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Interaction Rituals with Artificial Companions

From Media Equation to Emotional Relationships

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Abstract

The article proposes an understanding of interactions and relationships with artificial companions that is based on sociological interaction ritual theory. It argues that the formation of relationships with companions and inanimate objects is significantly affected by the emotional outcomes of interactions with these entities. The article suggests that these outcomes are similar to Collins's concept of emotional energy which involves feelings of solidarity, belonging, and group inclusion. The formation of social relationships and repeated interactions are supposed to be driven by basic needs for these feelings. The more interactions with companions produce increases in emotional energy, the more stable the social relations between human and companions will be. The article finally speculates on the ways in which interaction rituals with objects can inform social theory more generally with respect to the inclusion of nonhuman entities into conceptions of sociality.

1 Interaction rituals with artificial companions: From media equation to emotional relationships

My first job as a sociology undergraduate student in the 1990s was at a "new economy" firm. The company had developed one of the first internet dating sites, called the "Flirtmaschine". Much later, when the company went bankrupt, the site was acquired by Matchnet, today's largest provider of online dating services. Because the Flirtmaschine was one of the first of its kind, its developers were skeptical whether internet dating would work at all. They were concerned that people might find it too awkward to use, mostly because dating would suddenly become so rationalized and stripped of its "magic moments". In an effort to attenuate these concerns, designers came up with the idea of a digital matchmaker, the "Cyb". This interface agent, a personalized virtual character, had some natural language and emotional expression capabilities. It was supposed to build an enduring social relationship with the site's users and guide them through the dating process (see Moldt & von Scheve, 2000). During my first weeks at the company (I was employed with the interaction and user experience design department), I constantly wavered with my superiors' talk about users "interacting" with the Cyb – hadn't I just learned about Weber's definition of social action and social relationships in my introductory sociology classes? And didn't this definition first and foremost involve something like meaningful social action that is mutually reciprocated between two or more actors (Weber, 1968: 26-27)?

Now, more than a decade later, it seems quite common that humans readily form enduring relationships not only with other humans, but also with software agents, robots, and artificial companions. But this shouldn't be total news to sociology, given that humans have been forming relationships with objects and inanimate entities for ages. It was thus only a little later, when I was a student assistant within the DFG Priority Program "Socionics" (Malsch & Schulz-Schaeffer, 2007), that I learned about alternative conceptions of social action and interaction that did not exclude nonhuman actors. But still, the question why and how humans interact and tend to build relationships with objects is still a much debated one. This is particularly so in view of recent advances in communication and information technologies and the development of artifacts which are autonomous and proactive in many ways and have communicative and at times also emotive capabilities.

Much has been speculated on the ways in which humans interact with these systems and on their propensity to bond with non-human entities. This has resulted in theoretical models and concepts such as anthropomorphization (e.g., Don, 1992; Nass et al., 1993), media equation theory (Reeves & Nass, 1996), and the computers-as-social-actors paradigm (Nass et al., 1994a). Recently, research in human-computer interaction and social robotics has increasingly attended to technologies' companionship potential by exploiting fundamental human traits and modeling human-robot interaction in view of interactions between humans. At least from the "biological" modeling approach (Fong et al., 2003), this has seemingly led to the general position that "the more humanlike" social robots are and the more their interactional capabilities overlap with those of humans (e.g., in terms of multimodality), the more effective human-robot interaction will be.

Currently, most of this research is still located in the engineering sciences, in particular in the field of human-computer interaction as a sub-discipline. But also psychologists and, increasingly so, sociologists are attending to this area of inquiry. In this article, I

aim at contributing to a better theoretical and conceptual understanding of interactions and social relationships between humans and artificial companions from a genuinely sociological perspective. On the one hand, I will review some principles of interactions with intelligent and autonomous systems. On the other hand,I will introduce sociological accounts of interaction rituals and their emotional consequences to the field. In doing so, I will first review existing research on interactions and relationships with artificial companions and social robots and discuss the issue of sociability with these artifacts. Second, I will turn to the ways in which sociology has dealt with interactions with objects and artifacts. Here, I will highlight approaches that have explicitly attended to the formation of relationships with objects and those investigating the specifics of interactions with artificial companions in a broader social and cultural context. Finally, I will introduce theories of interaction rituals and interaction ritual chains to the field of human-artifact interactions. I will put particular emphasis on the potential emotional outcomes of those interactions and their consequences for relationship building. In doing so, I will make a plea for the use of "shallow" models of emotion in artificial companion design and briefly discuss some repercussions for sociological conceptions of interactions with nonhumans.

2 Artificial companions: Purposes, design issues, challenges

Artificial companions are already widespread amongst consumers and many of them have been hugely successful in commercial terms. One of the classic examples is the Tamagotchi. Bandai, producer of the small device, sold millions of units in the 1990s and required continuous attention, caring, and nurturing from its users. Other more recent and technically advanced examples are Furby (Hasbro) and toy dolls like My Real Baby (by Hasbro) or Primo Puel (Bandai). These toys, too, combine limited interactive capabilities with caring and relationship requirements (see also Turkle, 2010; Floridi, 2008).

