Magic as a Metaphor for Ubiquitous Computing

In fiction, magic often augments familiar objects with fantastical capabilities. User Experience Designer **Mike Kuniavsky** explores magic as a design metaphor to help users understand how newfangled ubiquitous computing products can be used.

While most people in the 1980s were focusing on the new microcomputers, Mark Weiser of PARC was imagining a future in which computers were invisible and everywhere. He coined the term ubiquitous computing (typically shortened to "ubicomp"), realizing with others at PARC that if computing power continued getting cheaper and smaller, it would be possible to put information processing into virtually anything. In 1996, he predicted that by 2005, computers would be hiding "in walls, chairs, clothing, light switches, cars—in everything."

That prediction has proven true: computer hardware is now cheap enough to be included in all kinds of devices—digital cameras, mobile phones, MP3 players—making everyday things into "smart things." And the catalog of things that depend on information processing is growing: The Toyota Prius' engine and the Adidas 1 shoe would be impossible

computers, sensors, and actuators. Ubicomp objects use embedded information processing, wireless networking, sensors, actuators, and displays to engage with the world.

What's missing in this technological vision, however, is a consistent design language that explains how these devices work to the people who will use them. No common verbal, visual, or interaction techniques have emerged to help users navigate a world filled with augmented devices.

The desktop PC faced a similar mismatch in the early 80s: its commercial potential was clear, but it lacked a user-centered explanatory framework. Back then, each application invented its own interface paradigm, and inconsistency became the rule. The desktop metaphor (again, props to PARC) changed that. It created a single set of ideas about how applications could act and how they could interact. What was learned in one tool could carry over to another, and the two could be used together. This allowed designers to progress from reinventing the wheel every time to building on a conceptual framework. That framework proved very robust, moving from one operating system to another and one hardware platform to another, outlasting the products (and sometimes the companies) that embraced it. Its longevity marks it as a good metaphor.

Metaphor, in general, has proven effective for structuring design. The shopping cart metaphor has been a cornerstone to e-commerce interaction design. Metaphors provide constraints and create common language and visual platforms to build on. A shared metaphor helps designers, engineers, project managers, marketers, and support-personnel to communicate and to develop along a trajectory defined by that metaphor's implicit boundaries.

This is where magic can help us. The desktop metaphor is largely inadequate to describe the wide range of form factors and functionality possible with devices that do not have screens or pointers. Mobile phone screens hardly resemble 1970s offices (the inspiration for the desktop metaphor). A shoe that dynamically changes its functionality

using sensors and a small CPU looks even less like an office. And yet nothing currently is replacing the desktop metaphor. Phone user interfaces still have file folder tabs and typewriter keyboards: they are little computers designed to look like big computers.

Magic can replace the desktop metaphor in ubicomp devices, opening the door to new classes of objects and interactions. This is neither an argument that magic exists, nor an argument for concealing how technology works from its users. I'm talking about the metaphor of enchanted objects—everyday objects that sense, analyze, act and communicate—and that's exactly what ubicomp objects do.

Designers of ubiquitous computing devices already use the language of enchanted object in their designs: Ambient Devices' Orb is a crystal ball for data.

The differences between ubicomp objects and their unaugmented counterparts are analogous to the differences between enchanted objects from their non-magical equivalents. Magical objects in myth have a number of qualities that recommend them as a design metaphor:

- ***We implicitly know how to use them.*** Magical objects typically are special versions of everyday ones. Think of the mirror in *Snow White*. Familiarity gives magical objects a baseline of known affordances and functions that can be augmented by their magic status. For users of new technologies, this could make them more approachable.
- ***They are physical.*** They are tangible (usually pre-industrial) objects that have familiar physical properties of size, weight, shape and color. Fairy tales are full of magic trees, rocks, shoes, axes, etc. Ubicomp objects are in shoes, clothes, phones, etc.
- ***They have a variety of interaction methods.*** Myth allows for many means of interacting with enchanted objects: Ali Baba's cave opens with speech, Aladdin's lamp is rubbed, Jack's beanstalk beans are planted, some talismans are swallowed. Ubicomp objects also can have any type of input—they don't have to have a screen or a keyboard.
- ***Magic objects are not humans, and we do not expect them to act human.*** The relationship between a magic item user and the item is one of user to tool. The tool may be hard to master (as Mickey Mouse found out with the brooms in *Fantasia*), but it is the user who is in control, not the tool. Enchanted objects may be stubborn, but they're rarely smarter than people or act like them. Concepts like ambient intelligence are more ambiguous, implying the device can, at some level, be as intelligent as humans.
- *There is widespread disbelief in magic.* Rarely do people take claims of magic literally, which may make it clear that magic is a metaphor and only a metaphor. The desktop metaphor did not slavishly recreate a desktop (few people keep trash cans on their desk) and ubicomp items do not need to behave exactly like their mythological counterparts.

Moreover, designers of embedded technology devices already use the language of enchanted objects in their designs, even if they do not acknowledge it explicitly: Ambient Devices' Orb is a crystal ball for data, Nokia's Medallion pendants are necklaces with moving picture jewels, the Symbol RS-1 barcode scanner is a ring. Clothes, cards, boxes, jewelry, amulets, wands, and books transcend many myths and cultures and regularly appear as enchanted objects. Creating technological versions of them can be a way of implicitly explaining what the technology does, how to use it, and what behavior to expect.

An important part of design is understand at what point an abstraction provides less value than the complexity it introduces. Too little abstraction looks like DOS. Too much abstraction looks like Microsoft Bob. Magic is at the right level of abstraction to provide a strong interaction metaphor for ubiquitous computing. Someday we may wave accelerometer-enabled wands to summon search engine genies and encrypt mail with biometric rings, and it'll all seem as comfortable as dragging a document to the trash.