

The Magic of Visual Interaction Design

Introduction

For centuries, magic has served as a means to control, inspire and entertain people with feats that seem beyond the capabilities of the mere mortal. Even today, when our knowledge of science and technology has jaded many to such acts of prestidigitation, the art continues to have the ability to generate wonder, although it's often directed solely to figuring out how a trick is done. In this realm of illusion production, both ancient and modern magicians have perfected means of making the ordinary look extraordinary. The degree of their success can often be measured by the level of disappointment among spectators who learn how seemingly otherworldly feats can be accomplished with a fake thumb tip and a lot of showmanship.

Visual interaction designers can apply these same techniques, principles, and levels of showmanship to the magic of technology. One of the key components of user interface design is to make the technology transparent by hiding the details of the implementation and intuitively presenting the capabilities that support the user's task. The magician, who presents an illusion by carefully hiding the underlying mechanics, applies the same approach. As Fraps (1997) has pointed out, the task of the magician is

...to leave the spectator only one possible interpretation. We give him beginning and end points and he himself constructs, by an unconscious automatic functioning process of his perception, a reality, ... which simultaneously contradicts his conscious perception. The stronger this contradiction, the more powerful the magic.

The designer achieves a similar effect when "erasing" in a paint program changes bits in a register, not ink on a page, but the illusion effectively con-

veys and supports the necessary task of the user.

While the idea of applying magic to human-computer interaction is not new (Tognazzini, 1993), it has not received the attention or application it deserves. I'd like to review some of the lessons that can be learned from magicians, examine their application in visual interaction design, and look at an effective example of using visual interaction design for doing magic.

Techniques

Bruce Tognazzini (1993) presents an excellent overview of the correspondence and applications of magic to interface design. Drawing from classic sources on magic and showmanship, he points out the strong overlap between the principles of magic and interface design, such as consistency, unity, simplicity, real world metaphors, and user testing. Both approaches are concerned with presenting a seamless and convincing alternative reality, whether that involves restoration of a seemingly cut rope or storage of electronic versions of written documents in electronic file folders.

While these principles can help to guide an overall approach, it is the specific techniques employed by magicians that produce the required conviction in the viewer. By far the most important technique is that of misdirection. Fitzkee (1975) discusses six types of misdirection: simulation, dissimulation, ruse, disguise, monotony, and maneuver. Tognazzini (1993) explains how two of these techniques, simulation and dissimulation, are crucial in interface design.

In simulation, something is made to look like something it is not. For the magician, this means making the scarf seem to disappear from his hand into thin air. For the designer, simulation is

used to differentiate the user's reality from that of the programmer. Perhaps the best known example is the use of a trash can icon for file deletion instead of requesting the track and sector of the file to be zero-overwritten. Dissimulation refers to concealing real facts by pretense. In the case of magic, it involves having the disappearing scarf actually hidden in the opposite hand. An interface design example would involve asking the user for the name of the file to "remove."

The importance of these principles and techniques in visual interaction design becomes apparent in circumstances where they fail to convey the illusion. Rohrer (1999) discusses the instance of the Macintosh computer's "magical trash can." The trash can icon is used to both delete documents and to eject diskettes. Users often experience a feeling of dread at the notion of placing their diskette in the trash. Collins (1995) attributes this use of the trash can metaphor for ejecting disks as "magic that goes too far." While electronic spreadsheets can "magically" recalculate cell values, this extends the spreadsheet metaphor in an intuitive manner. Tossing objects from a real-world office into the trash can in order to retrieve them rather than dispose of them is not an intuitive practice. Note that this lack of intuitiveness can extend to the inclusion of the "Shutdown" command under the "Start" menu in Windows.

Another application of the techniques of magic can be seen in situations

where the goal is to ensure that information is not distorted or misdirected. Tufte (1997) shows that when the task involves explaining a process, creating illusions is a form of "disinformation design." He goes on to provide examples of how reviewing the procedures used by magicians in explaining how to perform their illusions can lend insight into how to do the same for information design tasks.

Psychology

Nelms (1969) states that "[t]he art of illusion is at least 95 per cent applied psychology." Similar statements can obviously be made about user interface design. Many of the techniques discussed above rely on exploiting human psychology: perceptually, cognitively, and emotionally.

Knowledge of the strengths and limitations of the perceptual systems have often been exploited in magic. Optical illusions provide a vivid example of how the visual system processes information. The principles behind them are employed by magicians in areas such as making a tabletop that is thick enough to hide a rabbit seem no wider than a deck of cards (Friedhoffer, 1996). Similar principles are used by designers in capacities such as making on-screen buttons appear three-dimensional.