Another class of examples are virtual pets. These digital beings, although similar to the Tamagotchi, run as applications on websites or mobile devices. Well known examples are Nintendogs (Nintendo) or Pou (Android), the latter with currently more than 10 million downloads on Android Market. Other, still more advanced systems, are less well known or successful, for instance Nabaztag and Aibo, and many are currently being developed in labs across the globe, such as Cog, Nao, Kismet, Kaspar, or Geminoid (Benyon & Mival, 2008; Hudlicka et al. 2009; Turkle et al. 2004; see Peltu & Wilks, 2010; Nishio et al., 2007).

Generally, artificial companions are thought to be either virtual or embodied devices (e.g., Krämer et al., 2011). As virtual entities, they are digital programs, usually animated and with a number of input-output interface options to interact with a user. Virtual companions need not be implemented in a designated hardware but can run on many machines. In contrast, embodied companions are physically realized in (usually designated) hardware that is necessary for some of their capabilities and functions, e.g. sensing, gesturing, or emotional expressiveness (Zhao, 2006).

Researchers and commentators alike thus assign artificial companions a future role and cultural impact that might match that of "real" (alive) pets today (e.g., Floridi, 2008). Hence, the upsurge and variety of research on artificial companions is no surprise and shows that they are widely considered relevant both in terms of their ethical, economic, and social implications as well as in terms of representing ad-

vances in engineering and artificial intelligence. Within the European Union alone, a remarkable number of research projects focused on or involving artificial companions has been or is currently funded. This includes, for example, SERA (Social Engagement with Robots and Agents), Companions, LiREC (Living with Robots and Interactive Companions), Semaine, and CompanionAble (see Krämer et al., 2011; van Oost & Reed, 2011).

Although the aims and goals of these projects are diverse and broad in scope, they share a couple of common assumptions and understandings of what artificial companions are. According to the eminent literature, the key feature or smallest common denominator of artificial companions as either physical or digital entities is that they are sociable in some way, i.e. they have the potential to form social relationships with their human users or owners (see, e.g., Hudlicka et al., 2009; Krämer et al., 2011; van Oost & Reed, 2011; Wilks, 2010; Breazeal, 2002).

To realize this sociability potential, artificial companions are supposed to be able to interact and communicate verbally or non-verbally with humans and "understand" or even "befriend" them, ideally in a "humanlike" way (van Oost & Reed, 2011; Zhao, 2006). Artificial companions should have some kind of "personality" or be "personality rich", have motivational concerns, be proactive, and – very generally – be believable and consistent in their behavior (Benyon & Mival, 2008; Becker et al., 2007). This is why artificial companions have also been referred to as "personification technologies" (Benyon & Mival, 2010).

Last but not least, sociability is usually seen as involving the capacity for emotionality and in particular to form emotional bonds with users. Emotionality here involves two basic capabilities: First, artificial companions should exhibit emotional behavior and react emotionally to users' actions. This includes expressing certain emotional states verbally or non-verbally, as facial expressions or gestures, or initiating behavior based on some emotional state, for example withdrawing in cases of fear or approaching and exploring in cases of joy and happiness. Second, artificial companions should be capable of detecting and reacting to the emotions of their users in appropriate, i.e. socially acceptable ways (Benyon & Mival, 2008; Zhao, 2006; Castellano et al., 2012; Sanghvi et al., 2011; Leite et al., 2011). In sum, artificial companions reflect many of the criteria previously applied to "artificial" or "believable agents" and other artificial intelligence systems capable of interacting with humans, such as sociable robots (e.g., Moldt & von Scheve, 2001; Zhao, 2006). At the same time, they usually also reflect efforts at accounting for emotions on the level of the computational architecture, as in systems complementing belief-desire-intention (BDI) architectures with emotion-based mechanisms (e.g., Jiang et al. 2007; Pereira 2008).

In addition to these characteristics of artificial companions, Zhao (2006, p. 405f) has aptly summarized a number of components that are often relied upon in delineating what might define an artificial companion. First, there is a "robotic" component representing the autonomy of the device or agent. Second, artificial companions clearly have a "social" component. They are specifically designed to interact with humans through various modalities, such as visual, auditory, and tactile channels (see also Breazeal, 2002). Importantly, interacting here also involves a sense of "intersubjectivity" and mutual understanding of other's motivations, goals, and intentions. Third, Zhao (2006) identifies a "humanoid" component, which means that a system is able to simulate humanlike behavior and/or morphology.

Based on these characteristics, the question arises why humans wish to interact and form social relationships with artificial systems at all, often at the expense of interactions with other humans. Floridi (2008: 652-653) discusses three broad categories of reasons:

First, artificial companions are supposed to address specific human needs for social and emotional bonds and relationships. It is interesting to note that the human capacity to establish bonds with non-human entities reaches far beyond humanlike or even humanoid systems specifically designed for these purposes. For example, children frequently bond with the most trivial of objects, such as pencils, stones, or sticks. Anecdotal and scientific evidence have it that they attribute a "soul" or some kind of "mental life" to these inanimate objects and derive gratification from keeping them proper and in shape (not because of their aesthetic properties). In this sense, artificial companions are supposed to push humans' "Darwinian buttons" in their efforts at establishing social relationships (Turkle, 2010: 26).

