10 DOMAIN-APPROPRIATE DEVICES *

For a video example, see
⟨http://www.tk.uni-linz.ac.at/worldbeat/worldbeat.mov⟩.

Sample pattern for the CHI 20000 workshop "Pattern Languages for Interaction Design: Building Momentum" by Jan Borchers ⟨mailto:jan@tk.uni-linz.ac.at⟩.

Note: This pattern closely follows the Alexandrian format to examine how that format holds up for HCI patterns.

. . . you know what application area your interactive system is going to be about, and you have decided on the overall temporal and structural format of your interactive system—INCREMENTAL REVEALING (4), FLAT AND NARROW TREE (7). You are now ready to think about how the user should physically interact with your system at each phase.

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Modern interactive systems address a huge variety of application domains. Yet, they almost invariably use only mouse and keyboard as input devices.

Every interactive software system has a domain which it addresses and that its contents or functions are about. For example, a computer-based drawing course has the artistic domain of drawing as its application area, and a process control system in a power plant has the domain of that power plant and its functions as its application area.

However, most interactive systems use the standard keyboard and, nowadays, mouse as input devices, and nothing else. User interface designers put a lot of work into creating "metaphors" in which the virtual, on-screen world resembles items and concepts from the well-known, physical world. But all the while, those objects remain virtual, volatile images to be manipulated with the same, generic set of input devices and physical actions: type, point, click.

A reason that is commonly stated for this is that the development effort to create dedicated input devices is too high. But often, it is not even attempted to estimate the amount of extra work and its possible payoff, because it requires a lot of thinking from the designers to come up with new ideas apart from mouse and keyboard, and it is an area where products and standards are

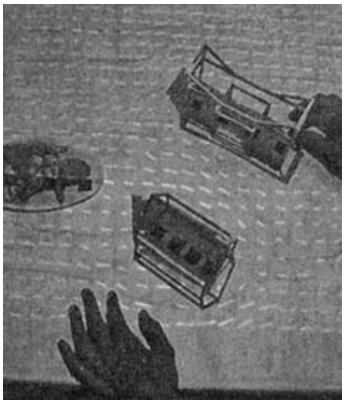
as comfortably developed and accessible as in the world of standard input devices.

But psychological research as well as common sense tell us that users are much more efficient, successful, and satisfied when they are offered input devices that resemble physical objects of the application domain. For example, Norman [1988, p. 23 ff.] talks in detail about the advantages of "natural mappings" from input device to system function, and gives a good example of a device perfectly designed for its dedicated purpose: a seat adjustment control in a car which is shaped like a miniature seat itself. To adjust his own seat, the user simply pushes the corresponding part of the miniature seat into the desired direction. It would have been far more cumbersome to understand and use the seat controls if they had been designed as a set of industry-standard buttons on the dashboard (and, if we imagine using those controls ourselves, it would probably also have been less fun).

A domain-appropriate control to adjust a car seat.

The same is true for the *WorldBeat* system shown in the opening picture: It is an interactive exhibit that demonstrates to its users how computers open up new ways to interact with music, from conducting a computer orchestra, to improvising to a Blues band with computer support. While our initial designs included a standard keyboard and mouse as input devices, we

gradually found out that we did not really need them, and that they would spoil the "musical atmosphere" that the exhibit tries to create. The two infrared batons, on the other hand, are artefacts that resemble a conductor's baton, or xylophone sticks—objects that are well known from the musical domain. In taking them up, the user is already led away from thinking about interacting with a computer, into an experience of interacting with music. The system was elected one of the three most popular exhibits in the centre where it is installed [Borchers, 1997], and received an award for its new way to convey musical concepts.



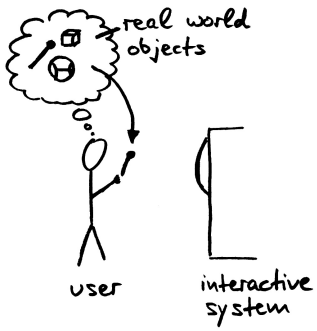
Urp simulates wind between two physical building models.

Ishii and Ullmer [1997] developed the concept of *Tangible Bits* where the gap between human and computer is bridged by "coupling digital inormation to everyday physical objects and environments". For example, they created an *Urban Planning Workbench (Urp)* where buildings are represented by physical models that can be moved around on a map of the neighbourhood. Effects such as shadows and airflow are simulated in response to the physical placement of the objects and projected

onto the map. Informal studies showed that most architects who tried the system would use it immediately if available [Underkoffler and Ishii, 1999]. This is another example of the advantages of dedicated, application-specific input devices.

Therefore:

Use input devices that resemble real objects from the application domain of your interactive system. Whenever users have to input something, determine whether the standard mouse and keyboard are really the best devices to use for this purpose, or if other devices can make working with the system more intuitive, efficient, and enjoyable.



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A new device is also a good starting point to create a system that looks fresh, different, and intriguing—INNOVATIVE APPEARANCE (12), and that does not look like "a computer"—INVISIBLE HARDWARE (15). If your interactive system requires different forms of input, try to map them to your new input device—ONE INPUT DEVICE (20). . . .

References

Jan Borchers. WorldBeat: Designing a baton-based interface for an interactive music exhibit. In *Proceedings of the CHI 97 Conference on Human Factors in Computing Systems (Atlanta, GA, USA, March 22–27, 1997)*, pages 131–138, New York, 1997. ACM.

Hiroshi Ishii and Brygg Ullmer. Tangible bits: Towards seamless interfaces between people, bits and atoms. In *Proceedings of the CHI 97 Conference on Human Factors in Computing Systems (Atlanta, GA, USA, March 22–27, 1997)*, pages 234–241, New York, 1997. ACM.

Donald A. Norman. *The Psychology of Everyday Things*. Basic Books, New York, 1988.

John Underkoffler and Hiroshi Ishii. Urp: A luminous-tangible workbench for urban planning and design. In *Proceedings of the CHI 99 Conference on Human Factors in Computing Systems (Pittsburgh, PA, USA, May 15–20, 1999)*, pages 386–393, New York, 1999. ACM.