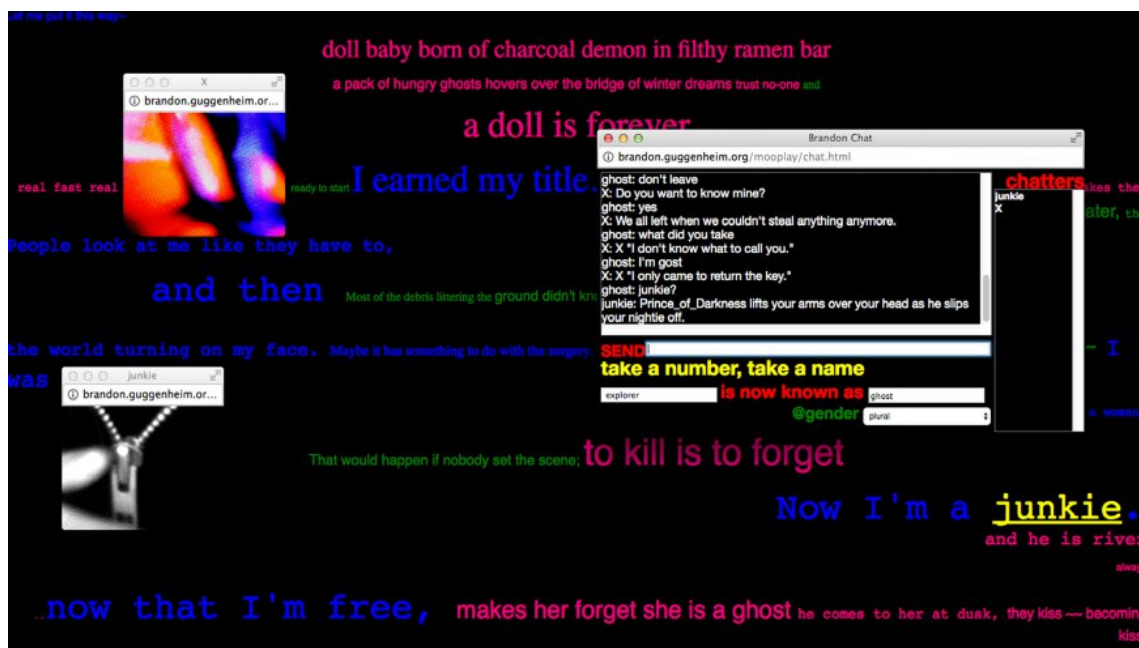


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Restoring Brandon, Shu Lea Cheang's Early Web Artwork

By Joanna Phillips, Deena Engel, Emma Dickson, Jonathan Farbowitz

In April, the Guggenheim's [CCBA initiative](#), which conserves computer-based art in the museum's permanent collection, completed the restoration of Shu Lea Cheang's web artwork *Brandon* (1998-1999). Commissioned by the Guggenheim in 1998, *Brandon* was the first of three web artworks that entered the museum's permanent collection in the early days of the Internet. (A full navigation of *Brandon* can be seen in the video below.)

Brandon (1998–99) by Shu Lea Cheang. A video navigation of the restored web artwork