Second, Floridi (2008) suggests that artificial companions will provide certain services, in particular those related to and usable in various social contexts. This includes information on entertainment, news, friends and family, but also information related to issues such as education and learning, nutrition, healthcare, and well-being more generally. This function of artificial companions is being continuously developed and deployment of these systems, for example in care for elderly and disabled persons, is mostly a question of time (e.g., Nirenburg, 2010; Sharkey & Sharkey, 2010; Kriglstein & Wallner, 2005).

Third, artificial companions are supposed to work as personal "enhancers" and "facilitators", much like personal digital assistants and other mobile devices already do today, but in a more proactive and socially relational fashion. Floridi (2008) speculates that artificial companions will serve, for example, as "memory stewards" (2008: 653) managing information about users. This use is in some ways foreshadowed by social network Facebook, which recently introduced its "Timeline" feature that lets users record their "life story through photos, friendships and personal milestones like graduating or traveling to new places"[1].

Given these potential uses and functions of artificial companions, some have suggested to separately account for their "utilitarian" and "social relational" functions (e.g., Zaho, 2006). On the one hand, this understanding is rooted in understandings of robots and other autonomous systems as devices primarily invented to reduce human workload, from robots in automobile manufacturing to robotic home appliances such as the Roomba, a vacuum cleaning robot. Research has shown that users establish social relationships even with the most basic robot appliances (e.g., Forlizzi, 2007). On the other hand, this functional/relational dichotomy is due to the "utilitarian" aspects of human or animal companionship, in which social support, exchange, reciprocity, and cooperation play integral roles (e.g., Gouldner, 1960). Research has indeed revealed that utilitarian aspects play a critical role in establishing social relationships with artificial companions, but in a slightly different and unexpected way. It seems that, in comparison to human companions, reduced social obligations and commitments towards artificial systems are a motivation for users to complement human social relationships with those established with artificial companions (see Turkle, 2010; Evans, 2010).

Given these characteristics, functions, and requirements, a key aim of re-

[1] <https://www.facebook.com/about/timeline> accessed Sept 9, 2013.

search is currently bound to the question of how to make artificial systems sociable or, in different words, how to improve their sociability and to increase the propensity of their owners to establish social relationships with them. An "essential challenge is to develop the sociability of artifacts" (Krämer et al., 2011: 474). In seeking answers to these questions, researchers and practitioners have sought to explore the very foundations of the nature and culture of sociability and to establish what kinds of sociability should be taken as models for relationships between humans and artificial companions. What kinds of relationships do owners want to establish with their companions? And what qualities should companions have to support or enable the establishment of such relationships?

In an integrative effort to systematize the various challenges related to these questions, Krämer and coworkers (2011) suggest to analyze the building blocks of sociability (both for human-human and human-artifact relationships) at three levels following a micro-to-macro logic. Their work is based on empirical studies conducted in the SERA project and accounts, amongst other things, for observational and ethnographic data on interactions with Nabaztag, a rabbit-like artificial companion. Their micro level deals with foundational aspects of human communication and interaction. The meso level turns to the principles of relationship building and looks at factors that affect the quality and shape of social relationships. The macro level primarily consists of roles that are assigned to owners and their companions.

In view of the micro level of sociability, Krämer and colleagues (2011) discuss what makes intersubjective understanding possible between human actors and what, in turn, would be needed to achieve this kind of understanding between humans and artificial companions. Although the authors draw mostly on work from philosophy and the cognitive sciences, the principles and concepts they refer to do not differ dramatically from those prominent in sociology, in particular in the phenomenological and symbolic interaction traditions. First they discuss perspective taking as a hallmark of sociability. Perspective taking denotes the capacity to know what others know and see things from the point of view of an interaction partner (e.g., Cooley, 1902; Mead, 1934; Krauss & Fussell, 1991). One of the likely precursors to perspective-taking is joint attention, i.e. the capacity "to jointly attend to objects and events with others" and thus to "share perceptions and experiences" (Moll & Meltzoff, 2011: 286). The second micro level mechanism promoting sociability is a common ground. This notion refers to socially shared stocks of implicit and explicit knowledge as prerequisites for shared understandings (e.g., Berger & Luckmann, 1966; Clark, 1992). Attending to the problem of how minimal common ground is established in the first place, recent research has focused on processes of embodied grounding (e.g., Barsalou, 2008; Lakoff & Johnson, 1980; Semin & Echterhoff, 2011) and highlighted the role of bodily processes in establishing common ground. Third, Krämer and associates (2011) suggest *Theory of Mind* (ToM) as a further micro mechanism underlying sociability. ToM refers to the attribution of mental states, such as intentions and beliefs, to other entities (human or artificial). This attribution facilitates the understanding of other minds – or "mindreading" – and their intentions in actions (e.g., Frith & Frith, 2003).

On the meso level, Krämer and colleagues (2011) identify a number of mechanisms that are foundational to relationship building between humans and potentially also to sociability with artificial systems. First, the authors discuss the "need to belong", which

reflects individuals' inherent motivation to become attached to groups and other actors and is well-documented in social psychology (e.g., Baumeister & Leary, 1995). Similar motivations have been postulated in sociology, for example by Durkheim (1951/1897) or Turner (2007). Second, Krämer and associates (2011) discuss a number of factors promoting the establishment of relationships, such as propinquity, similarity, attractiveness, and reciprocal liking. Third, they conjecture that the principles of social exchange are integral to the establishment of many social relationships. Here, it is primarily utilitarian considerations, social comparison, motives of inequity aversion and reciprocity that they deem crucial.

