NATURAL INVERSE: PHYSICALITY, INTERACTION AND MEANING

Extended abstract

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1. Introduction

Many of the novel tangible artifacts that have recently emerged are exciting, inspiring, fascinating – inviting you to touch and interact. The interweaving between computers and artifacts can create mesmerizing products that draw you to interact with them. And to ensure an interaction is a success, it is the responsibility of the designers to first understand what the physical nature of these products has to offer and how this physicality can be exploited to create meaningful interaction.

In designing a tangible artifact, it does not necessarily have to be totally different, or, 'out of the world', from what we already have and use today. In fact, today's ordinary artifacts, which include everyday appliances and devices, can teach us much about the interactions that we sometimes take for granted.

Exploring an artifact can be a positive experience if it allows users to recover from mistakes, be it on an everyday artifact, or a novel tangible one. Allowing users to recover from mistakes, or at the least reduce the effects of them, is such an important role in interaction. Without easy recovery users may avoid exploration, but with it users feel safe, knowing that their actions will not lead to failure. The presence of an 'inverse action' supports this recovery.

2. Inverse action as we all know it

The ability to inverse, or undo an action really helps users to recover from mistakes and to carry on with their task, hence sustaining them in an interaction. In Graphical User Interfaces (GUI), undo or redo assists users in tracing back one and more of their previous action(s). In computer supported cooperative work (CSCW), undo is found to be an integral need of users that must be supported by a system (Abowd & Dix,

1992). Whilst in direct manipulation (DM), the ability to inverse or undo proves to reduce the risk of getting it wrong the next time (Shneiderman, 1982).

In our own study, we have looked at everyday physical artifacts – appliances and devices, to understand what makes interaction natural and fluid (Ghazali & Dix, 2005a). From our findings, simple artifacts such as a dial or a knob on a speaker, which allows an inverse action, reduces the risk of getting it wrong for those who do not have complete understanding of an artifact, or to be precise, the understanding of the relationship between the physical state of the artifact and its underlying logical function. Furthermore, if the inverse action is 'natural', that is exploits the normal responses of our motor system, then users can recover virtually instinctively often unaware they have made an 'error', avoiding breakdown.

3.   Inverse action in tangible design

The inverse action has proven to be an integral part of interaction in our design studies of the Cubicle (Block et al, 2004). The Cubicle is a small device shaped like a cube and in ours studies was used to control a media application. In order to study users ability to infer how to interact with it, the mapping between the device and its effects were deliberately manipulated. Despite a lack of understanding of the mappings, the participants were able to react appropriately to feedback and successfully complete tasks and moreover enjoy the experience. The 'natural inverse' property, which is one of the key features of physicality, has helped participants in their interaction with the Cubicle (Ghazali & Dix, 2005b).

The natural inverse property in tangible design also gives flexibility to users in creating their own understanding of the physical artifact and its mapping. In the VoodooIO Gaming Kit (Villar et al, 2006), participants can freely define the functionality of a number of physical controllers such sliders, knobs and buttons,, and are also free to place these controllers anywhere on a canvas, in any way they like. What is interesting to note is the way the participants placed the slider on the canvas. We would have thought the slider would be placed like a typical slider, on a horizontal plane, with its minimum end on the left and the maximum on the right. This would automatically expose the conventional learnt meaning of its mapping. Nonetheless, participants placed sliders many ways, including vertically and diagonally with its minimum and maximum at either end. The natural inverse property means that when the participants interacted with these oddly placed sliders, they were able to apparently effortlessly interact with these,

despite their unconventional layout and allowing them to quickly create an understanding of the new mapping.

4. Its importance

A physical artifact, which is positively designed would encourage user to keep on interacting with the artifact besides creating a meaningful interaction. The natural inverse property does not just contribute in reducing the risk of getting it wrong, but also injecting a positive encouragement in the exploration – getting to know the unknown. A physical artifact with the property of natural inverse also gives flexibility to user in the creation of meaning between the artifact and the underlying functionality.

References

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