collage machine

interest-driven browsing through streaming collage

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Abstract

People now browse the web by scanning pages and deciding which links are worth chasing. They see a limited subset of all potentially interesting pages. CollageMachine [4] stirs up the process of web browsing with cognitive strategies that promote emergence and creativity. It changes the granularity of browsing. A session is seeded with a set of web addresses or search queries. CollageMachine deconstructs web pages to form collections of media elements – images and texts – and hyperlinks. It crawls hyperlinks and recurses. Meanwhile, media elements stream continuously into a collage. The user can engage in collage design as part of browsing by selecting elements for which she feels an affinity, and removing undesired ones. These direct manipulations drive an agent, which models the user's interests in order to effect the evolution of the collage. A visualization grid allocates screen real estate to optimize display of the most interesting media elements.

Project URL:
http://mrl.nyu.edu/collagemachine

1. Browsing

In the six short years since the first Mozilla, browsing has quickly become an everyday part of information age life around the world. What does it mean? Browsing comes from a 16th century French word meaning "buds, young shoots. " [8] Literally, it means "to feed on the leaves and shoots ... or tender parts of rough plants: said of goats, deer, cattle." This is an interesting activity. On the one hand, the basic need to eat for survival is being fulfilled. It is a critical task. On the other hand a culinary sense is suggested, a whimsical sense. Which shoot looks better to eat? Next, I will browse the one which looks tastiest.

When it comes to the web, the public understands this implicitly. Hence the term, "to surf the web." Surfing has whimsical implication. A surfer seeks to catch the finest wave around. This is a very important aspect of what browsing is. Utility is connected with an ineffable sense of pleasure.

Some researchers have ignored this aspect of browsing. Card and Pirolli have published a useful series of articles about how to mathematically model web-browsing behaviors, based on the analysis of web server logs. [10,11,12] Unfortunately and perhaps unwittingly, they have limited the scope of their work. They define their work on information foraging thus, "the basic idea behind information foraging theory is that we can analyze how users and their technology are adapted to the flux of tasks and information in their environment." [11: 1] The limitations of this approach should be very clear: if you think of browsing in terms of tasks, you'll be missing more or less half of what it is. While they recognize that "most of our everyday tasks can be characterized as ill-defined problems," what they mean by this is:

Tasks might include choosing a good graduate school, developing a financial plan for retirement, developing a successful business strategy, or writing an acceptable scientific paper.. [12: 4 -- 5]

This does not sound like surfing. The values represented are all work and no play. Life is more than the solving of problems, more than utility. What about heavy.com, where androgynous samurai stand as interface gate-keepers to the funky web representations of popular hip-hop and sexual personalities? It's another world, just as important. Ethnographic research which investigates the different kinds

of behaviors of users engaging in various browsing activities in diverse contexts, such as living rooms, Internet cafes, and universities, as well as workplaces, would complement empirical quantitative analysis.

During certain parts of the browsing process, users may be more interested in particular elements of documents, than in the documents, themselves. CollageMachine reduces the granularity of browsing from whole documents to media elements. Documents are not treated as integral forms. As containers of media elements, they are sources of material for the selection stage of collage-making. Direct manipulation of these media elements is afforded. Users can move seamlessly from the collage representation to the normal browsing paradigm when they desire depth of context. As containers of hyperlink references, documents are referential structures which connect media elements in order to support the process of inference.

The granularity of browsing is also extended. It is extended in terms of objects, because no longer is a single entity presented at once. Instead the media elements collect, overlap, and build up a sedimentary residue which reflects the user's collage manipulations. The granularity is also extended in time, as the collage evolves, unless the user intervenes to pause its development. While the other cited browsing and information visualization paradigms may utilize animation for transitions, their presentation is static in the absence of user interaction.

2. Collage

Collage is one of the most important artistic concepts of the information age [14]. Literally, it means glued stuff. A good connotative synonym would be combination. That is, collage is work created by combining materials (from different sources). In general, some of those materials are not created specifically for inclusion in the collage; they are derived from found objects. The recombination of these semiotic code elements, which occurs when they are cut from their original contexts and then pasted together, is the essence of collage. The pasted object functions semiotically, in context, to introduce new meaning to the work in two ways. First, as in Duchamp's single readymades [7], the new presentation environment of the collage creates a new context for the interpretation of its elements. Additionally, the juxtaposition of elements within a collage further alters their context, and thus their meaning. It forms semiotic relationships between them.