At the cognitive level, magic is only interesting and mysterious if one is acquainted with the regularities of the world. Gibson (1982) has pointed out that to a very young child who does not yet possess the notion of object constancy, making something disappear is a non-interesting event. He lists twelve invariants of ecological optics that capture the regularities of common sense that must be implicitly known for notions of other realities to be effective. Exploiting these same regularities in visual interaction design produces an interface where the user intuitively knows the potential outcomes of any action based on previous interactions in the real world.

The emotional aspect of magic can be seen through the use of drama and showmanship. As Nelms (1969) points out, most tricks are too brief to

have a meaningful structure. But a skilled magician can take a seemingly simple trick and make it memorable by providing a dramatic context. The same is true for interface design. It's been said, "the computer can't tell you the emotional story. It can give you the exact mathematical design, but what's missing is the eyebrows" (Zappa, 1989). Successful visual interaction design can provide the "eyebrows" and help users better accomplish their goals.

Visual Interaction Design and Magic

While my focus has been on how the techniques of magic can aid in better visual interaction design, I'd like to end with an example of the effective use of visual interaction design to successfully portray magic. Fay (1999) presents a web-based illusion in which the viewer chooses one of six cards and the web-magician correctly removes that card from the set. While the trick can be performed with real cards, this presentation makes effective use of the medium and can continue to mystify even after repeated presentations. Although the underlying workings of the trick are simple, this version effectively combines the best elements of both magic and visual interaction design to delight and amaze. By applying some of these same principles, perhaps we can achieve a similar level of magical success in all that we design.

References

- Collins, Dave. (1995). *Designing object-oriented interfaces*. Reading, MA: Addison-Wesley.
- Fay, R. S. (1999). Simeon's Cave of Magic (www.caveofmagic.com)
- Fitzkee, D. (1975). *Magic by misdirection*. Pomeroy, OH: Lee Jacob Productions.
- Fraps, T. (1997). The blind spot. In *The Flicking Fingers The Book or Don't Forget to Point*. Tahoma: Kaufman and Co.
- Friedhoffer, B. (1996). *Magic and perception: The art and science of fooling the senses*. New York: Franklin Watts.
- Gibson, J. J. (1982). Ecological physics, magic, and reality. In Reed, E. and Jones, R. (eds). *Reasons for Realism*. Hillsdale, NJ: LEA.

Nelms, H. (1969). *Magic and showmanship: A handbook for conjurers*. New York: Dover.

Rohrer, T. (2000). Feeling stuck in a GUI web: metaphors, image-schemata, and designing the human computer interface. (metaphor.uoregon.edu/gui4web.htm)

Tognazzini, B. (1993). Principles, techniques, and ethics of stage magic and their application to human interface design. *INTERCHI'93 Conference on Human Factors in Computing Systems*, Amsterdam, 24-29 April, 355-362.

Tufte, E.R. (1997). *Visual explanations: Images and quantities, evidence and narrative*. Cheshire, CT: Graphics Press.

Zappa, F. (1989). *The real Frank Zappa book*. New York: Poseidon Press.

About the Author

Frank Marchak is a principal at Veridical Research and Design, a human factors consulting firm specializing in basic and applied research in visual perception and cognition, human computer interaction design, and usability engineering services. He received the Ph.D. degree in experimental psychology from Dartmouth College and the A.B. degree in psychology from Muhlenberg College.

Author's Address

Frank M. Marchak
Veridical Research and Design
922 South Third Avenue
Bozeman, MT 59715-5261 USA
Tel: +1 406.522.9045
Fax: +1 406.522.9048
e-mail: fmarchak@veridicalresearch.com

About this Column

Your comments, ideas, and submissions are welcome. Send email to the editor, Frank Marchak, at chi-Bulletin-VID@acm.org. Alternatively, you can write to Frank Marchak at Veridical Research and Design, 922 South Third Avenue, Bozeman, MT 59715-5261 USA.

Visual Interaction Design is a Special Interest Area of SIGCHI focusing on the visual aspects of interaction in interface design. The goals of the Visual Interaction Design Special Interest Area are to act as a focal point for visual interaction design interest within SIGCHI, to advance visual interaction design as an integral component of HCI, and to integrate visual interaction design with the rest of SIGCHI.

To subscribe to the Visual Interaction Design ListServ group, send email to listserv@vtvm1.cc.vt.edu with the single line in the body: subscribe VISUAL-L <your name>. You can also access the list via net news: internet.computing.visual-l