus, as individuals orient to social situations, it always involves a moral aspect. This morality is not about whether one is acting in a moral or immoral way according to an abstract moral code. Rather, the morality in question is with the respect to the very possibility of acting together in a specific manner in a specific situation. This morality is the requirement of cooperation, and cooperation is fundamental to social interaction.

Human beings are endowed with socio-cognitive abilities for cooperation that separate us from other species (e.g. [19,20]). Tomasello [19] has termed our unique form of cooperation as “shared intentionality”. It is the ability to direct our attention to goals and things in the environment *together*. This ability for cooperation is a feature of human sociality, and all social interaction is intrinsically cooperative in nature (e.g. [17,19,20]). Similarly, from an ethnomethodological perspective, this cooperation creates the base for the constitution of the social world and our everyday interactions. Our actions lean on an essential aspect of sociality that Garfinkel [16] calls *Trust*. When persons trust, they produce actions that are understandable and discoverable as actions in-a-normative-order. By taking for granted the presuppositions of daily life people trust; they participate in the social world and simultaneously constitute it. [16]

What are we *really* doing when we interact with robots? To explore the conception of Trust with social robots, we want to draw attention to a distinction between “talking” and “using speech”. By “talking” we refer to situations of Trust, where a person produces actions that are discoverable within a normative order and assumes other participants to be able to perceive them as actions within that order. People assume that what they say will contribute to the emergence and realization of the current situation as what it is assumed to be to everyone or anyone (for example, an argument or small talk). On the other hand, “using speech” refers to situations lacking this reciprocal attitude.

Thus, in human interaction we are “talking” but with robots we may find ourselves in situations where we are *merely* “using speech”. We are in a situation that resembles interaction in appearance, and we are prompted to use language to do things. If we apply Garfinkel’s theory, talking to or with a robot is *social* interaction only if there is Trust,

as without Trust, acting *socially* would not be possible. *Social* interaction requires that the person assumes that the robot has capabilities to contribute – from their own point of view – to the emergence of constitutive social activity.

For robots to be equal partners in the co-construction of the social world in the sense that ordinary human interaction is concerned, they should be able to interpret the situation here and now, understand the morality of interaction and the implications of the lack of responses. And this is not the case. In theory, interaction with a robot does not easily fit into the requirements of *social* interaction as described by Garfinkel [16], and human-robot interaction may be conceptualized as a case of producing the appearances of social interactions. We can interact with socially interactive robots in a similar appearance to how we interact with humans, but the interaction does not constitute what human interaction constitutes.

4. The practical-ethical aspect of mimicking human interaction

Human interaction is not merely a back and forth exchange of communicative resources, but a continuous production of meaning and social reality. To humans, interaction is more than mere appearances, and, yet, the appearances are what roboticists are attempting to replicate. The design of socially interactive robots intrinsically involves the design of normative practices of human social interaction. For example, customer service robots such as the Pepper robot can be designed to engage people in public places with familiar normative practices such as greetings or polite questions (e.g. [3,4]): *Hello! How are you doing today? May I be of service?*

Applying the theoretical insights of Garfinkel, we argue that even though the humanlike interaction that comprises Trust would be impossible with robots, robots are programmed to perform sociality by mimicking actions that ordinarily require cooperation and therefore arouse a moral stance in the people interacting with them. In her pioneering ethnomethodological work on interaction with technologies, Suchman [21] argued that interaction between people and information technology devices implies mutual intelligibility. She argued that people often consider for example computational artefacts that possess reactive, linguistic and internally opaque properties as interactive and adjust their own actions in that [21]. In a similar vein, no matter what people personally think and feel about robots, the appearance of conversational sequences provided by a robot (for instance, the first part of a greeting [22] produced by a robot in a specific situation) makes the human participant recognize the interactionally obligated sequence structure that requires answering. Hence, we argue that when people respond to a social robot's greetings, they do not merely respond to the robot, but orient to the moral obligation involved in the normative practice of greetings.

For humans the embodiment of others is interactive without exception; the term *intercorporeality* refers to how human beings, while in each other's copresence, are continuously sensing others and being sensed by them through visual, tactile, and other sensorial systems [23,24]. This means that for humans, other persons' appearances, be they verbal or nonverbal, are never "mere appearances" but always contain a possibility for social action. Hence, "raising of my arm" can be done because I want to stretch my arm, but for instance in a classroom it can quickly be seen as an indication for asking a permission to speak to the teacher. Accordingly, when a robot is offering us "mere appearances", people may interpret them as actions because that is how they are used to see participants' behavior in interaction. For example, in our previous study,

schoolchildren appeared to interpret the robot's behaviors as meaningful: when the robot was nodding, a child commented, "It showed that I did it right" [10].

Thus, when a robot extends its hand toward a person while saying "nice to meet you", human participant may interpret this as an affordance for a handshake. Robots are "socially blind" in a sense that they are unable to make use of the situated resources of interaction. Nevertheless, interaction with a robot is also interaction which proceeds in turns and during this sequential process it is the human participant that reads the meanings into whatever the robots do or display, and this interpretation work resembles what people do when encountering each other.