3. Indeterminacy

Indeterminacy is one means for structuring decision-making in any of the phases of collage-making. It has a long history as a cultural method, predating Dada by more than a millennium. [15] Indeterminacy refers to the utilization of chance procedures, such as random selection operations and random factors that influence the values of parameters. Certain creative decisions are expressed in an algorithmic form that relies partially on randomness. Work which utilizes indeterminacy is not itself entirely random: the design of the algorithm which includes random factors shapes the ultimate outcome.

Tristin Tzara created "Dada poems" by cutting up the day's newspaper articles and casting the fragments. [13: 51] John Cage's Imaginary Landscapes no. 4, consists of a score which instructs each of 12 performers to manipulate the dial on an FM radio for certain time intervals which were chosen through structured chance procedures. In Music of Changes, the chance procedures structured the derivation of a score for solo piano.

CollageMachine uses indeterminacy in the selection of media elements and hyperlinks, and the placement of elements in The Collage Visualization Grid. A floating point weight is associated with each object. These weights become the basis for a series of randomSelect() operations. That is, the weight associated with a given object determines the likelihood of its selection. The invocation of chance procedures to make key decisions links CollageMachine with Dada and Cage in spirit. It keeps the process open and somewhat unpredictable. CollageMachine differs in that it embodies the process of collage-making.

4. Creativity and Emergence

The application of indeterminacy to creative processes turns out to be consistent with cognitive science. A group of cognitive scientists has broken off from the main line of that field in their study of creativity. The practices of these "creative cognition" researchers contributes to our understanding of collage. Previously, cognitive science had limited itself to the study of "highly restricted domains" of well-formed problem solving. [2: 5], such as structured puzzles like the "Tower of Hanoi". The hope was that this would lead to insights which would then be generalizable into broader understanding of creativity. Limited progress has been made through that line of inquiry.

The creative cognition researchers have included the study of fuzzier scenarios in order to cover a broad range of real-world creative practices. Through rigorous experimental investigation of what subjects do under consistent conditions, they have identified stages and structures of the creative process. While these components seem to be necessary for creative thinking, their presence is not sufficient to determine a creative outcome. In other words, creativity, by nature, includes indeterminacy. The need for indeterminacy in modelling creativity provides another indication that indeterminacy belongs in software, such as CollageMachine, which engages in creative processes.

Findings within creative cognition research describe the way collage works. A general cognitive model called Geneplore breaks creativity down into two phases:

In the initial, generative phase, one constructs mental representations called preinventive structures, having various properties that promote creative discovery.

These properties are then exploited during an exploratory phase in which one seeks to interpret preinventive structures in meaningful ways. [2: 17]

Geneplore research indicates further that when preinventive structures feature preinventive properties, they are more likely to lead to creative results.

The way that exploration and interpretation of preinventive structures lead to creative material is particularly indeterminate. While certain kinds of preinventive structures and properties create a likelihood for the development of creative material, ultimately creativity is unexpected. Creative material emerges: An image displays 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. [2: 50]

Within this general model of creativity, certain preinventive structures and particular preinventive properties describe Dada collage and CollageMachine. Mental blends are a type of preinventive structure that includes conceptual combinations, metaphors, and blended mental images. [2: 22] Clearly, these are all based on combining processes, the essence of collage. Verbal combinations accomplish similar results, where the constituents are words. Ambiguity and incongruity are preinventive properties to match with mental blend structures in order to increase the likelihood of emergence. If the relationships among the combined elements are clear and definite, there is no room for the imagination, so creativity is unlikely. Cognitive science has demonstrated that it is exactly the disjointedness of Dada collage which makes it so effective. Because the relationships between elements is not clear, the imagination -- the unconscious mind -- is spurred to make connections. The Dada artists did not work because of this explanation; indeed, the rejection of explanations, altogether, was an impetus for their collages. Nonetheless, 70 years later, the creative cognition scientists have validated their methods.

