Slow but Likeable? Inefficient Robots as Caring Team Members

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Abstract
This position paper discusses the notion of efficiency as a criterion for designing and evaluating the contributions that robots might make to human work teams. Participation in teams requires the coordination and prosecution of task-centric work activity but also requires the investment of caring social behavior as a distinctive kind of positive contribution to group interaction. Team spirit, emotional support, trust and reputation are all the outcome of such investments; they reinforce the capabilities of a team for particular joint activities, and contribute to its resilience over time. The requisite social behavior for these qualities of a team might be treated as a given in design considerations for human work teams. But the picture must change for human-robot teams: socially supportive behavior can only exist if it is explicitly designed in, and the consequent “task inefficiencies” are treated as a core part of the design equation. We draw on our own research on relational effort in social communication to offer some initial considerations about how task-inefficient action might be required for robots to engage in caring interactions with human collaborators.

Author Keywords
Social robotics; Close relationships; Social coordination

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H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

Introduction

The proliferation of robots into everyday social settings will necessarily bring new questions about the nature and focus of their design, and criteria for their evaluation, as researchers discover new facets to their interactions with people. Future advances in autonomous technologies will raise numerous challenges in this regard, especially if robots gain the potential to act as dynamic, self-coordinating members of work groups. Rather than being systems that require continuous human oversight and instruction, advanced robots may be able to work independently to offer their own contributions to collaborative teams over extended periods and in successive episodes of work. Scenarios of this kind raise new questions about how to design robots to be harmonious coworkers, and about how to evaluate their actions within the context of extended and repeated team interactions.

Studies of human-robot collaboration are quite reasonably concerned with evaluations of robotic systems by focusing on task efficiency, i.e., the extent to which a robot minimizes the expenditure of unnecessary effort in achieving an intended collaborative outcome. Examples include minimizing the time required by robots to perform tasks [14] or reducing the volume of dialogue required for a robot to engage in spoken conversation [5]. These kinds of evaluation are apposite when efficiency is a primary criterion for success, as when evaluating robots whose tasks are well specified or highly mechanical, e.g. [12].

However, considerations for efficiency may be inadequate for certain kinds of interactions that robots will have when interacting with people in teams. In this context, it will be important to consider qualities of behaviour and collaborator awareness that make robots *relational*. That is, designers will need to ensure that robots can engage in relationship-building activities to establish social bonds with the people who encounter them [2]. This need will be especially pressing if robots are expected to act in a manner that reflects some level of concern for the social well-being of their coworkers [1]. Efficiency, then, may not be the most important criterion when thinking about these types of interactions—robots may have more to offer if they are designed to be socially active and, in a prosocial sense, become likeable coworkers.

Prosocial Robots or Functional Mechanical Coworkers?

The idea of designing robots to be likeable is far from new. There is a substantial literature and accompanying design work on creating robots that have social meaning but at the same time are able to avoid falling into the uncanny valley (see [4], for example). However, this literature is at risk of placing social behavior so much at the centre of the design problem that task-work disappears as a concern.

For example, the design vision for Paro [16], a cuddly robotic seal, is as a companion robot. The goals towards which Paro's actions are planned are orchestrated around responses to human touch (stroking, squeezing) and attention (orientation and sounds). Just as with all robots, Paro's internal logic relates inputs from sensors to performance of actions, given the capabilities of its effectors. These are believed to be of potential therapeutic value by offering social stimulation, especially for people living with dementia [16]. In this sense, it is possible to discuss Paro's efficiency and yet, at the same time, it is not a terribly meaningful quality to evoke because it is so at odds with ordinary conceptions of social behaviour. Instead, relevant qualities relate to improvement of mood, encouraging social interaction and communication. Our observation is that tasks and efficiency seem to go together as part of one design paradigm, and social responsiveness and likeability seem to belong to another design paradigm entirely. Yet in human working relationships, likeability and efficiency coexist.

Inefficiency as a Feature of Caring Practices

To exemplify our position, we draw on our current research into the investment of effort into communications between people who care about one another [7,8,9]. This line of research has provoked us to reconsider the value of efficiency in mediated communication technologies. Many current systems contain features that aim to make communication more efficient, e.g. the "smart reply" feature available in Google's recently released *Allo* app [3]. This feature uses machine learning techniques to provide users with a set of predesigned responses as a way of saving mental and physical effort in conversation.

