Designing for Observability

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ABSTRACT

We sketch an interaction design for artificial cognitive systems initially centered around personification. We will question the approach of objective representation by taking visibility and observability into account. Based on the concepts *Semantics in Design, Seamfulness, Appropriation, Social Navigation, Awareness,* and *Accountability,* we discuss various levels of perceptibility. The concepts serve as basis for the evaluation of design decisions throughout this sketch.

INTRODUCTION

Representation is a key to understanding, hence the widespread use of graphical metaphors within GUIs. Despite a certain realism in appearance one must not forget that GUIs operate on a symbolic not on an iconic level: metaphors support conceptional models, they do not depict properties. After introducing the term affordance to the HCI discussion, D. Norman [1] claimed that it is widely misused, since these clues offered by GUIs are based on convention [2]. Nevertheless, we are used to the fact that our ordinary physical and social environment offers us indicators for orientation and we continue looking for them in other contexts.

In the history of the development of Embodied Conversational Agents ECAs [3], for instance, there have been strong arguments for lowering the barriers in the UI for non-expert users, because of the seemingly ordinary face-to-face conversation fostered by an ECA interface. After years of research into the effects of ECAs on HCI, it became more and more clear that this approach evokes user expectations which until now could not be fulfilled by the underlying technologies. Issues such as the speech recognition bottleneck, non-natural gestures, gaze- and dialogue behavior etc. lead to misguiding clues within the course of interaction.

The phenomenological definition of embodiment, however, offers a way to explain how meaning is created from our interactions with the world, how ordinariness is achieved and maintained [4]. This is tied to actions and the result of actions being observable and reportable. Based on a design task which we consider as prototypical – i.e. interface paradigms for complex AI systems are still in an exploratory stage –, we want to demonstrate how a framework of key concepts may help to identify crucial aspects of representation. Common to those concepts is that they all explore different aspects of observability. This should help to create artifacts that can be easier accepted as part of the ordinary environment.

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In this note we aim to demonstrate how these key concepts can be applied to assessing design requirements for a user interface to a complex personalized information processing and presentation system. As an example we sketch the interaction design of the RASCALLI system.

RASCALLI stands for Responsive Artificial Situated Cognitive Agents Living and Learning on the Internet (http://www.oefai.at/rascalli). RASCALLI agents, henceforth Rascalli, are virtual assistants that learn to adapt to user interests and preferences and to provide their users with personalized information gathered from the Internet and domain-specific knowledge bases. Rascalli learn and develop their knowledge, reasoning, perception and action capabilities through interaction with the user. Like natural cognitive systems, RASCALLI are equipped with senses relevant to perceive in the specific kind of environments they are made for. Thus their senses are different from ours. The appearance of the RASCALLI agents as ECAs is an obvious but arbitrary metaphor. (See Figure 1 for a screenshot of the RASCALLI ECA interface.) Why this is the case will be discussed in the remainder of this note. In Section 2, we lay out the theoretical concepts which then will be applied to the interaction design for the RASCALLI system (Section 3).

ASPECTS OF VISIBILITY: THEORETICAL CONCEPTS

Semantics in Design

Departing from a design perspective, „Product semantics“ developed within the domain of industrial design offers a method of discussing design artifacts in view of symbolic properties on multiple levels [5]. Indicators („Anzeichenfunktion“) deal with representational properties. There is a distinction between „natural“ and „artificial“ tokens. Natural tokens result from material and constructive properties. Those tokens can be read by users and help to identify function and potential use of an artifact. If technology is hidden under the surface, these clues can be provided by the designer, i.e. artificial tokens must be created. On a different level, symbolic functions („Symbolfunktion“) describe the meaning of an object as a symbol in a social context, i.e. reputation, status, etc.