Finally, the macro level of sociability represents the social roles taken by or ascribed to owners and artificial companions and how they influence the sociability of artificial systems. The primary question related to this issue is what roles owners want their companions to perform, whether those are clearly defined and/or multiple roles, and whether they are flexible and dynamic or rather rigid (Krämer et al., 2011).

In reviewing these challenges, the authors conclude that the micro level issues are hardest to overcome. This is because of the inherent complexity of the issues, because only little is known about these mechanisms in humans, and because of the "idiosyncratic construction of communication" in humans, which makes generic solutions somewhat fragile. In a similar vein, Zhao (2006) considers the general "interpretative asymmetry" of human-machine interactions as the major challenge to human-machine interactions because artifacts lack humans' interpretative capabilities as outlined on the micro level (2006: 411). Even more problematic, micro level issues include "challenges that have plagued AI for decades: the so-called 'commonsense problem' and the user modeling problem" (Krämer et al, 2011: 484-485). These problems are "classical" AI problems in that the "grounding" of knowledge within AI systems and the apprehension of users' knowledge have not yet been sufficiently solved.

As a way out of this dilemma, some have suggested to fall back from models of human-human interaction to models of human-animal, in particular human-dog, interactions. Although Krämer and colleagues (2011) partly dismiss this possibility because domesticated dogs have been "wired" to human interaction styles over long periods of co-evolution (2011: 487-488), I will explore this more "shallow" and "downgrading" perspective on artificial companions' sociability in more detail in the following sections. In doing so, I will first illustrate select sociological approaches to sociability with non-living things, an issue that has long been neglected within the discipline. I will then focus on the emotional aspect of interactions between humans and companions and suggest an understanding of companion sociability that is based on Collins's (2004) theory of Interaction Ritual Chains and the ("shallow") concept of "emotional energy".

3 Interactions with non-humans: A nudge for sociology?

"After this split, operated in the modern period, between an objective and a political world, *things* could not serve as comrades, colleagues, partners, accomplices or associates in the weaving of social life" (Latour, 1996a: 235; italics added). Latour in this statement summarizes the state of affairs of sociology with respect to material things, objects, and artifacts. The passage, however, clearly adds something to his and Callon's (Latour, 2005; Callon, 1987) previous vivid pleas of Actor Network Theory (ANT) to integrate nonhuman entities into the analysis of social action, interac-

tion, and networks – namely the notion of social relationships and companionship with things and artifacts.

Latour's (2005) original suggestion that material objects should be treated "symmetrically" as parts of the interactions between humans already stirred a great deal of irritation amongst sociologists when first introduced as the centerpiece of ANT. Until then, sociology had primarily conceived of social interaction as occurring exclusively between human actors. As I previously argued (von Scheve 2000; see also Cerulo, 2009), this is primarily due to Weber's (1968, 1991) dictum that social interaction is based on mutually referential and socially meaningful action. Action is meaningful in this sense only if it is intentional, which in turn has been interpreted as requiring consciousness and/or self-consciousness (e.g., Cerulo, 2009), which is clearly limited to humans. In a similar way, this view is reflected in most symbolic interactionist accounts of social interaction. As Cerulo argues, both Mead (1934) and Goffman (1959) emphasized the importance of self-identity and self-reflexivity – as forms of autonoetic consciousness (Vandekerckove et al., 2006) – in interacting with others.

More recently, however, there has been a subtle although notable shift in some areas of sociology to more substantially account for the role of material objects and nonhuman entities in social interaction.

In what follows, I will stick to Cerulo's (2009) recent review of these accounts. Pioneering work in this respect has been carried out in the context of ANT (Latour, 2005). This theory basically aims at describing relationships between "actants", which can be both humans and non-human entities. The defining characteristic of actants is that they need to be able to "make things happen" within a network of actants (Cerulo, 2009: 534). According to this perspective, an actant can be anything that facilitates social interaction between other actants (in particular human actants). As Latour puts it, an "actant can literally be anything provided it is granted to be the source of an action" (Latour 1996b: 373). Actants need not to be conscious and their behavior need not be intentional or even goal-directed. This is why in ANT human actors, organizations, nation states, animals, material objects or technological artifacts can all be actants. Although ANT is frequently referenced in the literature on artificial agents and companions, proponents of ANT have, to the best of my knowledge, seldom engaged in issues directly related to such artifacts.

Aside from ANT, interactionist theory has also developed alternative models to symbolic interaction that account for the possibility of social interactions with nonhumans. One of the first to carry out work in this tradition is Cohen (1989). He suggested four criteria that are usually fulfilled when humans interact with nonhuman entities (see Cerulo, 2009: 536): Humans are required to initially take the role of a nonhuman actor, they have to account for the options and restrictions brought about by nonhumans in social interaction, and they need to assume "mutuality" in nonhuman entities. Crucially, Cohen suggests that this is sufficient for social interaction to emerge and that nonhumans need not be capable of the sophisticated "mind machinery" of humans to serve as partners in meaningful interactions. In this context, Owens (2007) has introduced the concept of "doing mind" which refers to a number of "as-if" behaviors resembling or serving as clues for intentional action. Owens suggests that "doing mind" happens most likely when nonhuman entities are capable of autonomous behavior, when this behavior has been experienced as detrimental to human goals, and when there is urgency to the interaction, for example

in view of human goal attainment (see also Jerolmack, 2009).