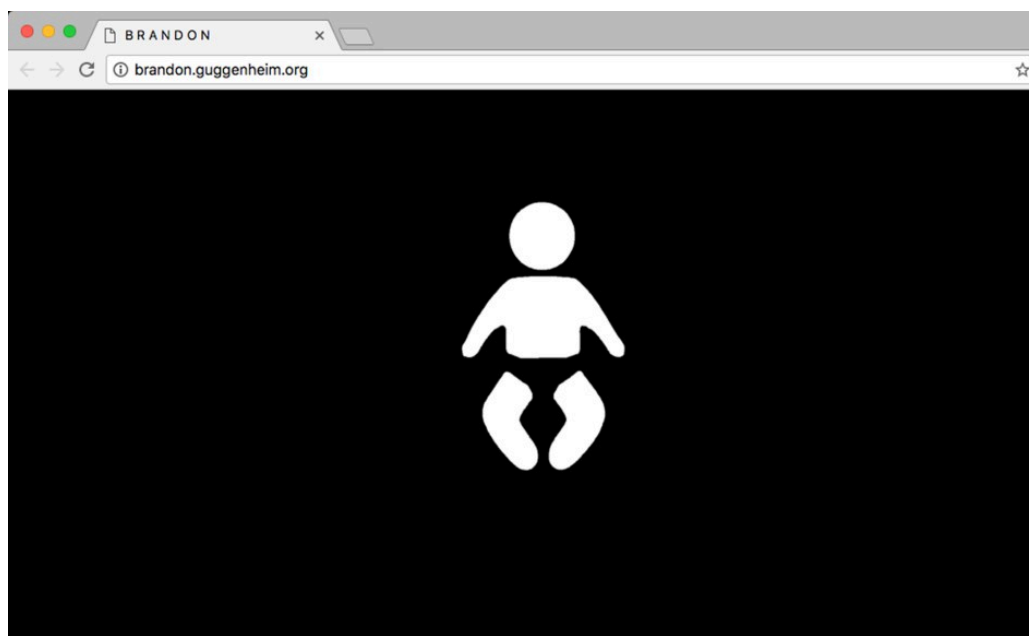


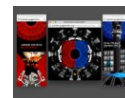
Over the years, the fast-evolving technological landscape of the web caused an increasing number of *Brandon's* features to fail: Certain pages and data were no longer accessible; text and image animations no longer displayed properly; and many internal and external links were broken. Just like any other website, *Brandon*, hosted at <http://brandon.guggenheim.org>, can only execute its programmed, functional, and aesthetic behaviors if browsers and server environments support its underlying technologies and if embedded links are functioning. With the goal of fully restoring all parts of *Brandon*, the Guggenheim's conservation department enrolled the artwork as a case study in the multi-year, cross-disciplinary CCBA initiative—a collaboration between the Guggenheim and faculty and students from [New York University's Department of Computer Science](#).



Brandon explores the tragic story of [Brandon Teena](#), a Nebraska trans man who was brutally raped and murdered in 1993. The work was originally conceived as a “one-year narrative project in installments.” Between 1998 and 1999, multiple [artists and programmers](#) uploaded new content and interfaces to the website, and several

“simulcast” live events took place at the Guggenheim Museum SoHo and the [De Waag Society for Old and New Media](#) in Amsterdam. During these events, audiences engaged in discussions about gender and racial identity via *Brandon's* online chat, a virtual court, and webcasts. By the end of the project, *Brandon* had become a complex website with five interfaces: “[bigdoll](#),” “[roadtrip](#),” “[panopticon](#),” “[mooplay](#),” and “[theatrum anatomicum](#).” Overall, the site encompassed 82 pages and popup windows, and featured a wealth of historic and current personae, stories, court cases, and avatars surrounding LGBTQ+ discourse, as well as chat logs and other traces of *Brandon's* live events between 1998 and 1999.





Brandon's splash page after the 2016-2017 restoration

As a basis for *Brandon's* restoration, CCBA research partner Professor Deena Engel and her computer science students Emma Dickson and Jillian Zhong analyzed *Brandon's* source code for two semesters. The artwork's technical composition proved to be exceptionally complex: The original website contains approximately 65,000 lines of code and over 4,500 files, which include a hidden archive of research materials. The web technologies used in *Brandon* include HTML, Java applets, JavaScript, several programming languages that run on the web server, a MySQL database, and various media formats. In a manner typical for its era, *Brandon's* code had been written "by hand," rather than using automation as is often done today to generate and consistently style web pages.

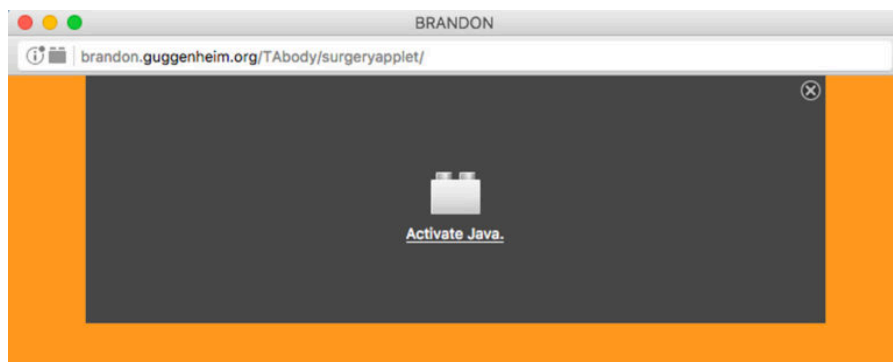
The research team's careful examination resulted in a detailed understanding of *Brandon's* intended behaviors—even if they could no longer be experienced online—and a precise list of artwork damages that the restoration would need to address. For example, texts and images that were animated by *Brandon's* eleven unique Java applets were either inaccessible or displayed incorrectly, because Java applet support has been discontinued in modern browsers. Page and text styling that were created using early HTML features were not properly recognized and thus displayed incorrectly by modern browsers. The entire "mooplay" interface was no longer accessible, and the chat logs and other data of the virtual court could not be retrieved from the underlying database.

