hypermedia, eternal life, and the impermanence agent

Noah Wardip-Fruin
Media Research Lab, New York University
noah@mrl.nyu.edu

introduction

The story of hypermedia, in which the Web is a recent chapter, begins with a vision of transforming the brain's associative connections into media — media that can be infinitely duplicated and easily shared — creating pathways of thought in a form that will not fade with memory. In recent years, hypermedia has begun to permeate our lives. But it is not as we dreamed: constantly growing, with nothing lost, only showing what we wish to see. Instead we find 'Not Found' a nearly daily message.

The story of software agents begins with the idea of a 'soft robot' — capable of carrying out tasks toward a goal, while requesting and receiving advice in human terms. In recent years, a much narrower marketing fantasy of the agent has emerged (with a relationship to actual agent technologies as tenuous as Robbie the Robot's relationship to factory robots) and it grows despite failures such as Microsoft Bob. Now we often see agents as anthropomorphized, self-customizing virtual servants designed for a single task: to be a pleasing interface to a world of information that does not please us.

The Web disappoints us with its too-perfect reflection of our ambivalent relationships with impermanence and openness: dynamic and unstable, diverse and overwhelming. In response, some Web businesses are marketing fantasies of agents that will find for us only the information we desire, sheltering us from chance encounters with unpleasant content and broken links. The Impermanence Agent is a different response.

The Impermanence Agent, developed over the last year, interacts with users as a web browser window. The Agent is a storyteller, telling a personal story, a story of impermanence. The Agent is meant to be experienced peripherally, over time — not 'visited.' It tracks the user's web browsing, makes copies of the texts and images the user views, and then customizes its story by incorporating this material into it. The Agent customizes until none of its original story is left.

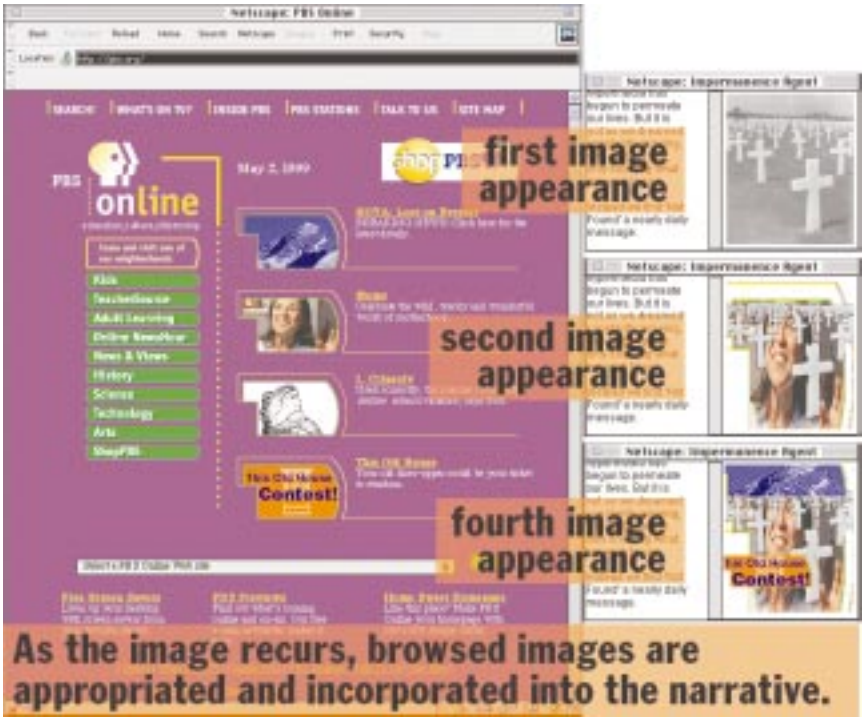

Figure 1: The images and texts of the Agent's story incorporate, and are eventually replaced by, materials from the user's web browsing

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a box of letters

1 Ikkyu, the Zen master, was very clever even as a boy. His teacher had a precious teacup, a rare antique. Ikkyu happened to break this cup and was very perplexed. Hearing the footsteps of his teacher, he held the pieces of the cup behind him. When the master appeared Ikkyu asked: “Why do people have to die?”

> “This is natural,” explained the older man. “Everything has to die and has just so long to live.”
>
> Ikkyu, producing the shattered cup, added: “It was time for your cup to die.”
>
> — “Time to Die” from Zen Flesh, Zen Bones [Reps61]

...infinite reproducibility

....lossless archiving

.....continual versioning

Whatever we may say about digital culture, it is always time for something to die.

