
Taming a Run-Away Object: How to Maintain and Extend Human Control in Human-Computer Interaction?

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Abstract

Our contribution to this workshop takes its starting point in communities of practice and how they own, share, appropriate and co-develop technology, hence addressing how to create interactive digital environments that are flexible enough to support appropriation by end-users. With a basis in common, interactive objects, we discuss ownership and control in relation to artificial intelligence and increasingly automated computer technologies. Through this discussion, we respond to the three primary challenges outlined in the workshop CFP.

Author Keywords

Control, appropriation, common, objects

ACM Classification Keywords

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

Introduction

Our contribution to the "Rethinking Interaction: From instrumental interaction to human-computer partnerships" workshop is rooted in the ERC project, "Common Interactive Objects". While the workshop mentions artificial intelligence as a potential resource,

Workshop Challenge 1:

"How can we create interactive digital environments that are flexible enough to support appropriation by end users?"

Rethinking interaction through common interactive objects involves reconsidering the possibilities of handling and manipulating these objects. Making interaction accessible through different methods and modalities contributes to the 'common'-ness of our digital technologies, and therefore the flexibility for appropriation: When people can interact with a tool in multiple ways, it opens up opportunities for them to also appropriate the tool in multiple ways. How can the common interactive objects be built to let the users learn and develop their use, while offering some structure, direction and stability?

the CIO project sees human-computer interaction (HCI) as currently caught in a situation where, because of the renewed focus on artificial intelligence, human control over technology is jeopardized. We take a critical stance towards the potential consequences of this new wave of AI, as well as the rhetoric about it.

To rethink and innovate HCI to better address these new challenges, we work from the hypothesis that the notion of common interactive objects may ultimately bring together an understanding of use and building of user interfaces in a coherent framework, to be applied in interaction design. In the workshop, we hope to discuss this idea as an alternative where interactive objects are explored in order to maintain and extend human control over the technological environment, by human beings both individually and together. This, we suggest as an alternative to human partnership and the Maes-Shneiderman control-delegation debate [15].

We propose that HCI needs to be understood in multiple situations of multiple users and multiple objects, in multiple ecologies and activities. Communities of practice own, share, appropriate and co-develop technology, hence addressing how to create interactive digital environments that are flexible enough to support appropriation by end users. We will in addition discuss ownership and control in this light, leading to a discussion of the aforementioned issue of user control over increasingly automated computer technology.

Conceptual Mindset

We view human-computer partnerships as human partnerships mediated by objects. We are in line with e.g. Nicolini et al. [13] who work with a pluralist

approach in which they understand objects as performing at least three types of work: They motivate collaboration; they allow participants to work across different types of boundaries; and they constitute the fundamental infrastructure of the activity. In parallel to this work, objects are not only in transition, performing boundary 'work,' they are also multiple, heterogeneous and potentially conflictual. Part of human collaboration and practice have always been processes of delegating tasks and activities to other people, to technologies, or to systems hereof. Giddens [10] talk about expert systems—routine tasks that have traditionally been spun off and delegated to other human beings, and likewise automated and delegated to technologies.

In Star's original introduction of boundary objects into the discussion about AI [18], such objects come from inside the community, and they are non-hierarchical. In continuation, Star [17] proposes that some of these objects are highly standardized and travel easily between communities, while others are malleable and do not. And in between we find boundary objects. As a consequence of the boundary crossing, one may usefully address objects inside boundaries in terms of openness, malleability and seamlessness, and objects crossing boundaries in terms of seamfulness, resistance and closedness (see [2, 6, 18]).

In continuation of Star [16, 17, 18] and Nicolini [13], the objects around which human collaborative practices are constituted contribute to the carrying out of the activities of the community of users. Objects may play different roles to different users at different points in time. The objects have different forms of ownership and are shared in various ways, such as the way in which Baecker et al. [1] characterize different forms of collaborative writing and editing of documents. Baecker et al. point to—among

Workshop Challenge 2:
"How can we combine human intelligence with artificial intelligence to optimally benefit human activities rather than simply replace them?"

Some GUI alternatives, such as speech-based interfaces [14], mean relying on machine learning/AI, but only on the technological side – for interaction to take place, the user is still to actively provide input. But even in many cases where human participation seems irrelevant, human intelligence currently underpins and powers AI. To have a discussion about further combining human intelligence with AI, with the aim of optimizing human benefit, we must tread carefully on the issue of who gets to determine the criteria for optimality, as well as why, when, and where this gets decided. This poses questions regarding externalization, delegation, collaboration, and control.

other issues—differences between people writing together in the same piece of text at the same time, and a variety of other roles around the object, such as roles of editors, commenters and readers, who have limited or no write access to the text, even if they can read it [1].