Cheang approved the restoration strategy, and the full restoration was launched in December 2016. At that point, the Guggenheim appointed CCBA fellow Jonathan Farbowitz, and also hired computer science student Emma Dickson to execute the restoration on site at the Guggenheim's time-based media conservation lab in close collaboration with Farbowitz and under the joint supervision of Engel and Guggenheim conservator Joanna Phillips.

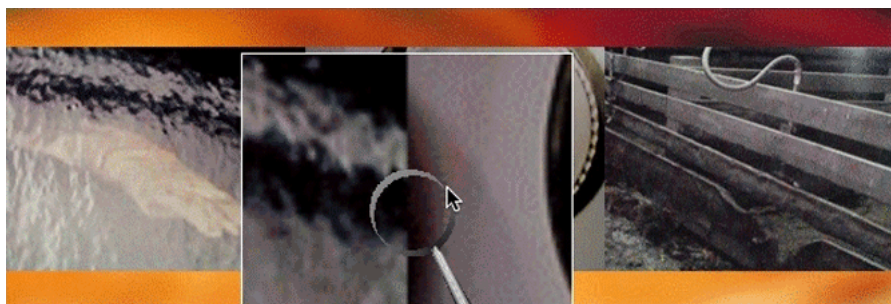


The restoration of *Brandon* focused on migrating Java applets and outdated HTML to modern technologies. Java

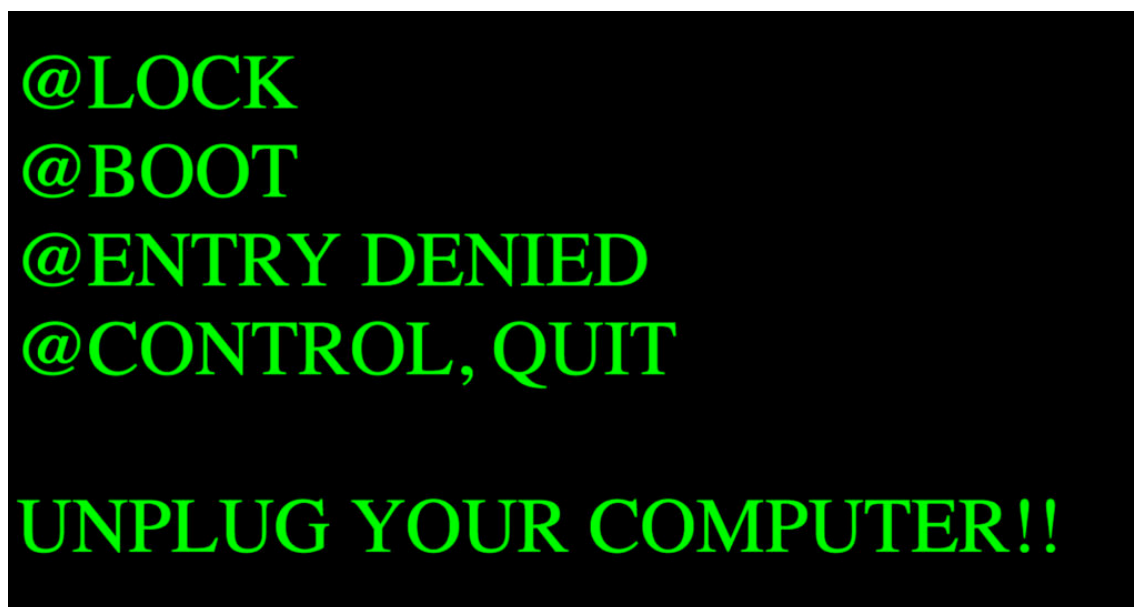
applets were replaced with GIFs, JavaScript, and new HTML, while nonfunctional HTML elements were replaced with CSS or resuscitated with JavaScript. Notable examples of these migration techniques are the surgery applet and the HTML <blink> tag. The surgery applet originally allowed users to mouse over and magnify various pictures. This is now achieved with a GIF of those original images and JavaScript. In the case of the deprecated HTML tag <blink>, the intended blinking of words and phrases was restored by adding JavaScript that identified blink tags in the original code and animated the text between them. In this way, the original code was retained and reanimated. Such a conservative approach was applied whenever possible to preserve *Brandon's* original technical composition and the unique and characteristic tone of its code.



Conservation ethics dictate that any additions to an artwork must be reversible, and that the original be clearly delineated from these additions.