Similar views are expressed in the newly emerging sociology of objects. Notably, Dant (2006) has offered arguments for sociological theory to account for what he calls "material civilization" in which material interactions play a significant role. Material interaction according to Dant (2006) is "the meeting of the materiality of peoples' bodies, including the mind and imagination that are part of those bodies, with the materiality of objects, including the qualities and capacities that have been designed and built in by the combined and collective actions of a series of other people" (2006: 300). The more general importance of objects for social life has also been highlighted by Molotch (2003) in his book *Where Stuff Comes From*. Molotch tracks the origins of material goods and investigates how they come to be the way they are and how they structure social life on a general level. Although his discussion is not about the interactions with objects per se, it gives unprecedented insights into how objects become integral parts of social life and social order.

In shifting the focus away from material nonhuman objects and interactions with them, Cerulo (2009: 541-542) also emphasizes the importance of animals, deities and the dead in social interaction. She reviews studies indicating that these entities have, for millennia, played key roles in human social life. Not only do humans report to frequently interact with these entities and ascribe to them qualities that are otherwise reserved to humans (such as having a "mind" or being able to comprehend language), but also do these entities have a significant impact on interactions amongst humans.

Another road to theorizing human-artifact interaction in sociological terms is more specific and focused on entities that come closer to artificial companions in the ways defined above. These studies originate from social science research on human-computer interaction and interactions with "intelligent" systems that have proactive and communicative capabilities, such as certain interfaces, interface agents, virtual characters, dialogue systems, and the like (see, for example, Braun-Thürmann 2003; Krummheuer 2011; Rammert & Schulz-Schaeffer, 2002). Most of these works start from the general assumption that computers are not socially intelligent in a way comparable to human intelligence. Rather, they are able to show behaviors *as if* they had humanlike intelligence.

Research has pointed out that users generally know that these systems are inanimate machines rather than intelligent and living beings. Nevertheless, they consistently attribute characteristics of interpersonal subjectivity, personality, emotionality and humanlike intelligence toward these entities – a phenomenon known as "anthropomorphism" (Don, 1992; Nass et al., 1993; Moldt & von Scheve, 2000, 2001). Users behave as if the artifact was an intelligent and intentional entity with humanlike qualities. In terms of sociological understandings of action and interaction, Geser (1989: 233) notes that one actor (human or nonhuman) fulfilling the criteria of intentional social action is sufficient to constitute social interaction. Other entities (for example some intelligent system) are only of interest as emitters of verbal or nonverbal *behavior*, for example speech acts, gestures, or facial expressions. These are perceived by the socially acting entity (the user) and may lead to alterations of the user's state of mind (e.g., by evoking emotions of some kind). This understanding is roughly in line with principles of Actor-Network-Theory. This attribution and anthropomorphization view is backed up by studies showing that users tend to perceive human-computer interaction in "self"

and "other" dimensions just like in interpersonal interactions (Nass et al., 1994a, 1994b). Likewise, users tend to assign sociomorphic attributes and behavioral roles toward intelligent systems. Other studies found that in computer mediated communication as well as in human-computer interaction, the same social norms and rules apply as in human (face-to-face) interactions (Bellamy & Hanewicz, 1999; Mayer et al., 2006; Tzeng, 2004; Payr, 2001; Turkle, 2007b; see also Cerulo, 2009).

Until now, the emerging fields of the sociology of objects and sociological studies of interactions with artifacts and nonhumans have paid comparably little attention to the actual *social relationships* people form with artifacts. A notable exception is Dant (1996), who approaches social relations with objects from the perspectives of fetishes. Dant argues that sociology has shown a lack of interest in the social relations humans form with objects and artifacts and instead focuses on individual actors or social relations between humans in social affairs (1996: 495-496). Dant credits Marx and Freud as pioneers of a "fetishism" approach to understand the relations between humans and objects. However, he criticizes both for being either too narrowly focused on economic aspects and the commodity character of objects (Marx) or on the extensive focus on desire and consumption (Freud). As an alternative view, he presents Baudrillard's discussion of the social relational character of human-object bonds. In doing so, Dant still sees the discursive and practical character neglected in the transformation of objects into fetishes. He thus proposes that the "fetishization" of artifacts is based on the discursive negotiation and overestimation of their social value.

This specific nature of social relationships (not merely interactions) between humans, "evocative objects", and other artifacts has been investigated in a number of studies by Turkle (2010; 2007a; Turkle et al., 2004). In fact, these studies are at the forefront of sociological analyses of relationships between humans and social robots and artificial companions, aptly combining the fields of artificial companion research, the sociology of objects, and science and technology studies. Much of Turkle's work employs ethnographic approaches to study relationship formation between humans (in particular children) and artifacts. She suggests that the potential of social robots and artificial companions to form relationships with humans is at least partly rooted in their (although simulated) need states and proactive pursuit to fulfill these needs (Turkle, 2010).

