

Proposal for DHCS 2007

A Featural Analysis of Collaborative and Dynamic Web Interfaces

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[Revised version submitted 9.19.07]

Increasingly, collaborative Web interfaces such as those compiled at www.infosthetics.com use dynamic graphical user interfaces (GUIs), displaying information through nonlinearity (e.g., allowing users to choose their own paths), iconicity (e.g., displaying a map instead of a list of countries' names), and other novel, sophisticated visual strategies. While dynamic GUIs are currently more prevalent in social networking sites (e.g., digg.com), their growth suggests that they are of potential interest to academic communities who seek to facilitate and represent the collaborative construction of information. And, indeed, dynamic GUIs are gaining ground in more academically oriented sites (e.g., BBC history www.bbc.co.uk/history/british/launch_tl_british.shtml; Superfund 365 <http://transition.turbulence.org/Works/superfund/about.html>). For these reasons, an understanding of the properties of dynamic GUIs may enable more accessible and appealing sites for collaborative academic endeavors (e.g., collections of images and texts from academic settings).

However, the properties of dynamic GUIs (in either social networking or academic sites) are not readily described by existing taxonomies for visualizations (e.g., [1, 2, 3, 4]). Existing taxonomies tend to draw their primes from models for the static visualization of information. Instead, additional tools are needed to analyze the common denominators and critical differences among various dynamic GUIs. Such analysis will, in turn, assist those who are developing communication spaces for collaborative endeavors. An understanding of the properties that facilitate user collaboration within onscreen environments will allow investigators to isolate and evaluate visualization strategies through procedures such as usability testing. Such analysis can, in turn, lead to guidelines for GUIs that effectively enable and represent dynamic visualizations of information, based on a well-understood communication architecture [5, pp. 362-363].

We propose that the essential properties of dynamic GUIs can be analyzed using an approach borrowed from linguistic theory: **binary distinctive features**. Our presentation proposes a feature system for analyzing dynamic GUIs and for distinguishing among subgenres within this category [6, 7, 8]. This system is based on an analysis currently underway of 50 sites archived at www.infosthetics.com. We also discuss the difference between **binary** and **scalar** features, arguing that a binary system is preferable for analyzing dynamic GUIs. The advantage of a binary feature system is its generative power: Analysts can use a finite and relatively small set of primes to describe a large number of individual items. We identify a preliminary list of 9 binary distinctive features that are strong candidates for describing dynamic GUIs. The 9 proposed features can be combined to describe, potentially, 2^9 different visual displays. That said, we argue that certain feature combinations are more likely to recur than others, and furthermore

that certain features are more likely to have [+] values than others. For example, while some features reflect properties of traditional Web interfaces (e.g., [\pm COLOR]), others tend to be used more widely, if not exclusively, on collaborative and dynamic Web interfaces (e.g., [\pm SCALING]).

Second, we demonstrate how these features manifest themselves in several examples of collaborative Web environments. One such interface, Digg Swarm <http://labs.digg.com/swarm> (an interface for the collaborative social news aggregation Website digg.com), is defined by the participation of collaborative user groups as well as by customizable user experiences. Digg Swarm uses the feature [+SCALING] to illustrate user activity in the following way. Circles appear onscreen in real time, illustrating the submission of a story. As activity occurs around a story by means of users "digging" (i.e., voting for the story to be placed on the front page of the Website), the circle containing the story grows larger. The circles illustrating submitted stories vary in size; more active stories have larger circles, less active stories have smaller circles. [+SCALING] is illustrated in Fig. 1. Although Digg Swarm is a nonacademic site, its strategies for collaboratively aggregating and visualizing information have direct applications for academic sites that also seek to use images and texts collaboratively.

When viewed through a wider lens, dynamic GUIs also embody the notions of early innovators such as Theodor Holm Nelson, who coined the term *hypertext* and proposed the collaborative electronic docuverse [9, 10]. Nelson envisioned a docuverse of electronic documents with loosely defined, flexible spaces where users could **create**, **edit**, **store**, and **reshape** their documents in ways that would be impossible on paper. Nelson's vision of electronic documents is prophetic in its description of Websites such as digg.com where users submit stories (**create**) to be voted on by users (**edit**) for viewing by users (**store**). Digg not only enables users to interact with its data but has also challenged users to **reshape** it: to "come up with the most creative and dynamic visualizations and applications [using] the Digg API [application programming interface]" [11]. Therefore, the docuverse (which Nelson has argued for over the past 40 years) is finally taking shape within innovative and novel interactions of Website developers, participatory users, and the availability of technology and software that makes these collaborations possible.