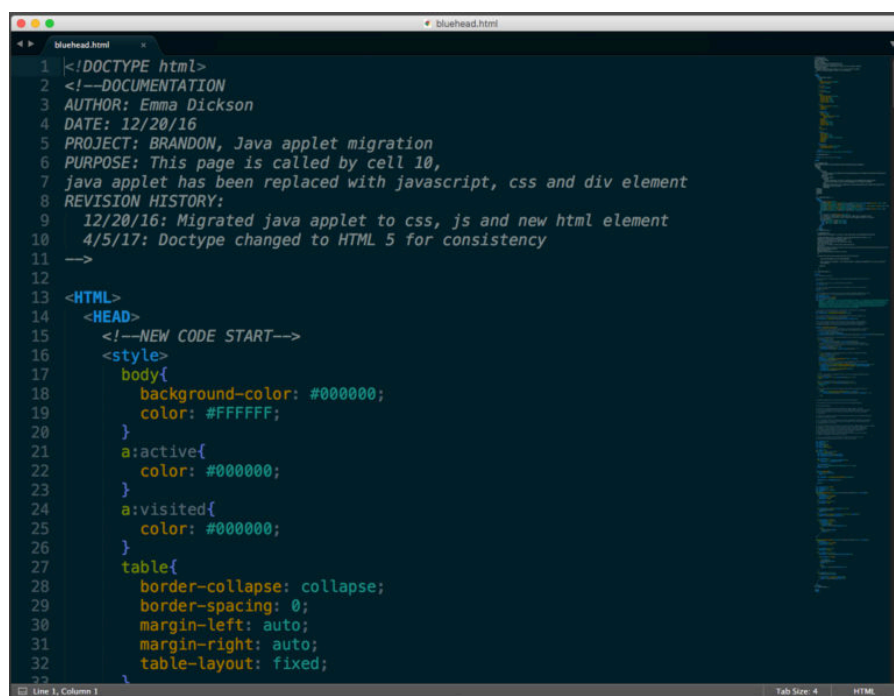
Conservators must also document any treatment to an artwork, making any actions taken fully transparent. In applying these guidelines to the



restoration of a web artwork, none of *Brandon's* original code was deleted. Instead, a duplicate version of *Brandon* was created in which defunct code was commented out so it would no longer be executed, and new code was added. All changes are reversible and clearly identified within the code through annotation, a common technique used by programmers to add human-readable explanations of code functionality. In this restoration, the annotations identify the beginning and end of new code, as well as its author, date, and purpose on a line-by-line basis, so that future

@LOCK
 @BOOT
 @ENTRY DENIED
 @CONTROL, QUIT
 UNPLUG YOUR COMPUTER!!

description and allows for side-by-side comparisons of old and new code.



```

1 <!DOCTYPE html>
2 <!--DOCUMENTATION
3 AUTHOR: Emma Dickson
4 DATE: 12/20/16
5 PROJECT: BRANDON, Java applet migration
6 PURPOSE: This page is called by cell 10,
7 java applet has been replaced with javascript, css and div element
8 REVISION HISTORY:
9 12/20/16: Migrated java applet to css, js and new html element
10 4/5/17: Doctype changed to HTML 5 for consistency
11 -->
12
13 <HTML>
14 <HEAD>
15 <!--NEW CODE START-->
16 <style>
17   body{
18     background-color: #000000;
19     color: #FFFFFF;
20   }
21   a:active{
22     color: #000000;
23   }
24   a:visited{
25     color: #000000;
26   }
27   table{
28     border-collapse: collapse;
29     border-spacing: 0;
30     margin-left: auto;
31     margin-right: auto;
32     table-layout: fixed;
33   }
  
```

visitors.

Several steps were taken to preserve the pre-restoration version of *Brandon*, including saving copies of the file directory, taking a digital snapshot of the web server, and creating a [web archive](#) using [Webrecorder](#). The server snapshot provides evidence of the environment that *Brandon* ran in as well as the site's software dependencies, while the web archive provides an interactive record of the site's functionality before restoration.

This project was the Guggenheim's first-ever restoration of a web artwork. The CCBA team's goal to apply ethics and standards from conservation to principles and practices in software remediation is a significant research and development milestone for the conservation community. Most importantly, *Brandon* is finally fully accessible to the public again and—a few days after its re-launch—was included in [Rhizome's](#) online exhibition [Net Art Anthology](#), which celebrates one hundred seminal artworks from net art history.

Read more about the Conserving Computer-Based Art (CCBA) initiative in our [two-part Q&A](#) with Conserving Computer-

conservators and programmers will have a clear understanding of the interventions that were made. Additionally, [Git version control software](#) was implemented to track every addition to the codebase. Git stamps every code change with a specific time, author, and

In keeping with established conservation reporting, a treatment report details the restoration and its underlying decision-making in written text along with screenshots and narrated screen recordings of navigations of the site. Also, per a request of the artist, the Guggenheim added text to *Brandon's* [credits page](#) to explain the restoration process to the site's



Based Art (CCBA) initiator [Joanna Phillips](#), Senior Conservator of Time-Based Media at the Guggenheim, and [Professor Deena Engel](#) from NYU's Department of Computer Science.

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