Importantly, her observations suggest that many people (primarily children and the elderly) act towards artificial companions in perfectly "social" ways with little differences to interactions with humans. It also seems that for many, the distinctions between aliveness and inanimateness become blurred and they perceive some robots and artificial companions as (almost) "living" things. Turkle argues that the capacity of artificial companions to engage human emotions is critical in explaining these behavioral tendencies. I will come back to this issue in more detail in the following section. Moreover, Turkle (2007, 2010) reports that many perceive interactions with artificial companions as less stressful, demanding, and exhausting than interactions in human relationships and in many cases would prefer interacting with robots to interactions with humans.

Turkle (2010) mentions three broad categories of social and cultural reasons for these observations. First, she diagnoses a general "culture of simulation" (2010: 9) in modern societies. The ideas and cultural practices of simulation (see also Baudrillard, 1994) change the ways in which authenticity is perceived. Turkle (ibid.)

surmises that the status of authenticity has been gradually changing from something good and virtuous to something that is associated with threat and taboo. Second, she assumes a general cultural development that increasingly emphasizes outward behavior over inner states of mind. Therefore, a robot or artificial companion that shows appropriate behavior is more likely to be considered an appropriate – and even alive – being. Third, Turkle (2010) argues that a general exhaustion (similar to what Ehrenberg (1998) has termed La Fatigue d'être soi) resulting from increasing social and emotional demands in private and work life (e.g., Neckel, 2009), make robot relationships increasingly interesting as an alternative to the demands of human social relationships.

It is interesting to note that these three developments have to varying degrees been issues in research on human emotions in various disciplines, but most prominently so in sociology. In addition to the crucial role that emotions and emotional bonds seem to play in the establishment of social relationships with artificial companions, the following section will develop a perspective on the emotional basis of relationships between humans and artificial companions that rests on micro-sociological ideas of ritualized interaction and interaction ritual chains.

4 Interaction ritual theory and emotional gratification

The theory of interaction ritual chains (IRC), as developed by Collins (2004), aims at explaining the social – in particular social order and solidarity – from a micro-sociological point of view. In his theory, Collins combines Durkheim's approach to ritual gatherings and the experience of collective effervescence with Goffman's symbolic interactionist account of ritualized face-to-face interaction. Based on Durkheim's understanding of ritual practices, emotions and collective emotional entrainment play a key role in Collin's theory. The basic model of IRCs involves five steps (Collins 1990: 31-32): First the assumption of a group assembly in physical face-to-face copresence. Although in most applications of the theory this pertains to small and middle-sized groups, Collins holds that two actors suffice to constitute a group. Second, an IRC needs a common and shared focus of attention on the same object or activity. This is a key ingredient in most ritual gatherings, for example religious congregations. Collins emphasizes the importance of participants' mutual awareness and focus on a common task. The third important ingredient to an IRC is that participants share a common mood or emotion regardless of the valence (positive or negative) of the emotion. This is similar to Durkheim's idea of collective effervescence and Collins assumes that the sharing of emotions is facilitated by contagious processes (also) on the level of human physiology and the common focus of attention (see also von Scheve & Ismer, 2013). This leads to emotional entrainment and participants are "absorbed" by and "in sync" with each other's emotions and behaviors. The fourth component of an IRC is in fact its outcome or result. The main outcome of a successful IRC according to Collins is feelings of solidarity and belonging. These feelings are independent of the shared emotions experienced during an interaction. Collins uses the concept of "emotional energy" to describe in more detail the feeling of solidarity. Although he admits that emotional energy is a somewhat vague concept (Collins 1990: 33), it is supposed to consist of confidence, enthusiasm, and good self-feelings on the positive, successful side of ritual interactions and feelings of depressions, lack of initiative and negative self-feelings on the negative side of unsuccessful rituals. A fifth component is that feel-

ings of solidarity have consequences for cognitions, in particular one's moral and normative stance towards the group, which is mediated by symbols representing the group. The emotions felt during a ritual interaction "affectively charge" symbols and promote solidarity also outside actual ritual practices.

Although there are other important aspects to the theory (such as status and stratification), Collins's model is essentially based on an understanding of "emotional energy" as a resource and an outcome of interaction rituals. The basic assumption underlying his theory is that actors are disposed to constantly strive to maintain or increase their levels of emotional energy, which is considered a specific form of gratification (Collins, 2004). Consequently, actors tend to prefer and repeat those interactions through which they expect to increase their emotional energy and to avoid those interactions that are likely to produce losses. As a result, positive emotions – or emotional energy – become a resource and part of actors' preferences.

A similar view on the role of emotions in social interaction is expressed by Turner (1988, 1999, 2007). According to his perspective, face-to-face interactions are characterized by a number of, more or less universal, needs which can be inferred from general and socially shared expectations and which can be fulfilled by transactional gratifications. These needs include, for example, the need for group inclusion, ontological security, facticity, self-affirmation, and emotional and material gratification (Turner, 1988; Turner, 1999). Turner acknowledges that postulating universal and almost anthropological needs is unpopular in sociology, but at the same time hints at the assumption of such needs in many theoretical traditions, for instance the need for self-verification in symbolic interactionism or the need to achieve optimal outcomes in social exchange theory. These needs, according to Turner, contribute to the emergence and reproduction of social order through repeated patterns of interaction: "people create, reproduce, or change social structures in terms of rewards or gratification" (Turner, 1988: 357). Expectations, experiences, role taking, role making, and the satisfaction of needs all combine into specific patterns in the course of repeated social interactions.