2 When I was nine months old, still in a walker, on a day that I do not remember, my mother was sitting in our living room. From where she sat she could see down our hallway, past the front door, to the place where the hallway turned in the direction of my bedroom.

From the bedroom came a crashing sound. But perhaps this was not so unusual, and it did not sound to her mother’s ear as if I was hurt, so she waited. In time, I came clumsily down the hallway, dragging a small overnight suitcase. That hallway I do remember, with white plaster walls and a brass chime that the doorbell made ring (and a closet with stairs beneath it that led to a basement that may only exist in my imagination). I made my way to the front door, put my small hand on the knob, turned to look at my mother and waved (I couldn’t speak). Bye-bye. Bye-bye.

My mother tells me that she cried.

3 There is a loss of memory. I was probably trying to visit Nana, my mother’s mother. By the time of my first self-aware, narrative memories Nana was already losing many of hers. I have only hints of what she was like from my own experience, a sense of her difference, and memories of moments in the kitchen when she named my puppet monkey Minkey and made chocolate milkshakes.

I remember going to visit her in the nursing home, where she was once she could no longer walk. On this visit she thought I was her son Wally, or so I imagine. She told me how she couldn’t wait to get out of there, and back on her feet again. We took her to the house for Christmas. She looked at one of her great-grandsons, too young to be walking, and said, “He’s coming and I’m going. But I can’t get a seat.” That summer she got a seat.

4 After she died we were left with a box of her letters. Not letters she had written, but letters that belonged to her. These seemed like poor materials for reconstituting a woman — but they, the paper trail, seemed to be all that was left.

At the same time, she seemed more alive after her death than in years. While she was alive, but after she was no longer herself, we had continued to leave her to carry the burden of being her. Once she was dead we took it upon ourselves. At the memorial service we treated each other with the care that she had given.

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The paper trail is no dodge for impermanence. But here I sit, inscribing Nana's existence again, attempting another addition to the collective box of letters.

eternal life

5 Mark Bernstein wrote about web shrines for HypertextNow, pointing to memorial inscriptions on the Web "by sons and daughters, by grieving parents, by academic institutions, by an army medic who cannot forget the ravaged body of a child whose name she never learned" [Bernstein97]. He suggests that those of us who think about media should approach web shrines with profound humility — in recognition of suffering, and in recognition of the fact that none of us predicted, none of us directed, and none of us profited from this emergence in the docuverse. Now many links in Bernstein's article are broken. Yahoo! has sprouted the category Society_and_Culture / Death / Obituaries / Memorials.

Bernstein later added a link to an article from The New York Times Online, which tells the story of "a not-for-profit group named Afterlife, dedicated to preserving the Web sites of deceased surfers" [Dunn98]. Afterlife (http://www.afterlife.org) consists of "a few volunteers who have been slowly gathering information on the legal, financial and technical issues of maintaining thousands or maybe hundreds of thousands of Web sites for all 'eternity.'"

At a site called "Dearly Departed" I find the simple sentence, "We miss you Gama" and decide to include it in my essay about Nana.

6 The Internet Archive Project (http://www.archive.org) is more famous than Afterlife, and has more hubris in its aims [Kahle97], but I believe its impetus is the same.[1] We find in the Internet that which expresses and creates, reflects and shapes, our complicated relationship with impermanence. The paper trail is changing, we are changing it, and with it we are changing our contact with immutability. There is a loss of memory, not only in broken links and missing sites and that which becomes outdated — but also in that which is updated, and those threads of newsgroup and email conversations with starting points lost and potentially infinite bifurcations. At the same time, a growing amount of our culture takes a form that allows identical, degradation-proof, multiply-viewable copies.

Consider the dream of hypermedia, put forth by Ted Nelson and others over the last three decades: That, in a not-so-distant future, we read and write (view and draw, hear and compose) most everything from and to a world-spanning computer network. That everyone have the ability to produce their own documents, and connect them with any other public documents. That the author may constantly create new versions of her or his own document, and individuals may create their own versions of any public document, and that public connections made between one version of one document and another version of another will usually automatically place themselves in all the extant versions. That historical backtrack and degradation-proof storage allows us to visit any version, any moment in the network's history [Nelson93a]. To have the ultimate archive, and yet have each element of this archive constantly in process. Dynamism without loss. Impermanence enfolded within permanence.

