ABSTRACT
Interactions is an interactive multimedia installation designed and realized by the author. The installation utilizes two neural network artist agents that act as virtual artists to manipulate a body of images, texts, and sounds collected from the internet as directed by audience participants. The piece addresses issues including competition in the arts, machine learning in media, the role of popular acceptance in art, and the relationship between raw materials and style in creating media.

Categories and Subject Descriptors
J.5 [Computer Applications]: Arts and Humanities: Fine Arts.


Keywords: Neural Networks, Media Creation, Dynamic Media, Multimedia, Art, Installation Art.

1. INTRODUCTION
The internet offers a virtually boundless resource of text and media content. However, while the traditional web browser provides a standardized portal to access this information, it fails to offer flexible and creative display scenarios that are capable of transforming web navigation into an artistic experience for audiences. There has been prior work to develop novel frameworks for interaction with internet content [4, 5, 2]. There has also been prior work in frameworks for automated multimedia creation [7]. However, this work does not utilize multimedia content. In Interactions, the notion of multimedia content re-mixing is explicitly addressed as a means to leverage the massive body of digital media content on the web. In this regard, it engages the conceptual focus of DJ and VJ culture, including the work of Paul Miller (aka DJ Spooky) [3].

There has been prior work in the use of artificial intelligence for media that encompasses analysis, simulation, and content creation [8]. The architectural design and realization of Interactions is drawn from this research.

The following sections describe Interactions and provide detailed discussion of the framework for interaction, content presentation, presence and absence, implementation issues, and conclusions.

2. FRAMEWORK FOR INTERACTION
Audience participants are invited to interact with the installation in two ways. First, participants can influence the content of the installation by typing any internet address. The piece will contact that website, download both images and text, and add this media to the repository of content requested by other participants. Interactions manipulates this media to create visual and sonic collages.

Figure 1. Participants interacting with the work
Second, participants interact with the installation to influence the ways in which the content is presented. Interactions makes use of two neural network-driven virtual artists that simultaneously control separate presentations of the body of downloaded content. Each neural network manipulates parameters such as the rate of change, the size of the image, the distortion of the sounds, and color filtering of the images. Audience participants are encouraged to ‘vote’ their preference for one virtual artist or the other by pressing one of two large buttons. If a virtual artist receives positive reinforcement, it will maintain its method of presentation, while the other artist will attempt to adapt its presentation to look more like the other. However, if the two artist/agents converge on identical presentation methods, one agent will radically alter its sound and look. In this manner, the installation enables interaction between audience participants, the web community, and the virtual artists as they interact with each other in a competition to gain the attention of audience participants.

3. CONTENT ACQUISITION AND PRESENTATION
Interactions is initialized as a blank slate. As described above, when an internet address is submitted to the installation, all images and text are download from the site and are added to the body of content.
3.1 Images
The virtual artist/agents of the piece draw from this body of images to generate a dynamic collage. Each agent controls image display parameters including the speed of display, spatial placement and rotation on the screen, size, and color/transparency filtering. To generate the visual collage, each artist/agent will cycle through the body of downloaded images, displaying each according to the specified feature vector. Each new image that is downloaded is added to the queue until a maximum threshold is reached and new images will replace the oldest images in the repository.

![Image](image1.png)

Figure 2. Concurrent visual collages generated by the virtual artists

3.2 Sound and Text
The use of sound and text mimics the manner in which the installation draws on images from multiple sources. Al Green, Beethoven, the Beastie Boys, John Coltrane, and many others are juxtaposed in Interactions to create a diverse sound collage with distinct cultural connotations. The work utilizes approximately one hundred samples, each approximately four seconds in duration. Unlike the downloaded images, these samples reflect a personal imprint of the author, as they are drawn from his personal music collection.

To generate the sonic and text collages, each artist/agent scans the full downloaded texts, and searches for matches against a list of keywords that are pre-defined by the author. Example keywords previously used in the work include: race, technology, home, and sexuality. Importantly, these keywords and associated sound samples can be easily repurposed for each installation of the work. This mechanism allows the piece to address site-specific concepts for each exhibition location and audience. When a matching keyword is found, the corresponding text is displayed, and the corresponding audio sample is triggered. Often the relationship between keywords and samples is direct. For example, a prominent lyric in a song can be linked to a keyword. However, the relationship can be more abstract. For example, music that connotes a particular culture, such as Balinese gamelan, can be linked to a referential keyword such as rhythm.

Just as the two artist/agents manipulate the presentation of visual images, they similarly manipulate the audio samples. An attribute vector defines post-processing effects for each sample that include its frequency, Q, and reverberation. The virtual artist dynamically updates these attributes in an analogous manner as in the visual domain. Left and right audio channels are used to project the sound collages of each artist/agent.

4. PRESENCE AND ABSENCE
Interactions addresses the notion of presence and absence through its multi-layered framework for interaction. The work itself is physically situated in an exhibition space where local audience participants interact with virtual artist/agents. The work at any given moment represents the history of interactions through website content provided by earlier participants. In this regard, the installation leaves footprints of those who have come before. Moreover, the work provides an embodied presence for the larger community of web content providers. Finally, the artist has authored a flexible framework for the exploration of conceptual ideas regarding media, creation, and competition where the sounds and images result from audience and virtual agent collaboration. Nonetheless, through the selection of keyword topics, personally contributed sound samples, and numerous conceptual biases that are built into the piece, the artist is at once present and absent from the process of creation. This redefinition of the role of the artist is central to the work.

5. IMPLEMENTATION
The author wrote all software for Interactions in Java. It utilizes the standard 2D Graphics package, and JSyn [1] for real time audio synthesis. Each virtual artist employs a 2-layer, feed forward neural network [6]. A keyboard is required for text based internet site queries, and a custom two-switch interface is provided for preference voting. Sound is projected into the exhibition space through stereo speakers or headphones, and a dual-monitor system or video projector is used for graphics rendering.

6. CONCLUSIONS
Interactions, has been presented in numerous exhibitions before diverse audiences. Feedback for the work has been very positive with most participants expressing enthusiasm for the underlying conceptual ideas and the explicit modeling of artist behaviors in response to audience preferences. Observations of participants reveal that the process of directly integrating images and text from input websites provides a direct sense of involvement and engagement with the work. To address this importance, great emphasis has been placed on the design and realization of parametric controls for visual collages. Future work will require improvements in the sonic aspects of the work to generate equally sophisticated and varied sound collages.

7. REFERENCES