Accordingly, the human partnerships mediated by interactive objects are complex and emerging; oftentimes, these objects may be seen as run-away objects [9] that have been modified by many, but under the control of nobody. With AI, one issue is that these objects have been modified not only by humans but also by algorithms and statistics in various forms. Hence, one of the open questions is whether the new forms of AI cause qualitative changes to this complex mediation or not? What does the focus on practice and collaboration mean for how we build technology so as to better support human control over technology in this setting? What implications does this have for the human-computer partnership? Can the run-away interactive objects be tamed by their human users?

Potentials and Problems of Artificial Intelligence in this Context

To further discuss the challenge of shifting from human doing to the "doing" of artificial intelligence in the interaction, we need to ask what routines are automated and how they talk back to the actions of users. Even human activities involving routinized actions are situated, grounded in a unique context. Artificial intelligence, as well as automation, poses a problem because it risks removing users' flexibility to adapt/shape their actions to the concrete situation.

Algorithmic objects have historically tended to create strong ties with disciplinary or organizational practices, discouraging alternative modes or interpretations. The

difficulty of changing software once it is installed and adopted seems to reinforce practices or habits. When humans delegate on software, or trust software systems to mediate relationships, they appear to do so under an apparent intersubjective understanding of its operation. Delegating, in this context, means trusting the perception of a common understanding. Some key questions include: To what extent these objects enable such an understanding and how do they make apparent their interactivity or coordination capabilities? To what extent can object-based coordination be inspected or made traceable? How are other people's actions subsumed though a shared object?

Nicolini et al. [13] describe how objects mediate and spur on action. The action lies with the users around, in, and through the objects. Karpachof [12] however, talks about artifacts or tools as either actively or passively externalized, and use this to discuss the role of classical AI when it comes to mediation of human activity, following Leontjev's idea that only that which is routinized can be automated. What would this idea mean for the computer-mediated, human partnerships, mediated by interactive objects?

Automation carries a set of crystallized decisions and expectations in an artefact, whether these come out of existing routines or not. These are decisions and expectations on/of how to perform activities, and hence the interactive objects promote, support, or afford selected programs of action while demoting others. When encapsulating a degree of automation, a common object may become a constitutive a part of organizational memory, enabling further elaboration of collective knowledge and performative capability in a shared or common infrastructure. Within a changing

Workshop Challenge 3:

"How can we help users shift easily across different types of human-computer partnerships, from full user control to full automation?"

The focus of the CIO project is on particular communities of practice and their varying practices/activities. Through this lens, we believe workshop challenge #3 could be explored with respect to such a community of practice. At the current stage, we do not envision any easy answers, as people's practices and the objects involved are so varied and influenced by context that formulating general solutions could prove to be near impossible. Some communities of practice may not even need or desire to shift from full user control to full automation. Aside from asking what benefit the possibility for such shifting of control could bring, it should also be asked whether it is even desired by the community.

context, however it can also become an object in need of maintenance, misaligned with the knowledge it intends to model as cultural object. An automated program of action can also constrain or even oppress some organizational actors' ability to adapt social and organizational practices within a community.

Basically, automation without previous routinization is problematic, as with AI. This is NOT because people are not used to actively externalized objects, but rather because AI picks up on forms of automation that do not reflect human routines. What does this mean at the level of the human-computer interaction?

Still, automated behavior does not need to constrain; on the contrary, it can function as an aspect of interactive objects. Equally, the interactive object may transparently enable further appropriation (e.g. automatic background recalculation in a spreadsheet). As such, dealing with automation can lead to an emergence of diverse love-hate socio-technical relationships, with varying degrees of stability and interpretive flexibility. When and which characteristics may favor such transitions still requires research.

Not only the capabilities provided to the user are relevant: The user's experience of control of and insight into the system's actions can also affect incentive to use and appropriate the technology. Van Oosterhout et al. [19] present a thermostat design in which shape change is used to convey the actions of the system while haptic feedback lets the user sense the system's "willingness" to submit to the user's choices. We advocate more considerations of this kind in the design of interfaces involving artificial intelligence and automation.

Where do we take it from here, and how?

Reiterating, we emphasize that rethinking interaction requires a perspective on human-computer interaction that encompassed multiple situations of multiple users and objects in multiple ecologies and activities.

To explore interactive objects with the aim of preserving and extending human control over the technological environment, it is important to address the difference between the control that lies with the user or community of users in use, the control that lies within the community of users when appropriating and developing the technology in use, and the control that lies with the creators of the technology (see also e.g. [3, 4, 11]). In this regard, the significance of notions like externalization, delegation, and control for computer-mediated human partnerships must be considered. Can designers and developers give communities of users the tools to tame the common interactive objects? Or what about the inverse relation [7]: How can common interactive objects be built to let the users learn and develop their use, while offering some structure, direction and stability?

The current work is mainly conceptual. In the workshop, we will use examples from literature to present and develop our ideas: Wikipedia (as discussed by [5]) and spreadsheets (as analysed by Dourish [8]).

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