CollageMachine

An Interactive Agent of Web Recombination

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Abstract

CollageMachine *builds interactive collages from the Web. First you choose a direction. Then* CollageMachine *will take you surfing out across the Internet as far as it can reach. It builds a collage from the most interesting media it can find for you. You don't have to click through links. You rearrange the collage to refine your exploration.*

CollageMachine *is an agent of recombination. Aesthetics of musical composition and conceptual detournement underlie its development. The composer John Cage and Dada artists such as Marcel Duchamp and Max Ernst used structured chance procedures to create aesthetic assemblages. These works create new meaning by recontextualizing found objects. Instead of functioning as a single visual work,* CollageMachine *embodies the process of collage making.*

CollageMachine *[1] deconstructs Web sites and re-presents them in collage form. The program crawls the Web, downloading sites. It breaks each page down into media elements—images and texts. Over time, these elements stream into a collage. Point, click, drag, and drop to rearrange the media. How you organize the* elements shows CollageMachine *what you're interested in. You can teach it to bring media of interest to you. On the basis of your interactions,* CollageMachine *reasons about your interests; the evolving model informs ongoing choices of selection and placement.* CollageMachine *has been developed through a process of freely combining disciplines according to the principles of "interface ecology."*

Motivation

As a composer, I set out to bring a musical sensibility to browsing the Web. From music, I brought temporality—rhythm, tempo, duration—into the interactive medium. Color is a form of pitch, with its own sensibilities of harmony and counterpoint. As in West African music, polyrhythm functions as a cultural mechanism for composing several voices which are substantially independent and on equal footing and at the same time fundamentally interdependent. Here a grid of overlapping media

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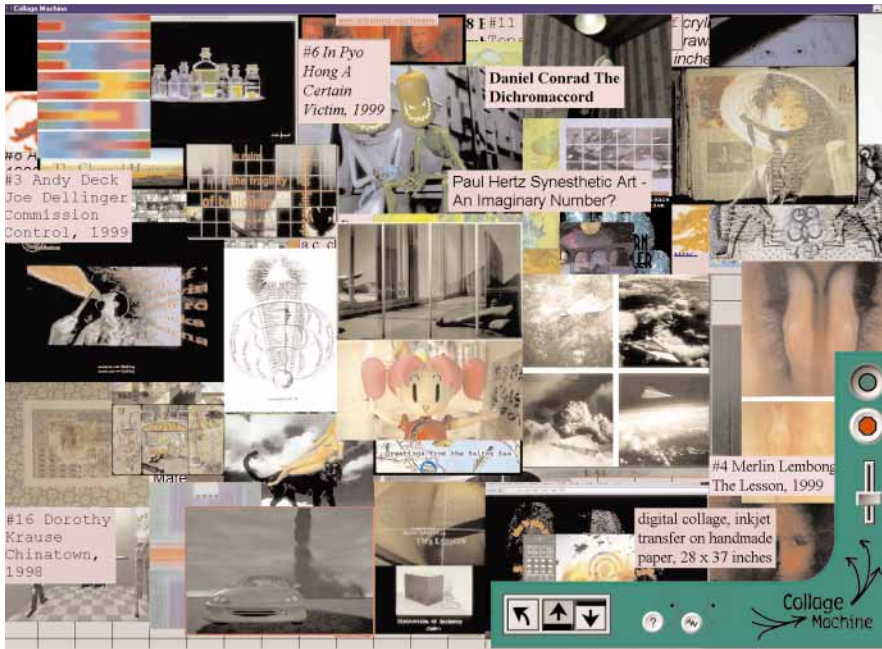
Fig. 1. *CollageMachine* image from the 1999 Digital Salon site. Images courtesy Andruid Kerne.

elements creates visual polyrhythms. Indeterminacy ensures that, like snowflakes, no two emerging collage states are alike.

The work has taken on the character of a tool as well as that of a composition. I have sought to give people a different kind of control in their interactive experiences. The user is invited to rearrange her or his Web perspective instead of simply digesting someone else's Web pages.

A tree is a hierarchical data structure, with a root, parents, and children. Deleuze and Guatari have developed the term *rhizome* to describe nonhierarchical, fluid semiotic chains and organizations of power [2]. Literally, rhizome refers to a fibrous, branching root structure distinguished by the absence of an ultimate source of emanation. The Web is more or less rhizomatic—an open graph with an infinite potential for crosslinks. Hyperlinks create a structure that is not inherently treelike, even though trees are sometimes built with them.

