



Censor Chair: Exploring Censorship and Social Presence through Psychophysiological Sensing

Eric Aley¹, Trina Cooper¹, Ross Graeber², Andruud Kerne², Kyle Overby³, Phoebe O. Toups Dugas²
Visualization Lab¹, Interface Ecology Lab | Computer Science Department², Virtual Network Lab³

Texas A&M University
College Station, Texas 77843, U.S.A.

{ ealey, furball, rgraber, andruud, koverby } @ tamu.edu; phoebe.toups.dugas@acm.org

ABSTRACT

In this paper, we describe *Censor Chair*, an art installation that creates a shared experience addressing forms of censorship including self-censorship, censorship of a group upon an individual, visual and auditory censorship in digital media, and censorship in society. We are taking a playful position in considering relationships between censorship and sensors that monitor physiology. *Censor Chair* makes use of a galvanic skin response (GSR) sensor, live video feeds, and a barcode reader to drive the presentation of a digital media library.

Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation (e.g., HCI)]: Multimedia Information Systems – *artificial, augmented, and virtual realities*.

General Term

Human Factors.

Keywords

Art installation, censorship, galvanic skin response, presence, psychophysiological sensing, signal processing, social interaction.

1. INTRODUCTION

Censorship is a common occurrence in the modern world. Everyone experiences censorship: from what is shown on television based on the guidelines of the Federal Communications Commission regarding the display of sex, violence, and profanity [9], to the way one carefully picks his or her words depending upon company [28], to the admonitions broadcast at U.S. airports forbidding the telling of jokes in security lines. Censorship of artistic work and personal communication abounds and in many ways it can be both good and bad.

Our goal is to bring censorship to mind, to make it visible and explicit, and to provoke thought about it. We do not decide if censorship is right, wrong, or somewhere in between. With the days when Bugs Bunny held up that little black sign that read “CENSORED” in mind, we created *Censor Chair*.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

MM05, November 6-11, 2005, Singapore.

Copyright 2005 ACM 1-59593-044-2/05/0011...\$5.00.

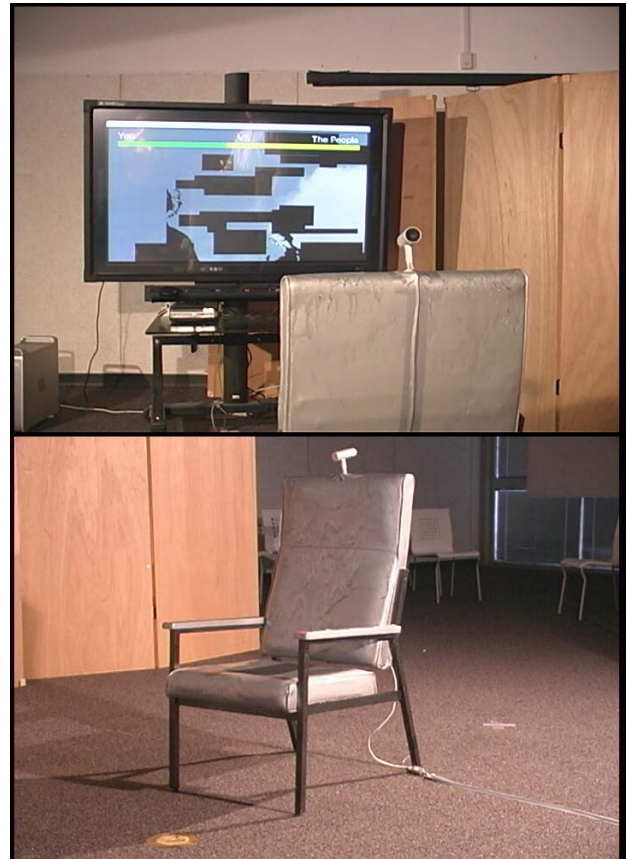


Figure 1. The *Censor Chair* installation showing the entire setup from behind (above) and only the *Chair* from the front (below).

Censor Chair is an event-oriented psychophysiological interpretive environment. The purposes of *Censor Chair* are to provoke thought about censorship, measure a person’s physiological response to varying amounts of presence and censorship, to relate the use of sensors and monitoring to processes of censorship, and to contextualize these issues in the interplay between a crowd and an individual.

In this paper, we explore the underlying concepts of *Censor Chair* and its motivations, provide user experience scenario narratives, and then return to a more in-depth look at the structural layers of interaction possible within the context of the installation. We then go on to explain relevant prior works and technical details of *Censor Chair*. Finally, we discuss our formative evaluations, conclusions, and plans for future work.



Figure 2. Initial visualization.

Left: The “BE SEATED” message, along with an indication that the video, “censor.mov” is being opened.

Right: The “RELAX” message.