This can be illustrated by an excerpt (Excerpt 1, presented below) from Pelikan and Broth's study [13] about turn-taking with a social robot Nao. As Nao provides an introduction "I'm Nao" (line 04), the human participant Gary treats this as a cue to reciprocate by also stating their own name (line 06). However, Nao is not programmed to "listen to" the participant's name in this specific sequential place but, instead, to tell more about itself before asking the participant's name (line 10). Gary however repairs this "misunderstanding" by repeating their name in designed place (line 12).

```
01 Nao +(0.6) hello:
    nao +waving -->
02      (0.4)
03 Gar >hi<
04 Nao (0.5) i'm nao
05      (0.8)
06 Gar i'm+ gar[y]
    nao -->+
07 Nao      ↑[i]'m a ro:bot
08 Nao (0.4) an i'm four ↑years ↓old
09 Nao (0.9) i come from fra:nce
10 Nao (0.9) ↑what's ↓your name?
11 Nao (0.4) da ↑dup
12 Gar (0.7) >gary<
13 Nao (0.9) da↓ dap
14 Nao (0.3) nice to ↑meet ↓you (0.2) gary,
15 Nao (1.6) i ↑love games,
```

Excerpt 1. An excerpt adapted from a turn-taking study by Pelikan and Broth [13:4925].

Pelikan and Broth's study [13] reported that humans adjusted their interaction style to meet the technical limitations and specific requirements of the robot to accomplish interaction with it. For example, participants avoided using words that they learned the robot would not recognize. However, participants also showed tendency to produce turns during the interaction that are similar to normative practices of human interactions even when they were aware that the robot did not perceive these turns [13].

People will adapt their conduct to the interactive frameworks that are needed, here and now, if the frameworks are somehow visible. This does not mean, however, that people *always* respond to robots in similar way as to humans, nor does it mean that they are somehow *genuinely* obligated to them in the same sense as they are to other humans.

Although humans' tendency to respond socially to robots is often explained with anthropomorphism [25], the issue with socially interactive robots is that humans also orient to the interaction order that resembles human interaction and thus calls for certain expectations of conduct, regardless of what kind of entities humans assume robots to be.

As discussed earlier, this orientation to interaction order, evolved during lifetime and turned into a “continuous” way of being in the world, always contains a moral stance of following the expected procedures of interaction. We may feel compelled, for instance, to return greetings to a robot’s handwave or a verbal greeting. For the same reason, it may feel slightly awkward to just walk away from an interaction with a robot.

Robots create a rather curious and somewhat problematic practical-ethical issue: they pretend to be social and prompt responses in us and, thus, make us put cognitive effort into the interaction that is inherently a moral endeavor. Human-robot interaction seems to be a social situation by the looks of it, yet it is *lacking a reciprocal partner* in interaction. Robots that use these interactional abilities to invite people to engage with them are calling us to use what we have learned from social interactions starting from the moment we are born. The moral consequences of not responding to another person’s questions or walking away from a person amidst walking together similarly become practical issues to solve during these situations. By mimicking features that are familiar to people from their daily interactions, the robot is appealing to *our* sociality; not just cognition, but social norms that constitute our social world in interactions.

Thus, the central issue is: if the design of robots only seeks to effectively provide the appearances of human everyday interaction without understanding that the same things are central to the practical-moral order, ethical “crimes” can occur. We respond based on what things look like to us, but as we start to interact, we may find ourselves puzzled at the fact that things “are not what they seem”. It somewhat resembles an unethical experiment where the participants in the experiment have been deceived and the true nature of the experiment has not been told.

5. Discussion

5.1. The “social” of social robots

Concerning the constitution of the social as described by Garfinkel [16], if we want to have *social* interactions with robots, the requirements for interactions are huge and almost impossible to meet. Echoing Kahn’s [26] observation that robots seem to belong to an ontological category of their own, our analysis implies – however this time related to interaction as practice – that from an ontological standpoint, interaction with social robots is a completely new form of interaction. It is different from interacting with a human because in theory it does not really constitute *social* actions that comprise Trust [16], even though in appearance it almost seems like it does.

As discussed earlier, human interaction is essentially cooperative and reciprocal, and interaction is how we make the social world and its meanings. Participants of these interactions are invested in the management of the social world and normality. However, robots do not (nor they never could) possess the same *need* for social interaction as humans do. From the standpoint of a robot, it can produce “mere behaviors”, for instance, raising of an arm and selection of verbal responses. Social robots enter the area of what has previously been human only, the shared meaning making process of our world, yet they do not participate in it as individuals that have an intrinsic need for such a world. Robots are not invested in the interaction in the same manner as humans are and they do not comprehend the world of normative practices and institutional realities. Essentially, robots do not enter the dialogical space where meanings are co-constructed [27], and they do not have an intrinsic stake in their sociality as agents [28].