Yet on the Web, hierarchies persist. A pervasive example is the relationship between author and audience, or in economic terms, producer and consumer. This hierarchy is intensified by extreme differences in economic scale. Hierarchies are also created by search engines, particularly given that most of them sell positioning on keywords as a commodity, by directory trees like Yahoo, which also position sites based on business relationships, and of course by corporate megaportals like Disney's Go Network.

CollageMachine overturns this hierarchy by reassembling the building blocks of content (Figs. 1, 2). Initially all content is on the same level. When the user invokes the interactive interface, she creates her own priorities rather than accepting the values represented by content providers. The user is afforded a new role in determining signification values. The hierarchy is overthrown, or at least recast, through the interaction, the adaptation of the agent, and the resulting reassembly of semiotic codes. The Situationists used the term *detournement* to refer to "the reuse of preexisting artistic elements in a new ensemble" so as to radically change the way their meanings are interpreted [3]. In *CollageMachine*, the normal flow of content packaging on the Web is detourned.

Collage and Emergence

Collage is one of the most important artistic concepts of the Information Age [4]. The word literally means "pasting" or "gluing." Braque and Picasso made the first works in the Euro-American art world which fall under the larger rubric of collage. This work is called *papier collé*. In

Still Life with Chair Caning (1912), Picasso used a printed piece of oilcloth to represent caning. In such work, the pasted object functions as a visual representation of what would have otherwise been painted. It fulfils certain visual design goals.

The Dada sense of collage—which is what I mean when I use the term—takes the process a step further. A few years after *papier collé*, Dada artists such as Tristan Tzara and Louis Aragon credited Max Ernst with inventing collage. According to Ernst, *"Si ce sont les plumes qui font le plumage, ce n'est pas la colle qui fait le collage.* "If plumes make plumage, glue does not make collage [glue-age]" [4]. In other words, making collage goes beyond physical and visual pasting. The pasted object functions semiotically. It introduces new meaning to the work. Where does this new meaning come from?

Collage recombines found objects. Marcel Duchamp did the first work with found objects or "readymades" in the Euro-American art world. In 1917, his *Fountain*, submitted to the Society of Independent Artists Exhibition in New York, consisted of an unadorned urinal [5]. The resulting

Fig. 2. Another collage made from the 1999 Digital Salon Web site.

outrage demonstrated that the context of an object plays a key role in its meaning. According to the anthropologist Clifford Geertz [6], the nature of meaning is interpretive, not objective. Context plays a key role in the semiotic webs of significance that we weave.

Collage artists utilize preexisting images, texts, videos, sounds, and Web pages [7]. The process of recombination includes selection, cutting, and pasting. New meanings are produced both by the presen-

tation context of the found objects, as in *Fountain*, and also by their relationships to each other. This is what it is that, although "not glue," makes collage. One technique of recombination is to create ambiguity. Ambiguity arises through the combination of disparate elements whose connection is unclear or multivalent. Audience members are forced to make their own interpretations. A multiplicity of new meanings can emerge, and with them new ideas.

Indeterminacy is often invoked as a method for selecting materials in the combining process of collage. A chance procedure is used to randomly select significant elements which become part of a work or to choose values of parameters which determine its nature. Work that utilizes indeterminacy is not itself entirely random. Metalevel decisions of what elements can be selected and how to combine them based on the chance procedure structure the effect of the randomness.

In recent decades, creative-cognition researchers have uncovered scientific validation for the methods of the Dada collage artists. A key concept of creative cognition is *emergence*. "An image displays

Fig. 3. A news collage, which pulls content from *The New York Times, CNN, USA Today*, and the BBC.

emergence when its parts or features are combined such that additional, unexpected features result, making it possible to detect new patterns and relations in the image that were not intentionally created" [8]. The experience of emergence is provoked by the semiotic recycling and combining of collage. Novel combinations that lack a single clear meaning have been shown to play a role in motivating people to search for and discover emergent

features [9]. Mental blends also stimulate creative discovery [10]. These cognitive processes can lead to deep restructuring of knowledge.

Breaking Down Documents

Browsing is more than a matter of efficient retrieval of information. By definition, it is a casual process, based as much on whims as on goals. Play and work are mixed. *CollageMachine* brings recombination to the center of the browsing process. Rather than presenting whole documents to the user, it breaks the Web pages down into their constituent media elements. HTML documents are deconstructed. Paragraph tags and table cell boundaries are used to decide how to break passages of text down into reasonable-sized chunks. Images and hyperlinks are also extracted. *CollageMachine* shifts the granularity of browsing from Web pages to media elements. Not only can the free association of dynamically generated collages spur the emergence of new ideas, but users may be more interested in the constituent elements than in the documents themselves (Fig. 3).