2. CONCEPT

Censor Chair combines psychophysiological sensing, video tracking, barcodes, and digital media projection to create an immersive experience exploring censorship and presence. By psychophysiological sensing, we mean measuring physical signals from the body to model psychological state [5].

The installation consists of the sensing *Chair*, a projector, and a barcode catalogued media library. An individual, referred to as the *You*, sits in the *Chair*, while other participants, known as *The People*, stand, move, and otherwise interact with the *You* in the space. *The People* influence the system through the *You*, as well as through the video tracking interface and the media library. Video projected into the environment is used as a means to visualize the psychophysiological response of one participant to the other participants present in the space. We recontextualize the interaction and reaction of the participants to one another as two kinds of censorship: the internal censorship of the *You* by her/himself and explicit censorship appearing over playing video. Of the two, the *Censor Chair* quantifies the latter while the former is part of the personal experience of the piece.

Censor Chair uses three sources of input to control the presentation of videos in a small media library. These videos are displayed on the wall in front of the *Chair* using the projector. The *Chair* acquires galvanic skin response (GSR) data about the *You*’s arousal / anxiety level [5] through simple sensors embedded in its arms. Any participant can scan barcodes on the media library catalogue sheet, in order to determine what video is playing on the projector. A video feed of *The People* comes from the camera mounted on the *Chair*’s back. It is processed to generate a silhouette and mixed over the video from the media library.

Signals taken from the GSR are used to model the general emotional state of the *You*. This psychophysiological data from the GSR sensor is used to control the level of censorship of the video that is playing. This censorship takes the visual form of black bars and the silhouette of *The People*, which obscures the video. The size of the silhouette is also determined by the GSR signal. Additionally, the volume of the video soundtrack is attenuated in proportion to the censorship level. More technical details can be found in Section 4.

2.1 Use Scenarios

For *Censor Chair* there are three main scenarios that exemplify the experience of the installation. Each of these is discussed below in an ongoing narrative format describing the interactions between individuals with the installation.

2.1.1 The case of a lone individual (You)

Alan is wandering through the interactive art exhibition, where he finds an oddly equipped, but empty chair facing an image projected on an otherwise blank wall. The image is black, with the text acting like a window onto a playing video. The text reads, in large block letters: “BE SEATED” (Figure 2, left).

Alan decides to obey the sign and sit in the chair, and, as he does so, the image changes. The message “RELAX” replaces the previous imperative (Figure 2, right). Soon Alan finds himself comfortably watching images of trees and flowers, slowly zooming and panning across the screen.

After just a few moments, he takes interest in what is occurring on the screen. As he looks, something unusual happens: a large black bar suddenly rips across the image he was viewing, obscuring a portion of it. Alan shakes his head, a bit surprised and confused. Soon, more bars follow and, before long, almost nothing can be seen.

As Alan stands up, the bars quickly fade away, leaving the images as they were before. The images are then replaced with the black background, and the words “BE SEATED” re-materialize showing only a small portion of what could be seen before. Alan decides to try again.

As before, the system issues the command to him, and the images play across the screen. Alan watches in horror as the bars begin crashing across the screen. He decides to do something different this time. Instead of watching, he closes his eyes and slows his breathing. When he opens them, the bars are gone, only the peaceful images remain.

Alan stands up and heads off to another exhibit, leaving the *Censor Chair* displaying its message on the screen.

2.1.2 The case of You and The People (ignoring the media library)

Later, after Alan leaves, a group forms around the back of *Censor Chair*, all too timid to follow the message on the screen instructing them to be seated.

Eventually, Sarah, an outgoing member of the crowd, steps forward to experiment with the system. She follows the directions and seats herself comfortably. As she does so, the fervor in the crowd dies down as the people watch Sarah’s demonstration. The experience begins identically to that of Alan, but soon changes dramatically.

Sarah and *The People* are soon treated to calming video footage of open spaces and sky. Superimposed over the video footage is a small black silhouette of the crowd and a meter materializes at the top, labeled, “You vs. *The People*”. Immediately the conflict between Sarah and those surrounding her is realized. The reading of the meter indicates an intermediate state between the two extremes.

Sarah finds herself suddenly at odds with the people behind her. As they move, the imagery becomes blocked out. The more they move, the more nervous Sarah becomes and the larger they loom.

Sarah does not realize how to control or even influence the system, and things begin to change even more drastically. The meter begins to shift from her favor, taking the side of *The People*. The silhouettes grow ever larger, threatening to completely blot out Sarah’s pictures. Something new: black bars begin to crash across the screen. Before long, the meter indicates that *The People* are in



Figure 3. Examples of visualization during the experience for the video “censor.mov”. The “You vs. The People” meter at the top indicates GSR output from the *You*. Green indicates the *You*’s side, while yellow indicates *The People*. The images show a calm reading from the GSR (left), a moderate reading (middle), and a very excited reading (right). Note the number of black bars and the size of the silhouettes in each.

control; almost nothing on the screen is left: inky shadow covers all but a few spots.