Both authors hold that emotional gratification and the fulfilling of certain transactional needs are crucial for actors to repeatedly engage in social interactions with others. Now how can these theories contribute to a better understanding of the relationships between humans and artificial companions? How can they help in addressing certain design challenges on the one hand, and how can they promote a genuinely sociological understanding of why and how individuals form relationships with inanimate objects? First, although Collins (2004) heavily draws on Durkheim's work on collective ritual gatherings in crowds or larger groups, he states on various occasions – much closer to Goffman's work – that interaction ritual chains can already evolve between two actors (e.g., Collins, 2008). This of course limits the potential for collective effervescence, emotional contagion and emotional entrainment between actors because the shared focus of attention and the mutuality in interaction are much more common between two actors than between larger numbers of actors. Also, feelings of "resonating" with the group seldom emerge in dyadic interactions. Nevertheless, these phenomena are not in principle impossible in dyadic settings. With respect to the outcomes of interaction rituals and the fulfillment of certain needs, it seems that both Turner's and Collins's positions are mutually compatible, although they use a different terminology. Turner, however, would make a case for these outcomes that is expressly valid without ritual gath-

erings in larger groups, primarily relying on individual need states and their gratification.

Given the existing research on artificial companions outlined in the preceding sections, I suggest that the shared focus of attention and a common mood are amongst the phenomena users tend to attribute or ascribe to artificial companions. This is a process that probably does not apply to any inanimate object. For example, we would not necessarily expect actors to attribute certain moods and shared attention to toasters, microwaves, or TV sets. It does seem to apply, however, to certain animals. For example, pet owners tend to attribute emotional states across the whole spectrum of primary and secondary emotions to their animals (Morris et al., 2008) and owners do ascribe the capacity for joint attention to animals, in particular dogs. Thus, the communicative and emotional capabilities and the desired personality richness of artificial companions might well support attributions of this sort.

But even if these processes only work in a limited way in interacting with artifacts, need states and the transactional satisfaction of needs – according to Turner (1988) – independently contribute to the experience of positive emotion and the accumulation of emotional energy. "When needs are realized, people experience variants of satisfaction-happiness, whereas when they are not met, they will experience negative emotions of potentially many varieties – primary, first-order, and second-order" (Turner, 2007: 101). The less the ritual and "collective" ingredients are present, however, the less pronounced will be the effects that are mediated by symbols and the consequences for generalized "in-group solidarity", as suggested by Durkheim.

One understanding of human-artifact relationships that emerges from these theories is that interactions with artificial companions, and likewise with other objects and artifacts, affect the levels of emotional energy on the side of human interaction partners. Both Collins's and Turner's works exclusively focus on traditional understandings of social interactions as happening between human interaction partners only. Admittedly, much is at stake when some of the criteria mentioned in their theories are applied to interactions between humans and artifacts, in particular those located on the micro level according to Krämer's and colleagues' (2011) understanding of sociability. However, taking into account the various arguments marshaled by more recent theories on interactions with nonhumans, there is little reason to believe that the consequences of human-nonhuman interaction cannot (also) be understood on the level of their emotional outcomes and emotional energy.

Humans' propensity to attribute various humanlike qualities to objects and artifacts, particularly to those with communicative and emotive capabilities, seem to be a prerequisite for affecting the levels of emotional energy and for the social relational implications that (positive) emotional energy implies, namely solidarity and feelings of belonging as a basis for the formation of relationships. Restricting this analysis to the fulfillment of certain (universal) needs seems to miss the point: Engagement with various objects and artifacts indeed fulfills or fails to fulfill a number of needs and gives rise to strong emotional reactions, for example anger, happiness or disappointment. These feelings need not, however, lead to any kind of solidarity or feelings of belonging (or the opposite), as captured in the concept of emotional energy. These consequences are most probably absent because interactions are perceived as categorically different from human interactions. I suspect that (a) the attribution of certain "micro-level"

capabilities and (b) the emotional responsiveness of artificial companions are necessary requirements for solidarity-generating changes in emotional energy to occur. Both factors have been shown to shift interactions with robots and artifacts to a more "humanlike" level and to increase the perception of artifacts' "aliveness". Ultimately, the kinds of minimal design requirements needed to establish attributions of a shared focus of attention and shared mood need to be determined by empirical research. However, *proactivity* fostering the attribution of states resembling human or animal motivational states and desires seems to be critical in bringing about illusions of "aliveness". Likewise, basic expressive or even communicative capabilities clearly add to the emergence of this impression. In terms of artificial companions' believability, consistency in behaviors – in particular those related to interaction rituals – seems to be a critical issue. Consistency in behavior is sometimes seen as locked in a zero-sum game with the complexity of behavior. The more complex behavior can be, the higher the challenges for consistency. Given the arguments outlined above, simple and repetitive behaviors might in fact increase the risk of boredom, but this is not necessarily related to an artifact's potential for sociability.