Agent

By an agent, I mean a program that acts on behalf of the user [11]. The agent makes decisions on its own volition. It learns about the user's interests. It can run autonomously without direct input from the user. It adapts in response to the user's ongoing expression. One type of agent is called a *recommender system*. These offer suggestions to the user about interesting content. Another type creates graphic representations based on a set of constraints. *CollageMachine* is both of these.

Current Implementation

CollageMachine is currently implemented as a signed Java applet that is freely available on the Internet at http://mrl.nyu.edu/ecology/collageMachine. The user initiates a session by specifying one or more URLs or searches. A grid, initially empty, is gradually filled by a slow stream of media

Fig. 4. Collage from a search on archaeology.

elements. Like a musical composition, the collage session unfolds over time. Internally *CollageMachine* downloads and parses the initial Web pages in order to create collections of media elements and links. The program iteratively engages in a series of decisions about

- which media elements to add to the representation,
- where on the screen to add them,
- the order in which to stack overlapping elements on screen,
- which media elements to delete from the visual representation (once a large number have accumulated),
- which links to recursively follow,
- when to uncache media elements and links.

These decisions are based upon a system of floating point weights which feed weighted randomSelect() operations. Weights are derived according to MIME type, distance from the initial URLs (breadth-first, rather than depth-first traversal is preferred), time on screen, and the user's interests (Fig. 4).

Interactive Interface

The autonomy of the agent is balanced by the interactive interface, which provides the user with the capability to express interest. This same interface also manipulates the visual state of the collage. Therefore, unlike in other recommender systems, the user never has to engage in a special process of rating documents or media elements just to inform *CollageMachine*. The recommender system is seamlessly integrated with collage browsing and creation. Expression of interest and

arrangement of the collage are the same activity. The browsing user responds to "recommendations," as in Lieberman's *Letizia* [12], except that here the recommendations are represented visually in the midst of the streaming collage by their constituent media elements. The user may activate one of three tools for point and click, drag and drop interaction:

Go there. Open a window showing a page. (If you click on a hyperlink, the page is the hyperlink reference. Otherwise it is the page that contains the media element.) Express interest in that place and in the selected element. Lift the element to the top. This connects the collage browsing experience with the typical browsing experience.

I Like/Grab. Express interest in a media element and others like it. Lift the element to the top. Reposition elements by dragging them.

I Don't Like/Cut. Express dislike of a media element and others like it. When you click a media element, it is immediately deleted.

Spreading Activation Network of Weights

Changes to the weights effected by interaction are propagated to the underlying data structures through a spreading activation network [13]. The program internally maintains nodes that represent each page as a collection of media elements; it also contains a directed graph that represents the pages' connecting hyperlinks. The user's expression of interest or lack of interest is propagated through this network, with a damping factor. The altered weights feed back into subsequent randomSelect() operations.

Interface Ecology

CollageMachine has been developed according to principles of musical composition, computer science, graphic design, semiotic postcriticism, and other disciplines. None of these has been considered ultimate. Instead they all contribute with equal value to the integrated conception and development of the Information Age ecosystem [14]. This ecosystem is an interactive environment that creates conceptual, cultural, political, technological, economic, and personal relationships. Interface ecology is a metadiscipline that comprises the dynamic intersection of media, disciplines, and cultures. Interfaces are the border zones where these systems of representation meet. Allowing them to meet on equal terms and rhizomatically contribute with equal value opens the potential for hybridization. New combinations emerge. Interface ecology also acknowledges that the process of making—from science to poetry—is essentially interpretive, not objective. Scientists and authors are in no more privileged a position than their subjects.

When interacting with computers, people are involved in a multidimensional spectrum of activities; they are more or less deliberately combining the accomplishment of tasks with entertainment, art, and education. The human-computer interface, as the gateway between the user and computation, data, and network connectivity, marshals the experience of the digital medium. In all cases, this interaction occurs in a sociocultural context, including where and when the user is on the computer, real-life activities the user is in engaged in, her personal background, the background and approach of the digital media authors and the platform developers, and the historical and economic period; it also incorporates considerations of software, graphics, text, audio and video design and authoring. Only by considering the dynamics of this open system of actors and factors when we evaluate, design, and build digital media experiences can we work the medium. I call this "interface ecology" because the dynamics of this open system—that is, the interplay and relationships of the components—is the system's essential signature.

References and Notes

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