Someone behind her suggests that Sarah should relax, citing the original command of the system. She closes her eyes and does her best, clearing her mind and breathing deeply. She is startled back open by sudden noise from the crowd. As she opens her eyes, the meter has shifted to indicate her calm state. Her influence gains power, revealing the images. This sudden realization takes her back out of a relaxed state, however, and things begin to tip, once again, toward the dominance of *The People*.

2.1.3 The case of You and The People (with the media library)

After the interaction continues for some time Sarah has become more proficient at keeping *The People* from censoring her display. Something new occurs, a member of *The People*, Sam, discovers the barcode reader and a list of barcodes. Tentatively Sam swipes the code for “peacemarch.mpeg” and footage from an old American newsreel begins to play on the screen.

Sarah finds herself distracted by the new video. Before, it was easy to avoid the censor bars, but now she is made nervous both by the distraction of the video and sound, and her fear that *The People* are gaining more control over the system. Given time, she is able to adjust, but what emerges is that there is a multiplicity of means that can affect the *Censor Chair* experience.

2.2 Structural Layers of Interaction

Within *Censor Chair* there are several layers of interaction that take place. We roughly classify these structural layers as biofeedback, influence, and video selection, as displayed in Figure 4. It should be clear that technically and theoretically, the potential for activating any subset of the three interaction layers is always present; however, in actual experiences of the installation, only particular structures will be relevant. The above scenarios begin to demonstrate this.

2.2.1 Biofeedback

The biofeedback structure represents a direct influence loop between the *You* and the *Chair*. This individualized component utilizes a measure of the *You*’s arousal / anxiety (the GSR signal) to control the visual censorship of the video; this loop feeds back as the *You*, in turn, is affected by the visual presentation of the video and the censorship graphics. His or her new anxiety level is measured and utilized continuously in the control structure. When taken in isolation, this biofeedback structure correlates directly with “The case of the lone individual” (Section 2.1.1).

The flow within the biofeedback structure is considered entirely influence, as the *You* can only interface with the system through her/his level of anxiety. In this solitary case, the *You* may censor her/himself, depending on her/his ability to stay calm. This is the simplest scenario, and the one in which the *You* can most easily influence the system, as there is no one observing or interacting with her/him.

2.2.2 Influence

The influence structural layer encompasses the biofeedback loop and expands upon it. It adds in the effects of *The People* on the *You* and the *Censor Chair* system, as well the ways in which *Censor Chair* affects *The People*. The influence loop is demonstrated in “The case of *You* and *The People* (ignoring the media library)” (Section 2.1.2).

Within the influence structure, flow through the system splits and merges. The *You* is affected by the presence of the *The People* through a range of social interactions. The system is indirectly influenced by the presence of others in the space, as they disrupt the *You* [4]. Further, video is used to represent the presence of people behind the *Chair*. A silhouette of *The People* is derived, which is, in turn, mixed into the projected video feed, with a magnitude determined by the anxiety level measured in the biofeedback structural layer. Thus, *The People* generate more censorship of the video with this black silhouette. The censored movie not only affects the *You*, but also affects *The People*. The process cycles and evolves.

When others are taken into account, the interactions and implications of those interactions change. In considering the influence structure, the video is censored for all participants and is affected by all participants. In addition, the “*You vs. The People*” meter graphically represents the state of the anxiety measure, while also framing the situation as a conflict between participants in the *Censor Chair* installation.

2.2.3 Video Selection

The video selection structure expands upon the influence structure, taking into account the media library and the participants’ interactions with it. Any participant may change which video is playing at any time by using the barcode catalog of videos. The control structure correlates with “The case of *You* and *The People* (with the media library)” (Section 2.1.3).

The *You* may select the video before sitting down, but this need not be the only case. *The People* may change the video while the *You* is seated, which influences the interactions. At this level, the

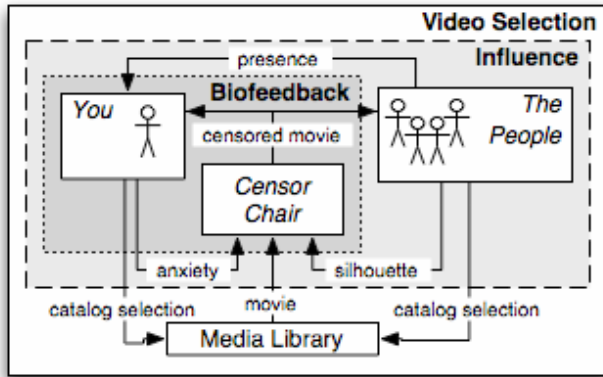


Figure 4. Flow through the *Censor Chair* system, divided into three structural layers of interaction.

implications also change because *The People* now have more control over the environment. Indeed, it is possible for *The People* to take complete control of the video and actively prevent the *You* from changing it.