Afterlife, and the Internet Archive, and the dream of hypermedia aren't about embalming; they're about eternal life.

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1 More focused, but perhaps equally Quixotic, is the work of librarians hoping to preserve traditional scholarly permanence. Consider this, from "Books to Bytes: The Electronic Archive" (New York Times Online, April 8): "If we increasingly as scholars rely on various digital resources and those aren't preserved, we won't have that kind of accountability and trail of how research develops," said Margaret Hedstrom, an associate professor at the School of Information at the University of Michigan at Ann Arbor. "It's both the loss of the information and the whole validation of scholarship. Those are the implications of not solving this problem." [Hafner99]

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> Remember the analogy between text and water. Water flows freely, ice does not. The free-flowing *live* documents on the network are subject to constant new use and linkage, and those new links continually become interactively available. Any detached copy someone keeps is frozen and *dead*, lacking access to the new linkage (and, if there were any substantial body of in-links at the time the copy was made, probably most of those as well).
>
> — Ted Nelson [Nelson93b]

7 Even the origins of hypermedia contain traces of the quest for eternal life. In 1945, Vannevar Bush published "As We May Think" — an article now widely considered the genesis of hypermedia [Bush45]. In it Bush writes of the memex, a "future device for individual use... a sort of mechanized private file and library" in the shape of a desk. The memex, as described, uses methods such as microfilm storage, dry photography, and analog computing to give post-war scholars access to a huge, indexed repository of knowledge — any section of which can be called up with a few keystrokes.

The field of information retrieval has been inspired by Bush's vision of simple, elegant information access. Hypertext and hypermedia, however, have been inspired by Bush's description of the scholar creating links and pathways through this information — associative connections that attempt to partially reflect the "intricate web of trails carried by the cells of the brain." The trails envisioned freely interconnect all the contents of the memex, which include both public documents and personal notes, diagrams, and photographs. Bush describes a great thinker's disciples not simply inheriting that person's "additions to the world's record," but also the connections, the structure, the tools by which that work was created.

In this vision, we are not only immortalized by our additions to the paper trail (which are stored identically in innumerable memexes), but can preserve and pass on our very pathways of thought. These pathways will not break or fade. Those who follow us can keep these connections in use, expanding and updating them, tending to our virtual immortality in both word and connection. The volunteers of Afterlife may be seen, perhaps, as the progeny of this vision, half a century later.

4 the internet and the agent

8 Like grains of rice on a chessboard, Internet traffic doubles and redoubles within a single year.[2] 404 Not Founds notwithstanding. 503 Forbiddens notwithstanding. Broken images notwithstanding. It seems we can live without eternal life.

Or can we? In "Weaving a Better Web" Byte writes, "HTML isn't dead, but it is suffering from its own success — and every time you get a '404 URL not found' error message, you're suffering, too" [Mace98].

Did Byte write this to remind us, lest we forget suffering in our embrace of an impermanent

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2 This redoubling was widely publicized after an April 15, 1998 report from the US Commerce Department ("The Emerging Digital Economy") stated that Internet traffic was doubling every 100 days. URL verified: May 1999. <http://www.ecommerce.gov/emerging.htm>. (The http://www.ecommerce.gov site also contains information on the May 25-26, 1999 conference, "Understanding the Digital Economy — Data, Tools and Research.")

'Grains of rice on a chessboard' refers to the various stories of a king who agrees to pay a subject 1 grain of rice for the first square of the chessboard, 2 for the second, 4 for the third, and so on through the progression. The stories end either with a bankrupt king or a headless subject.

Web? In this formulation, is it the loss that is our suffering — or the message, the reminder, the error? Is HTML, the stuff of our newly-woven paper trail, a life of itself, suffering, perhaps to die — while we pull silk from our abdomens in overtime, doubling an already-massive body every few months?

What can we do, except get rid of the message, the offending 404? We can't stop back-end filtration — we can't stop impermanence in the system.[3] Byte itself is now a thing of memory. We may write "Web Pages Must Live Forever" [Nielsen98] but we must also know that they cannot.

> The idea of an agent originated with John McCarthy in the mid-1950's, and the term was coined by Oliver G. Selfridge a few years later, when they were both at the Massachusetts Institute of Technology. They had in view a system that, when given a goal, could carry out the details of the appropriate computer operations and could ask for and receive advice, offered in human terms, when it was stuck. An agent would be a 'soft robot' living and doing its business within the computer's world.
>
> — Alan Kay [Kay84]

The concept of a soft robot, or agent, is a very broad one. As is the concept of a mechanical robot. But each, in contact with our pervasive fantasies of human servitude, has spawned very narrow, anthropomorphic visions in entertainment and marketing.