Seamful Design

There is an analogy to the notion of seamful design introduced by M. Weiser and further examined by M. Chalmers and I. MacColl [6]. If underlying properties are not hidden („seamless“) but revealed to users („seamful“), they are likely to open up new areas of actions and ways of potential use. The authors consider seamful and seamless design not as a contradiction but as a continuum with both advantages and disadvantages. Just as natural tokens, „beautiful seams“ [7], i.e. well designed ones that become a resource for users, can play a vital role for the creation of meaning: „Users' interactions not only let them achieve their moment–by–moment tasks and goals, but also let them build up a shared understanding of how to resolve interactional problems … .“ [6]

Appropriation

Everyday life is characterized by the possibility of spontaneous action. We often improvise. This is also expressed by the fact that users tend to come up with unintended use within technology adoption [6, 8]. In fact, the intended use can only be suggested by design, if and how coupling, i.e. an intentional action arising in the course of interaction, takes place is actively managed by the user. Although this is closely connected to the concept of seamful design, we want to focus on the ability of a user to switch between different levels of dealing with an artifact – acting with it or acting through it. In desktop software the former is usually hidden in preference panes. Making these options visible enables users to spontaneously change back an forth between addressing its properties or using the artifact as a tool.

Social Navigation

Instead of trying to model human reasoning, aggregated user experience is used to provide additional information to support decisions [9]. Social navigation has been widely used within e-commerce applications, where items are recommended based on user behavior (Collaborative Filtering). In this case the presentation, i.e. the visibility of user traces, is crucial for the acceptance of these recommendations. This does not imply that the user or other users have to become visible as individuals. In the meantime social navigation is widely experienced on a daily basis within a wide range of social platforms. Due to the broad use of the term social we would like to point out the analogy to the objective world again. Social navigation is basically an artifact-centered view depicting traces or trails left by users on an artifact up to now.

Awareness and Social Awareness

Our everyday world is characterized by the fact, that it is inhabited by other social beings. According to Erickson and Kellogg [10] this has two implications: first of all people are generally aware of others in their environment, and secondly people are aware of being seen by others. To convey presence within computational systems, on the one hand, activities of users need to become visible and observable to each other. Dourish and Bly [11] state that providing the right amount of information is critical since too much information can also be distracting. On the other hand, while exposing one's activities to others, the user needs to be in control of what is visible to the others.

Accountability

Suchman [12] pointed out that human action is situated. Mutual understanding is actively managed and achieved in the course of interaction. This mutual achievement must be recognizable by both parties involved. Furthermore this understanding is relative to particular communities and activities.

For a computational system to be accountable, actions and their effects need to be made observable and reportable to serve as a resource for understanding.

THE CONCEPTS IN PRACTICE

Rascalli are personal assistants, digital companions, that aim at supporting the user to handle the growing digital information overflow in a personalized way. Thus it is crucial for the interaction design of Rascalli, that it supports the agent learning through interaction with the user, and the user understanding the context of the agent's actions.

Figure 1. Screenshot of the RASCALLI ECA interface.

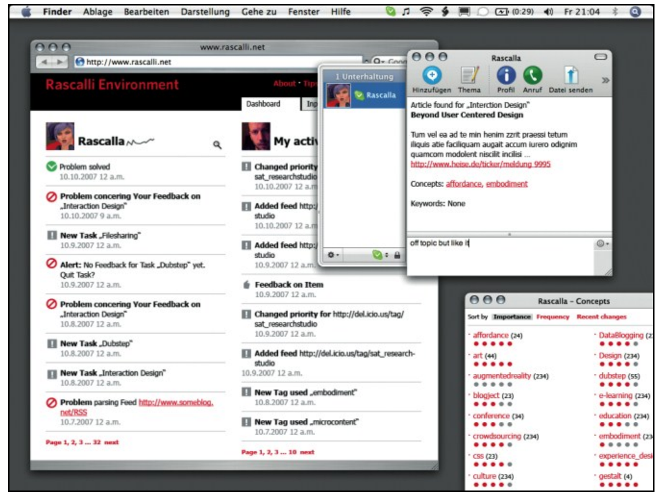

Figure 2. Design studies of a non-personified approach

In the following, we list a number of problems for the interaction design arising from the particular type of system and the technological state-of-the-art of the system components, and make our proposals for remedies.

Fixing User Expectations

Departing from a GUI design perspective on the level of tokens we have to state that the Rascalli interface consists of a combination of established GUI paradigms from the domains of game-design and desktop applications that do not immediately suggest a certain mode of interaction.