In terms of the design issues prevalent in artificial companions research, an approach based on emotional energy as the primary outcome variable could have several advantages. First, it does not necessarily require solving the classical "hard" micro-level problems of artificial intelligence research. What is required instead is to focus on behavioral believability promoting the attribution and ascription of the necessary micro-level capabilities. This is also in line with Turkle's observations that behavioral cues and consistency – "doing mind" in Owens's (2007) terms – seemingly supersede the existence of actual mind-like qualities. It might also satisfy Collins's (2004) constraint of a shared attention on a common task or activity. To account for the requirements of shared moods, the impression that artificial companions have emotions *at all* is crucial. Although systems capable of sensing and tracking users' emotions might simulate mood sharing, the mere impression that an artifact is emotionally responsive in the first place (e.g., via facial or verbal expressions) might suffice to generate outcomes of emotional energy.

These observations and some of the available evidence thus point the potential of "shallow" models of emotion in the design of artificial companions. With "shallow models of emotion" I borrow a term from Sloman (2001) to indicate emotional capabilities that primarily aim at consistency in observable emotional behavior without necessarily implementing those components of emotion that are less well observable but have a substantial influence, for instance on physiological reactions and cognitive processing. If the goal is to develop artifacts in ways that increase the potential for human owners to build social relationships with them, then a suitable strategy might be one that does not in the first place follow a "biological" modeling paradigm (Fong et al., 2003), but instead aims at improving those cues that generate changes in emotional energy as interaction outcomes. The basic idea is that, in analogy to human interaction ritual chains, as long as interactions with artificial companions increase an owner's level of emotional energy, he or she is not only likely to engage in repeated interactions, but also to develop feelings of solidarity, belonging, and bonding which can be seen as foundational to many social relationships.

Empirically, these propositions can be tested in various ways. One possibility would be experimental designs in

which relationship strength with a companion is measured as the dependent variable using standard or modified psychometric scales. Different experimental and control groups could be differentiated by the degree of the "shallowness" of emotionality or based on the capacities for human-like interactions as independent variables. Likewise, the emotional outcomes of interactions can be measured using methods of emotion assessment, such as appraisal questionnaires for discrete emotions or the Positive and Negative Affect Schedule (PANAS, see Watson et al. 1988). Furthermore, the emotional significance or affective meaning of an artifact as such could be assessed using semantic differential rating scales (Osgood, Suci, & Tannenbaum, 1957; Heise 2007).

5 Conclusion

In this article, I have reviewed current research on artificial companions from two different perspectives. First from a "design" or "engineering" perspective, highlighting a number of conceptual issues and questions regarding the definitions and criteria characterizing artificial companions. I have also briefly reviewed the specific challenges that are currently discussed with regard to the potential of artificial companions for sociability and the formation of social relationships with users. Second, I have turned to sociological approaches to interactions with nonhumans. Considering in particular works from the emerging sociology of objects, I have discussed some principles and broader societal conditions promoting the interaction of humans with nonhuman entities. I have placed special emphasis on works dealing with computers and technical systems as interaction partners that have proactive and communicative capabilities. Furthermore, I have discussed the potential transitions from mere interactions to the formation of social relationships with objects. Finally, I have suggested ways in which these two strands of research might profit from the consideration of emotions, in particular from the concept of "emotional energy" as an outcome and motivator of interactions with artificial companions. My basic claim in this respect is that, given established tendencies of humans to attribute certain "mind-like" qualities to artifacts and their communicative and emotive capabilities, interactions with artifacts produce changes in humans users' levels of emotional energy, which in turn transform into feelings of belonging and solidarity directed towards the artifact and invigorate the social relationship. Importantly, the valence of the affective interaction between human and companion (i.e., whether it is based on positive or negative emotions) is irrelevant for changes in emotional energy (i.e., sharing negative emotions might result in increases of emotional energy and thus solidarity).

In this regard, I have also developed an argument for an increased attention to "shallow" models of emotion in the design of artificial companions. This argument was motivated by current micro-level challenges in artificial companion research. Because in the foreseeable future, the hard problems of AI will probably not be solved in a satisfactorily way, shallow models of emotion might provide a route to further advance the development of artificial companions. This is because they rely more on implementing "doing emotion" than on technically realizing the whole bottom-up architecture of human emotion. It might even be said that, much in the same way as current societal developments encourage individuals to establish relationships with artifacts at the expense of human relationships, these developments increasingly familiarize individuals with the "performative" and staged aspects of emotion, as can be seen, for example, by the prominent

discourses on emotional intelligence, emotion regulation, and emotional competences (e.g., Illouz 2007; Neckel 2009).

In terms of sociological theory and social theory more generally, extending the idea of interaction ritual chains and the role of emotional energy to inanimate objects and artifacts might also make a valuable contribution to the emerging field of the sociology of objects. As of now, interactions with nonhumans are primarily discussed in view of whether these are "valid" social interactions at all. But, as many have argued, there is reason – and in fact an increasing necessity – to conceive of sociality as including the realm of the inanimate as well. This seems to be particularly true regarding the ever increasing presence of "intelligent" technological artifacts. Therefore, understanding the ways in which humans interact with and through artifacts, how they form social relationships with artifacts, and how this is mediated by and influences human feeling and thinking will be critical challenges to sociology in the 21st century.

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