

# Abduction and Web Interface Design

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## INTRODUCTION

According to Raskin (2000), the way we interact with a product, what we do, and how it responds are what define an interface. This is a good starting definition in one important respect: an interface is not something given or an entirely predefined property, but it is the dynamic interaction that actually takes place when a product meets the users. More precisely, an interface is that interaction that mediates the relation between the user and a tool explaining which approach is necessary to exploit its functions. Hence, an interface can be considered a mediating structure.

A useful exemplification of a mediating structure is provided by the so-called *stigmergy*. Looking at the animal-animal interactions, Raskin (2000) noted that termites were able to put up their collective nest, even if they did not seem to collaborate or communicate with each other. The explanation provided by Grassé (Susi et al., 2001) is that termites do interact with each other, even if their interactions are mediated through the environment. According to the stigmergy theory, each termite acts upon the work environment, changing it in a certain way. The environment physically encodes and stores the change made upon it so that every change becomes a clue that affects a certain reaction from it. Analogously, we might claim that an interface mediates the relation between the user and a tool affording him or her to use it a certain way<sup>1</sup>. Understanding the kind of mediation involved can be fruitfully investigated from an epistemological point of view. More precisely, we claim that the process of mediating can be understood better when it is considered to be an inferential one.

## BACKGROUND

Several researchers (Kirsh, 2004; Hollan et al., 2000) recently have pointed out that designing interface deals with displaying as many clues as possible from which the user can infer correctly and quickly what to do next. However, although the inferential nature of such interactions is acknowledged, as yet, no model has been designed that takes it into account. For instance, Shneiderman (2002) has suggested that the value of an interface should be measured in terms of its consistency, predictability, and controllability. To some extent, these are all epistemological values. In which sense could an interaction be predictable or consistent? How can understanding the inferential nature of human-computer interaction shed light on the activity of designing good interfaces? Here, the epistemological task required is twofold: first, investigating what kind of inference is involved in such an interaction; and second, explaining how the analysis of the nature of computer interaction as inferential can provide useful hints about how to design and evaluate inferences.

Regarding both of these issues, in both cases we shall refer to the concept of abduction as a keystone of an epistemological model.

## THE ROLE OF ABDUCTION IN DESIGNING INTERFACES

More than one hundred years ago, Charles Sanders Peirce (1923) pointed out that human performances are inferential and mediated by signs. Here, signs can be icons or indexes but also conceptions, images,

and feelings. Analogously to the case of stigmergy, we have signs or clues that can be icons but also symbols and written words from which certain conclusions are inferred.

According to Peirce (1972), all those performances that involve sign activities are abductions. More precisely, abduction is that explanatory process of inferring certain facts and/or hypotheses that explain or discover some phenomenon or observation (Magnani, 2001). Abductions that solve the problem at hand are considered inferences to the best explanation. Consider, for example, the method of inquiring employed by detectives (Eco & Sebeok, 1991). In this case, we do not have direct experience of what we are taking about. Say, we did not see the murderer killing the victim, but we infer that given certain signs or clues, a given fact must have happened. Analogously, we argue that the mediation activity brought about by an interface is the same as that employed by detectives. Designers that want to make their interface more comprehensible must uncover evidence and clues from which the user is prompted to infer correctly the way a detective does; this kind of inference could be called *inference to the best interaction*.

We can conclude that how good an interface is depends on how easily we can draw the correct inference. A detective easily can discover the murderer, if the murderer has left evidence (clues) from which the detective can infer that that person and only that person could be guilty. Moreover, that an inference could be performed easily and successfully also depends upon how quickly one can do that. Sometimes, finding the murderer is very difficult. It may require a great effort. Therefore, we argue that how quick the process is depends on whether it is performed without an excessive amount of processing. If clues are clear and well displayed, the inference is drawn promptly. As Krug (2000) put it, it does not have to make us think.

In order to clarify this point even more, let us introduce the important distinction between theoretical and manipulative abduction (Magnani, 2001). The distinction provides an interesting account to explain how inferences that exploit the environment visually and spatially, for instance, provide a quicker and more efficient response. Sentential and manipulative abductions mainly differ regarding whether the exploitation of environment is or is not crucial to

carrying out reasoning. Sentential abduction mostly refers to a verbal dimension of abductive inference, where signs and clues are expressed in sentences or in explicit statements. This kind of abduction has been applied extensively in logic programming (Flach & Kakas, 2000) and in artificial intelligence, in general (Thagard, 1988).

In contrast, manipulative abduction occurs when the process of inferring mostly leans on and is driven by the environment. Here, signs are diagrams, kinesthetic schemas, decorated texts, images, spatial representations, and even feelings. In all those examples, the environment embodies clues that trigger an abductive process, helping to unearth information that otherwise would have remained invisible. Here, the exploitation of the environment comes about quickly, because it is performed almost tacitly and implicitly. According to that, many cases have demonstrated that problem-solving activities that use visual and spatial representation, for instance, are quicker and more efficient than sentential ones. We can conclude that, in devising interfaces, designers have to deal mostly with the latter type of abduction. Interfaces that lean on the environment are tacit and implicit and, for this reason, much quicker than sentential ones.

Investigating the activity of designing interfaces from the abductive epistemological perspective described previously helps designers in another important respect: how to mimic the physical world within a digital one to enhance understanding.

As we have seen previously, the environment enables us to trigger inferential processes. But it can do that if and only if it can embody and encode those signs from which one can infer what to do next. For example, if you are working in your office and would appreciate a visit from one of your colleagues, you can just keep the door open. Otherwise, you can keep it closed. In both cases, the environment encodes the clue (the door kept open or closed), from which your colleagues can infer whether you do or don't want to be disturbed. Here are the questions we immediately come up: How can we encode those signs in a digital world? How can we enrich it so as to render it capable of embodying and encoding clues?

The question of how to enrich the digital world mainly concerns how to mimic some important features of the physical world in the digital one. Often,

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