Concerning the task of an entity personally assisting a user, we have to consider the appropriate appearance: a companion, a toy or rather a set of tools? The agent as personified animated character has a great impact on the user experience. On a symbolic level, it creates the impression of a single, exclusive all knowing entity, which evokes rather unrealizable expectations. However, it is more convenient to use a range of instances that could specialize in different domains of the user's need for personalized information. This would also lower the expectations towards the artifact. The relevance of the individual instances is easier to evaluate within the narrower range. User feedback can be more specific, results more comprehensible.

Revealing Limitations

A severe limitation of an ECA-centric interface mimicking face-to-face conversation is that it hides the underlying principles instead of making them accountable. For instance, the ECA seemingly looks at the user, but typically has no vision. It provides signals as if it were listening to the user even though it is deaf, lacking a speech recognition component, or hearing impaired as recognition quality usually is poor. Moreover the personified animated character evokes the impression of a conversation going on which is blurring the fact that the interaction rather is a sequence of pairs of user queries and system answers. Depending on the complexity of the underlying processing system a noticeable delay between user utterance and system reply is likely to occur, which typically is hidden by displaying idle behaviors. As a consequence, the situation is not accountable, and the mode of interaction is not appropriate.

Given the shortcomings of current technology for modeling human-like communication behavior, we have to find a mode of interaction where the system's equivalent of mutual understanding (which a user expects from a communication situation) can still be managed and made observable. Mutual achievements can rather be recognized in the context of single concepts – as it is done in tagging within folksonomies – than in complex coherence of speech. Instead of being guided by a free speech dialogue situation, it would be more efficient to concentrate on selected parts of the user actions such as automatically tracking tags a user employs on social bookmarking or clipping platforms. The fact that answers to user queries are delayed is another indicator to move away from the dialogue situation. Instead we use ongoing tasks – a training situation – within which the agent automatically identifies relevant information on the basis of a user's tag set. It presents this information to the user, asks and gets feedback whether the system's coupling of tags and information was appropriate. This way system and user can step by step to find common ground based on selected concepts.

Building upon Fragmentation

On the level of representation, agents must offer a range of modi in order to be accessed via a general web interface, such as Instant Messenger Clients, "Microblogging" applications, Email, RSS-feeds etc. Employing Web 2.0 open API, we can make sure that agents can be integrated in the users' individual infrastructure. Depending on the preferred mode, users must be able to act within a range from immediate interaction to continuous partial attention. In addition, we expect such an approach to create a range of possible use cases. On the level of interaction, the option of evaluating results must be constantly available so that the user can decide on the fly if feedback is necessary – acting with the agent or acting through the agent.

Qualifying the Quantity of User-System Interactions

Obviously the quality of the results strongly depends on the quantity of interactions. The quantity of the relationship needs to be captured in statistics and visualized for the user – the user leaving traces on an artifact.

Creating Awareness

For the purpose of creating awareness of an entity that is constantly around, the agent also needs a surface to leave traces of its activities. This can be achieved by making use of feeds as known from "Microblogging" (e.g. twitter.com) or social platforms such as "Facebook" (www.facebook.com). Both user and agent actions are logged as events in a growing textual list. From the opposite point of view this is also raising awareness of exposing one's activities to the agent. The user gets an instant overview and can decide about the level of detail, filter the list etc.

Making Mutual Understanding accountable

Discrepancies between the user's self-evaluation and the agent's user profile are likely to arise. The agent creates a profile, i.e. an external, independent view on the user. This profile might be in contradiction with the user's self-evaluation and can result in inappropriate behavior of the agent. As a consequence the interface has to enable and encourage self-monitoring of the user's behavior towards the agent. In addition, the user must be able to review and evaluate his/her actions. This allows the user to control and correct what is visible towards the agent and makes the interaction more efficient. Resulting changes in the user profile again need to be made visible by log entries etc.

Moreover, inconsistencies must be made observable to the user: an item may be appropriate in the context of the agent's task, whereas the user evaluation is contradictory. This may be due to the user's inattentiveness or change of interest, etc.

CONCLUSION

In our contribution, we have sketched an interaction design for artificial cognitive systems initially centered around personification. We have built upon a series of concepts – *Semantics in Design, Seamfulness, Appropriation, Social Navigation, Awareness, Accountability* – we consider helpful for outlining aspects of visibility and observability. We expect the new interface to be less realistic but more real.

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