Such a design is ideal from an efficiency perspective, yet the way in which it trivializes the process of message composition makes it questionable for the mediation of caring relationships [10]. This is because people are sensitive to the effort invested by their close partners, and place great value on actions that evidence time, thought, and craft during the creation of text [7]. Our research indicates that people are especially appreciative of *discretionary* effort, which refers to additional effort that is not mandated but which is nevertheless committed in service of a close relationship [7]. This kind of effort has also been recognized as an indication of commitment in the context of organisational teams [15].

We find caring behavior to be embedded in the quotidian affairs of people who have established relationships with one another. By relationship, we do not restrict ourselves to considering romantic or familial attachments: social relationships developed at work, identified with trust and responsibility, also evidence caring actions. In other words, task performance and socially meaningful action draw from a common pool of available human resources: time, energy, planning, and accommodation of complementary skill sets. From a purely task-oriented perspective, coworkers "waste time" on activities such as brewing a pot of tea or bringing baked goods to the office. These are not merely matters of nutritional replenishment, but can instead be seen as catering to the affect- and socially-oriented elements of cohesive teams. Thus many features of human relationships can be seen as strictly inefficient, yet are significant in a social sense, conveying sentiment and intent towards others. It may also be that some of the task inefficiencies are recouped by generating closer coordination [13].

Towards Inefficient Caring Robots

Our motivation for raising these matters in the context of robots is that they speak to new and important considerations for the design of robotic team members. Designers of robotic systems might therefore benefit by shifting their thinking away from efficiency concerns when creating particular kinds of team-oriented human-robot interactions.

For example, one of the touted benefits of social robots is that they may be able to participate in care of the elderly [6]. ‘Slower’ and ‘less efficient’ interactions may be necessary to both build and maintain a social understanding as well as operate towards task-oriented goals. They may also help to create interactions that feel more plausible to the people involved. For example, a study by Lee et al. [11] suggests that people may engage in very natural interactions with a robot if the robot’s behaviour exhibits human-like qualities, e.g. if the robot is late to an appointment, or claims to be “embarrassed”. These are features that, again, have little to do with efficiency, but may affect the perception of a robot as a legitimate team member.

These ideas raise numerous questions. For example, can robots be designed so as to exhibit behaviours that are notionally inefficient yet remain acceptable to the people working alongside them? How can a robotic collaborator balance indications of care with purposeful task completion? Would a robot’s efforts to be caring be seen as “uncanny” because of a mismatch of expectation in this rather different realm of human experience? Our interest lies in the broader challenges raised by the goal of designing robots to be plausible collaborators, and we wish to explore the technical and social challenges associated with understanding how a robot might convey behaviour that allows it to be seen as a caring individual within a team.

Conclusion

Our perspective is primarily intended to provoke new thinking about what it might mean to design productive human-robot interactions. It is not a refined position, but is one that we think could stimulate conversation, and which would clearly benefit from further elaboration at the workshop. Our use of the term “inefficient” is deliberately provocative, and it is important to note that we are not talking about efficiency in terms of energy savings. (Though we recognize that this may be an important consideration for the designer.) We feel robot ream members are ready for a paradigm shift to fully integrate social and task constraints in a unified scheme for reacting and planning joint actions with people. We wish to discuss the tensions and tradeoffs, practical and ethical, that may exist when designing robots that can be seen as both productive and likeable by their collaborators.

We see the need for deliberate “inefficiency” as a central challenge for the design of robots intended to have caring relationships with humans [1], and we believe that this has potential to raise questions about how to design and evaluate human-robot interactions. For example, how can a robot be designed with the ability to invest “discretionary” effort? Could it be translated into use of spare capacity to act when taskwork is on track, or should it push back taskwork when social triggers invoke caring attention? How would a robot know what is socially appropriate in terms of effort investment? Efficiency could be operationalized as an independent variable, and studies could examine user preferences for situations in which a robot is either highly efficient or exhibits lassitude in its performance. Since social robots may assume responsibility for health and social care in the future [6], we see the design of caring interactions as a pressing concern, not just for successful teamwork but also for the societal integration of robots more broadly.

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