From a muddling of these visions with ongoing agent research, the image has arisen of a perfect information servant — an agent with a singular task: to be a pleasing interface to a world of information that doesn't please us. Despite the disaster of Microsoft Bob, this image has continued to gain momentum. Now the Web, in its too-perfect reflection of our ambivalent relationships with impermanence and openness, is found displeasing by many. It is wonderfully dynamic, but unstable. Its openness is exciting, but we complain of information overload and find ourselves embroiled in censorship battles. We suffer, apparently, with each 404. There is continual talk of the Web being undigestible, uninteresting, uncomfortable, and difficult to understand. Yet we do not wish to abandon it, for all our talk of its faults.

Across the Web, many are attempting to sell fantasy images of an agent/servant as the key to mapping cyberspace into a comfortable coherence. Sometimes a fantasy agent image is used to market a much less sophisticated agent. Sometimes the fantasy of the agent is used to market something that isn't an agent at all. The signs of these fantasies can be read in the language of sites from NewsBot ("With NewsBot at your service, you'll always know...")

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3 "front end (n.), front-end (adj.) — whatever stands between you and a system. A front end can be the terminal in your office, for example. A front-end program is one which mediates between a user and some other system or program, perhaps collecting data for it by quizzing you." (Ted Nelson, Dream Machines, p.9)

The back end is the system with which the front end interfaces. It is where all the data in the above data collection example is stored, along with the information about how it relates to other data.

In hypermedia systems, what one sees of the network, and how one sees it, is determined by the configuration of the front end (e.g., the client, the browser). The network one is looking at (what is available to see — e.g., the Internet) is what the back end contains.

Questions of filtration, particularly those of how we use back-end filtration to determine what is available to see (and to whom), are of great importance at this point in Internet history — a topic I address at greater length in "Reading and Writing, Linking and Filtering" in Intelligent Agent 2/2 [Wardrip-Fruin98].

to The Mining Company ("Guides Do The Hard Work, So You Don't Have To"), and are brought nearly to the level of parody at Ask Jeeves ("Jeeves here, at your service. I'm your host and I'm here to help you find what you're looking for, whatever that might be. I've spent years perusing the internet (so you don't have to), and I have found wonderful sites that will help simplify your life...").

Figure 2: Another image, before alteration

10 During the last year, I have been working with a.c. chapman and Brion Moss to create the Impermanence Agent.

Like the fantasy agents, which are expected to give advice rather than receive it, the Impermanence Agent tells stories before listening to them.

The Impermanence Agent doesn't separate good information from bad, but combines family history with other fictions to tell stories of impermanence. They are Nana's stories, and mine, and each user's.

They are the user's not simply as audience, but also because the Impermanence Agent is always looking over the edge of the Netscape windows on each user's desktop, and using the information it gathers, the information users show it, in its storytelling to that user. It is a personal agent, a customizing agent, an illusion of an agent.

Figure 3: Image after first alteration

The Impermanence Agent appears, itself, as a Netscape window. It is a combination of server and client-side applications written in PERL and JavaScript, making liberal use of existing software such as WordNet (http://www.cogsci.princeton.edu/~wn/) and ImageMagick (http://www.wizards.dupont.com/cristy/), and benefiting much from the willingness of Duane Whitehurst to modify some existing code and create some new.

The Impermanence Agent is our addition to the box of letters. We have created the stories with which it begins, stories like Nana's, stories like this one. We have created the means by which it selects texts and images from the user's browsing and combines them with its own, customizing the story. We have set in motion the impermanence in which these pieces drawn from the user's Web browsing eventually entirely replace the stories we have created. And, because we can't help ourselves, we have also saved these stories. All of this will work until the next version of Netscape replaces the current one. Perhaps even longer.

And it will last longer than it works, like the boxes of disks we each have, formatted for filesystems not read by any current operating system. Like the pictures of people, four generations back, that none of us ever met.

The Impermanence Agent is art meant to be experienced peripherally, to be left open on the desktop for a week. In its stories, children are born, letters are burned, we are duplicated and saved and lost. The texts and images of our daily browsing are incorporated into, then wear away, then become something new within the space that held the Agent's stories. Then the story has been told.

Figure 4: Image after third alteration

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