

# Information Metaphors

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What is hypertext? Is hypertext the sum of the various systems that have been developed which exhibit linking properties? Aren't traditional books like encyclopedias, which also exhibit linking properties, also hypertext? Couldn't any piece of text that refers the reader to another piece of information or, really makes any reference at all be considered hypertext?

What I wish to argue firstly in this paper is the hypertext is really an information metaphor, a way of conceiving information. Hypertext belongs to a family of prescriptive information theories. It dictates that information should be constructed in a particular manner. The basic supposition of hypertext is that "everything is intertwined" and should consequently be linked together to show this relation. It generally conceives information as nodes and link networks forming navigable paths that can be toured, returned to, and referenced. While there are now perhaps millions of instances of hypertext, not any single one of them is the paradigmatic hypertext. I assert that each of the systems we deem hypertext are really just pieces of information which conform to a more general information metaphor, what hypertext really manifests itself as. What we see as we read Nielsen's "The History of Hypertext" is the evolution of an information theory from its infancy to mature examples.

I consider object-oriented programming (OOP) to be another information metaphor, a peer to hypertext. It organizes information into hierarchies of data "classes" that are

mediated by actions or methods, computer instructions on how to manipulate the data. Again OOP is a prescriptive theory, it specifies how systems of information ought to be designed. Much like hypertext, OOP is not any single system, but a metaphor for how systems ought to be built. Several different programming languages follow, in part or wholly, the edicts of OOP.

Agent-based interaction is a much more recent metaphor for information manipulation. As Pattie Maes, one of agent theory's main proponents puts it; "The metaphor used is that of a *personal assistant* who is *collaborating with the user* in the same work environment."<sup>1</sup> It treats information as the domain of personified, intelligent, and autonomous agents that are capable of exchanging information with other agents and are supposed to be intelligent enough to carry out the wishes of the entities with which they interact. Agent-theory is also a prescriptive theory, it says we ought to design our information to be worked upon and embodied in anthropomorphized software. Several different attempts have been made to successfully create agents, but none have really been wholly successful.

"Okay, so hypertext is a metaphor, one of many," you say, "but what does that have to do with anything?" I'll be blunt: hypertext and object-oriented programming are surprising limited and astonishingly poor metaphors for information. Neither fully take into account the fluxist and almost lifelike nature of information. Hypertext provides an

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<sup>1</sup> P, Maes. "Agents that Reduce Work and Information Overload." *Communications of the ACM*, Vol. 37, No. 7, pp. 31-40, 146, ACM Press, July 1994.

(<http://pattie.www.media.mit.edu/people/pattie/CACM-94/CACM-94.p1.html>)

excellent methodology for managing large chunks of static information and organizing them relationally. OOP provides a rigid and orderly method for reusing information. Both fall short in dealing with rapidly changing information landscapes. Agent technology has the possibility of being able to adequately manage rapidly changing and evolving information, but has thus been far too complicated for any one to implement on a large scale. I wish to offer an alternative metaphor that is both prescriptive and descriptive, describes both information and its structure and suggests how software ought to be constructed in support of information.

Consider our rhetorical universe of information as an ecosystem<sup>2</sup>, in which the basic constituents are organisms capable of growing, evolving, and adapting. To borrow from the language of memetics, information could be considered as “memes” the information equivalent of “genes.”

The literature of the HCI community has been flirting with the idea of a biological model for computing more and more as of late. The artificial life work at the Santa Fe Institute and projects like Amalthea<sup>3</sup> at the MIT Media lab are starting to draw attention. People are also beginning to conceive the Internet as a sort of information ecology<sup>4</sup>. The most recent version of the ACM's *interactions* contains an interesting discussion of computer interfaces in terms of ecological models: “Cultural Representation Interface Cultural

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<sup>2</sup> Marilyn Cooper (1989) approached writing, the creation of information, with a biological model in her “Ecology of Writing”

<sup>3</sup> <http://moux.www.media.mit.edu/people/moux/papers/PAAM96/>

<sup>4</sup> <http://www.javaworld.com/javaworld/jw-11-1997/jw-11-miko.html>

Representation in Interface Ecosystems” by Andruid Kerne. A recent article on Feed<sup>5</sup> also discussed the future of operating systems in terms of competing organisms in an ecosystem. Microsoft’s whitepaper for Millennium<sup>6</sup>, their next generation operating system also makes allusions to biological ideas (and, coincidentally uses terminology similar to the “Borg” from *Star Trek*).

So how would a biological metaphor describe information? Typically it presents information in the same way that biology conceives living beings, as the result of a process of evolution. Information is not simply composed of links and nodes, but more lifelike; it can recombine, mutate, evolve, die from neglect, thrive through copious attention, and fight against competing information. I have found that it is not difficult to think of information as taking on a life of it’s own. Usenet, for instance can be seen as being an ecosystem for information. Consider how net news threads that are popular thrive whereas less popular ideas are quickly deleted from the server to make way for new ideas. This, to me, is quite similar to the way in which a living being must compete in order to survive in its natural environment.

Now that we have briefly covered the descriptive aspects of a biological model for information, let’s turn to the prescriptive aspects. What does a biological model for information say about how we ought to construct our information systems and accompanying software tools? Software architectures ought to be constructed (form follows function) to allow information to exhibit more biological features. It is quite

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<sup>5</sup> [http://www.feedmag.com/html/feedline/98.04johnson/98.04johnson\\_master.html](http://www.feedmag.com/html/feedline/98.04johnson/98.04johnson_master.html)

<sup>6</sup> <http://research.microsoft.com/os/Millennium/mgoals.html>

difficult to develop thoroughly biological software or information using current tools and techniques. By thoroughly biological I mean:

- Adaptive
- Autonomous
- Evolutionary
- Self-organizing

Some of the recent advances of genetic techniques for programming and artificial life should be taken up by information theorists and used to give information an explicit life of it's own, perhaps some sort of information equivalent of DNA.

I would like to go into more detail, but it's not really possible to clearly explain all of this in a five page paper. However, it is my hope that this paper will cause you to consider information in a different light altogether. Hypertext and object-oriented programming will probably be the dominant metaphors for storing, retrieving, and manipulating information over the next few years, but it is interesting to consider alternatives.