DESIGNING FOR ATTENTION

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ABSTRACT

One challenge of human computer interaction research is the design of systems capable of reasoning about users' attention and consequently decide how to *disappear* or gain and guide user's attention. For this purpose reactive, deliberative, social, and aesthetic processes controlling attention should be taken into account. This workshop aims at exploring these processes in order to establish the basis for a theoretical framework that could inform the design of systems capable of assessing user attention (e.g. through eye tracking), evaluating the effectiveness of a current focus, and gaining, shifting, or maintaining attention (e.g. through humour, surprise).

Keywords

Attention, Human Computer Interaction.

1. DESCRIPTION OF THE TOPICS

The fast shift of attention from one subject to another or one activity to another is one of the consequences of information overload. In certain situations the ability to quickly access several information sources, to switch activities, or to change context is advantageous. In other situations it would be more fruitful to create and maintain a focus whilst offering the possibility to switch attention to other contents or activities. This is especially the case in domains where the lack of knowledge and experience of users with the subject at hand may cause a loss of focus, but it also applies to other situations. A large portion of research on human attention in digital environments is based on the findings of cognitive psychology (e.g. Raskin [9]), or experimental psychology (e.g. Bearne [1]). Such studies are characterised by the aim of supporting the attentional choices of the user making the device *transparent*.

Another area of research focuses instead on designing interfaces and systems capable of guiding the user in the choice of attentional focus. Some of these act as *proactive* helpers for the user [6-8]. The two approaches are very often regarded as divergent, responding to different needs and requiring different design choices. We believe that this is not necessarily the case. We should not aim at designing transparent or proactive systems. Rather we should aim at designing systems capable of *reasoning about users' attention*, and consequently decide how best to disappear or to gain and guide user's attention. Focusing on attentional mechanisms also provides a framework that reconciles the direct manipulation user interfaces approach and the interface agents approach as clearly presented and exemplified by Horviz [3].

Reasoning about user's attention must encompass reasoning about *reactive processes controlling attention* and *deliberative processes controlling attention*. Further more these processes must be co-ordinated to explain situations in which deliberative process are initiated by reactive processes (e.g. attention shift caused by a visual stimulus), or reactive processes are pruned by deliberative process (e.g. certain external stimuli are not noticed because one's attention is focused elsewhere). Some interesting results in modelling attention as the necessary link between cognition and perception are reported by Hill [2] in his system simulating a virtual human pilot.

A complete account of attentional mechanisms however must take into consideration two more processes that interplay with the reactive and deliberative ones. These are *social processes* and *aesthetic processes* controlling attention.

2. THE WORKSHOP

Currently most researchers working in particular application areas focus their design specifically to satisfy communication goals for their audience or to satisfy the requirements for their particular discourse. This workshop aims at initiating a discussion amongst researchers and practitioners interested in attentional processes in order to establish the base for a theoretical framework that could inform system design.

In particular the following questions will be addressed in small groups and with respect to several scenarios:

- What are the possible levels of description for attentional foci (e.g. the word one is reading, the tool one is selecting, the task one is performing)?

- Focus may be modified and expanded, how is this different from changing focus? (how is this achieved? How is its cost evaluated?)
- How descriptions of attentional foci at different levels impact on the system design?
- What are the parameters intervening in the evaluation of the effectiveness of a given focus with respect to a given goal?
- Is it possible to create and use a taxonomy of user interruptions based, for instance, on their types (e.g. visual, textual, verbal), their time dimension (when, for how long, how often, the interruption take place)?
- Is interruption the only way of changing focus? And in which ways can focus be expanded or modified?
- What are the parameters intervening in the evaluation of the cost of shifting attentional focus and how are this related to the dimensions in the taxonomy?

The results of this discussion will be used to address some of the challenges involved in designing systems capable of reasoning about attention. Including the design of systems that can:

- identify, with reasonable accuracy:
  - the user's current attentional focus (based on context, or others, e.g. gaze information [10]);
  - user's goals (these can either be declared by the user, implicitly defined by the system or the situation in which it is used, or dynamically evaluated on the basis of the user activity and focus);
  - currently available alternative foci;
  - currently unavailable foci that could be made available by the system.
- Given the user's goals evaluate, with reasonable accuracy, the relative effectiveness of the current user's focus with respect to alternative foci;
- Evaluate the cost of interrupting the user activity (see, for example [4, 5]).
- Fade / disappear (e.g. doing nothing, eliminate items that could possibly cause a shift of user focus) ;
- Gain and maintain user attention in order to direct it toward more effective foci.

2.1 Workshop Organisation

Before the workshop, prospective participants will be asked to submit position papers stating their interests and research in attentional processes. Participation of researchers bringing views from fields such as psychology, sociology, linguistics, and communication is encouraged.

On the morning of the workshop selected position papers will be presented. The afternoon session will consist of a set of break-out groups working on the scenario based analysis. We will conclude the workshop preparing a poster and discussing future activities.

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