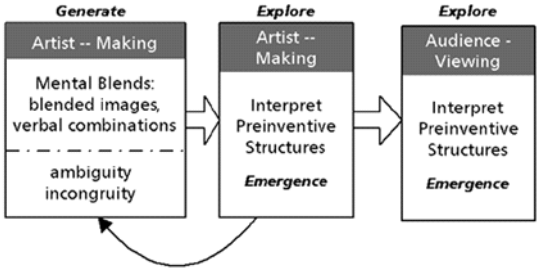

Figure 2: The Creative Cognition of Collage

The collage artist provides these structures and properties which promotes emergence. S/he gets involved in exploration and interpretation mostly on a meta level: in consideration of refinement of the provision of opportunities for emergence in the audience. Primary exploration and interpretation are the audience's role.

CollageMachine positions itself within this model of the creative cognition of collage. The program takes the generative role of the artist: it constructs ambiguous and incongruous blends of images and texts. The user does the exploring. S/he can respond to the developing collage by rearranging its elements. S/he expresses interpretive sensibility through the direct manipulation interface of the collage design tools. The program monitors this interaction in order to evolve its model of the user's interests. Meanwhile, the same model drives the ongoing process of blend generation. By situating this feedback loop in the midst of the cycle of collage generation and interpretation, emergence is promoted. The structure of creative cognition is harnessed in order to assist creative experience.

5. CollageMachine Sessions

A CollageMachine session begins with seeding. This is the specification of the web addresses or addresses from which the collage generation begins. Seeding is implemented through HTML and JavaScript. It invokes the signed Java applet which generates the actual streaming collage. The collage is generated dynamically. As web pages are deconstructed, the agent model is developed. The user influences the model by activating one of the collage design tools, and directly manipulating collage elements. Through direct manipulation the user simultaneously effects collage design and expresses interests.

6. Seeding A Collage

The user is offered three methods for specifying the seed addresses. One method, "popular blends," consists of canned sets, like a typical portal. Examples, are "news collage," which draws from The New York Times, The BBC, CNN, and ABC, and "art museums," which draws from The Louvre, The Van Gogh Museum, The British Museum, The National Gallery, and MOMA. "Searches" allows the formulation of up to five queries, which are then passed to a search engine. Most search engines produce extensive junk (in the form of unrelated shopping and advertisements). In response to formal usability tests, Google was selected as the search engine, because the results are more effective. The third seeding method allows the user to type URLs directly. Usability testing showed that it is important to specify this as "web addresses," not "URLs," because some users are not familiar with the latter term.

In any of these scenarios, the result is the same. A set of URLs is generated. (Popular search engines use the CGI "get" method: the forms which call them simply collect arguments and append them to a URL.) The URLs are passed to CollageMachine as start-up parameters.

7. Collage Design Tools

In order to steer the session and take control of the web browsing experience's visual appearance, the user activates a tool and interacts with the collage. The selected tool determines the effect of direct manipulation. Like Photoshop tools, each enables a different design effect. Each tool simultaneously expresses interests.

	**Positive Grab.** Move an element you like. Similar appear more. Enables dragging, as well as lifting.
	**Negative Grab.** Move an element you dislike. Similar appear less. This tool enables dragging without lifting. The manipulated element may be dragged under elements that the program considers more important.
	**Cut.** Delete an element you dislike. Again, similar appear less.
	**Web Page.** Browse the page associated with an element in regular browser. Similar appear more.

8. Dynamic Design – Collage Grid Visualization

Grid operation is based on the current state of weights of on-screen elements. At the start of each cycle, the elements are sorted according by weight. The stacking order is adjusted so that the most interesting elements are on top. A size for the next element is chosen from the range of accepted sizes. The size is proportional to the significance of the new element, in comparison with those already on screen. If the element is an image, the size is adjusted to mirror the aspect ratio of the original. It is also limited to the size of the original, avoiding pixelation.

Figure 3: Later state of the same news collage session.

Next, each possible rectangle of the chosen size is considered as a candidate for placement. The weights associated with these candidate grid regions are computed. These candidate weights are fed to a randomSelect() operation. Thus, the location of the new element is chosen. If the grid is considered to be full, the element with the lowest weight is deleted. Heuristics ensure that the element the cursor is presently over is never covered. They also assign special weights to the most recently added and manipulated elements, so that they don't get covered up quickly.

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