In sum, we argue that (1) dynamic GUIs are especially suited for online environments that invite collaboration by multiple parties; (2) theories for analyzing static visualization methods are inadequate for analyzing dynamic GUIs; (3) distinctive feature theory offers a model for analyzing and classifying dynamic GUIs; (4) identifying the distinctive features of dynamic GUIs will facilitate the creation of guidelines for their effective use in collaborative sites, both academic and nonacademic.

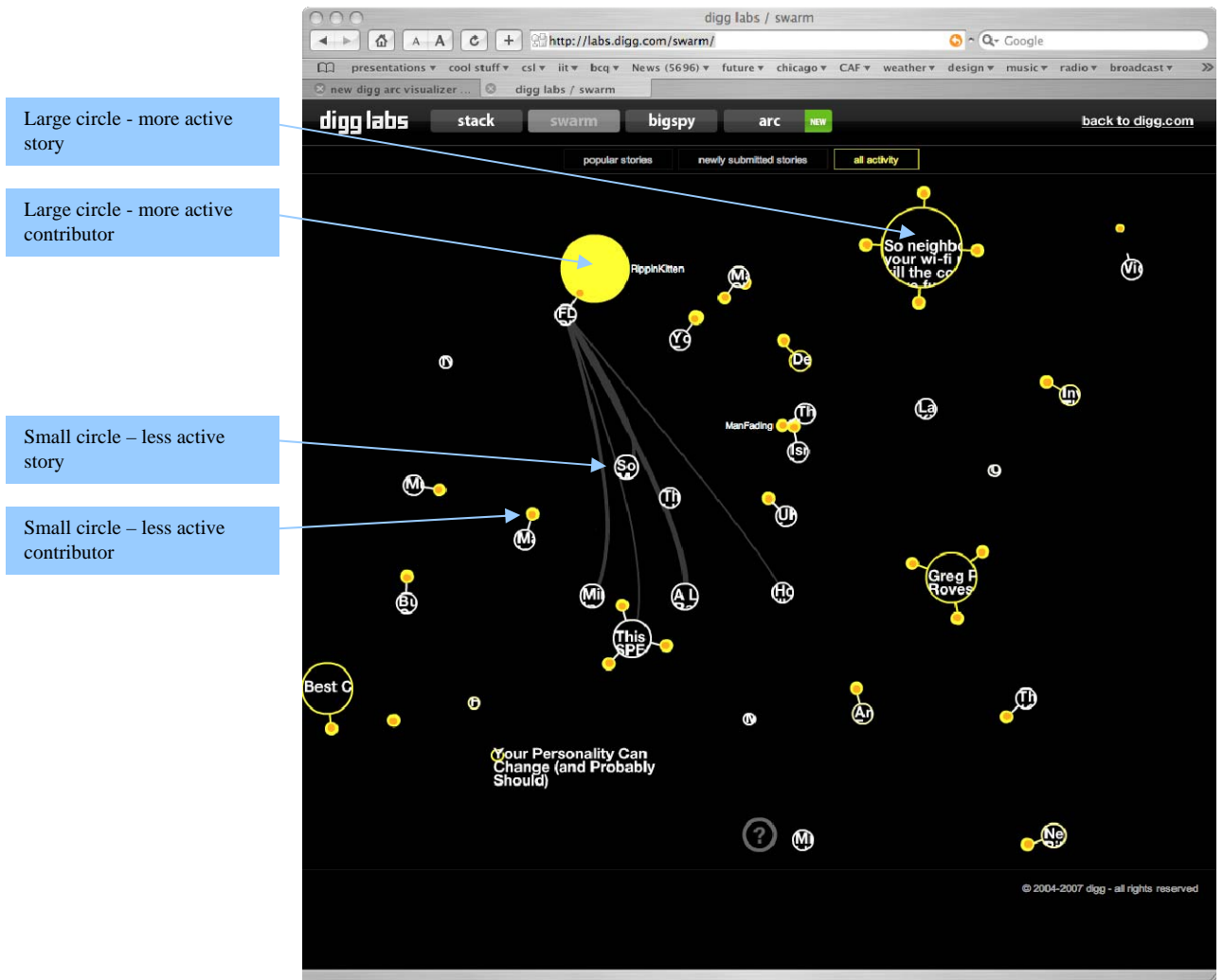


Figure 1. Digg swarm—all elements adjust dynamically to reflect real-time collaborative activity.

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