In a recent scenario-based study, we found that participants felt that being interviewed by a robot would not make sense, because a robot cannot *really* listen, and it would be like speaking to a void [29]. Meanwhile, people in actual situations may experience the robot as ‘other’ [30]. Humans in their orientations to robots contribute to their sociality [11] and use narratives and descriptions to make sense of robots’ functions [31]. At this stage of robotics, actual encounters with social robots are not common in daily life in society, and people are still seeking to understand what robots are and what kinds of interactions and meanings we can have with them (e.g. [30,32–34]). Whether the interaction between a human and a robot meets the requirements of some sort of social interaction and is conceived as “genuine” seems to be left on the shoulders of the human. Humans as active participants in the process are experts of the social, and it will be exposed in real-life practices how they are willing to define the social within situated interactions and how such definitions form (e.g. [12]). From ethnomethodological perspective, the sociality of a robot is an immediate empirical matter for those who encounter robots and interact with them.

In this article we have discussed that one of the reasons that humans respond to robots is because of the normative interaction practices. We share Turkle’s concern [35] that humans’ responses to robots’ interactions should not be “blindly” celebrated. We argue that exploiting the essential readiness of humans to interact socially may have consequences for human-robot interaction design that are currently understudied. This issue should be considered more, especially as robots are developed to engage people in public spaces and enter areas of human daily life.

5.2. *Approaching social robots in practice*

Regarding the practical use and adoption of social robots within areas of human life, ethnographic studies provide useful insights about what works in practice (e.g. [34,36,37]). Investigations of natural environments are important for discovering how humans adapt or disregard new technologies in practice [34,36,37]. Designing robots for human environments also calls for understanding about the real needs and the values within these environments [38,39].

Ethnomethodological studies with social robots may naturally lead to design implications (e.g. [13]). For example, ethnomethodological conversation analysis has been used to analyze how implementing certain social cues improve interactions with a robot [14], and how users’ engagement with robots can be extended [40,41]. Ethnomethodological conceptual tools have been applied to ethnographic studies to conceive how humans contribute – enact – the social of a robot [12], and account for robots as both agents and things [11].

To understand better what is appropriate and ethically sustainable behavior for socially interactive robots, for example in public places where people may spontaneously encounter them, the experiences that relate to the practical-ethical aspects should also be studied and recognized. These experiences may include discomfort, embarrassment, guilt, awkwardness and uncertainty – for example, in a study of a Nao robot as a language learning assistant at a school, we identified two occasions when failures in the robot’s speech recognition software “singled out” one pupil to whom the robot did not respond, and who consequently felt as being ignored by the robot [10].

To contribute to the future empirical studies, we emphasize that there are some main methodological principles, based on the ethnomethodological theory presented in this article, that can be used to make aspects of human-robot interaction visible. First,

dissection of the actual actions is needed to reveal meaningful affordances of the activity system in question (cf. [42]). Second, human-robot interaction comprises sequences of actions and these sequences are often realized in action pairs. This organization of sequential activity can be studied by applying the conventions of ethnomethodological conversation analysis (e.g. [13,41]).

In studies using ethnomethodological principles, phenomena are not measured and compiled into averages, but rather their meaning is analyzed in the context of procedural action sequences. This means that, for instance, similar-looking instances or “errors” can be a consequence of different kinds of reasoning processes attached to completely different affordances of the situation. In order to be able to do a detailed analysis, video recordings of situations are usually used as data. Accomplishing the detailed analysis of situational reasoning instead of using generalizations and/or pre-specified coding schemes is the aspect that can be seen separating ethnomethodological and ethnographic research approaches, although the distinction between these two approaches is not always clear and the approaches are often mixed in actual research designs.

6. Conclusion

In the present paper, we have explored the potential implications of ethnomethodological theory, specifically the detailed observations of social actions described by Garfinkel [15,16], regarding interactions between humans and social robots. With the insights of ethnomethodology, we have argued that in the conceptual sense, interaction with a social robot is essentially different from interaction with humans because with a robot the interaction reduces to superficial components and lacks the constitutive structure where social world is maintained as a cooperative moral practice.

This paper has pointed out a practical-ethical aspect related to social robots, that is, a potential issue about the “exploitation” of human sociality within the paradigm of socially interactive robots. Robots have the power to elicit responses and experiences that are traceable to the moral order of everyday human interactions that are the bedrock of human sociality. This way robots essentially enter the stage of the “social”. The interaction initiatives mimicked from human interaction, such as greetings or questions, practically force humans to somehow orient to interaction with a social robot.

We have argued in this paper that social robots invoke the normative practices that feature into our social interactions that are essentially *reciprocal*. Yet, a robot is not invested in the interaction in the same manner as a human is. However, the mere appearances of the sequences of such normative practices – although programmed – can elicit a sense of social interaction taking place, and it is currently up to humans to make sense of that.

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