3. BACKGROUND

There has been a great deal of research into psychophysiological sensing and biofeedback [1][4][5]. Several creative projects have integrated components of this research into immersive experiences. Because psychophysiological sensing can provide a wealth of information about a participant's conscious and unconscious activities [1][4][5], we decided to integrate these capabilities into our interactive installation. Previous research indicated that GSR is a well established sensory method to obtain a window into the psychophysiological state of an individual helping to inspire the design of our project [4][5]. Since our project integrates several academic disciplines, we include a summary of background and informing works here.

3.1 Group Interaction

[5] provides validity for the underlying concepts of *Censor Chair*. An *orienting response* occurs when a person is paying attention to a new factor in their environment [5]. Psychophysiological indicators will increase during an orienting response [5].

[4] determined that presence alone does not produce significant psychophysiological response. [4] also provides evidence that when people feel threatened by observers this will trigger psychophysiological response. A subject can feel threatened for several reasons: the subject and observer are in a subordinate-supervisor relationship, or the subject feels the need for self-preservation [4]. When the subject is involved in tasks while feeling threatened, psychophysiological indicators become heightened [4]. These socializing factors impact our subjects while they are being observed in *Censor Chair*.

3.2 Sensing Technology

GSR is a psychophysiological sensing technology that determines the level of conductivity across a person's skin. This conductance is directly related to subject's level of perspiration, which is keyed to arousal / anxiety level [5]. GSR technology is used in lie detectors, and can provide a significant amount of data concerning attention and excitability of the user [4]. GSR is a robust sensing system, it reads well under varying conditions. In addition to being a good

source for data capture, GSR is straightforward to integrate into an installation. The only requirement is a pair of unobtrusive metal contacts that are bridged by a participant's skin. This can be implemented as a passive sensor, requiring almost no direct interaction by the participant.

Other sensor types, including electroencephalogram and heart rate variability measures proved too invasive, difficult-to-use, and expensive for this version of *Censor Chair* [5][7][23]. While these other methods could be useful for gathering a more detailed model of a participant's emotive state, they are also more ambiguous readings [5][7][23]. We chose GSR for its simplicity, clarity, and price.

3.3 Biofeedback

Biofeedback is a means to control one's autonomic processes by being able to visualize those processes. In the simplest structure of *Censor Chair*, the system acts as a biofeedback loop for the participant (see Section 2.2.1).

There have been successful studies using biofeedback as a means to treat attention deficit hyperactivity disorder (ADHD) [13]. [13] shows that biofeedback has a high success rate for behavior modification in when used in the right circumstances. For the *You* to "win" in *Censor Chair* they must learn to control their actions and re-actions emotionally.

3.4 Previous Works

Some prior creative endeavors, as well as theoretical and applied research have used psychophysiological sensing to provide an experience similar to what we hope to achieve, demonstrated the technologies we plan to incorporate, or help to provide justification for our research.

3.4.1 Games

Balloontrip [22] is a game in which a GSR sensor is used to adjust the user's experience. As the user becomes agitated (determined by the GSR) the game difficulty increases. This generates a biofeedback loop, in which the user must remain calm in order for the game to be easy. We follow the example of the *Balloontrip* group in how we process the signal from the GSR: using high-pass, low-pass, and notch filters on the signal before it is fed into an analog / digital converter [22]. We take the raw analog signal, then run the filters using *Max/MSP*.

Two commercial examples of the use of biofeedback and psychophysiological sensing are currently in existence. The first is *The Journey to Wild Divine* [26], which uses GSR and heart rate variability to monitor the user's "energy". The game takes the user through biofeedback scenarios which ultimately require the user to control her / his "energy". *The Journey to Wild Divine* is used as a way of training the body and the mind to be more connected, in addition to being an adventure game.

A newer example currently in development is *Relax to Win* [20], which clearly states the goal and method of playing in its name. Royal Philips Electronics has recently released a statement that they have designed and built the *Relax to Win* sensor, which is a simple ring-like device that fits between two fingers and wirelessly transmits GSR data from the subject to a nearby computing device (generally a cellular telephone). We do not yet know what level of public acceptance *Relax to Win* will attain.

3.4.2 Artistic Influence

Many interactive artists have recently incorporated GSR into their works. Nold is responsible for *Bio Mapping*, an ongoing project that combines the GSR readings of participants with global positioning data to create an emotional topology of users in a geographical region [17]. Gromala makes art that uses psychophysiological sensing as an indicator to trigger the interactivity of her works. *Living Book of the Senses* allows viewers to influence the contents and layers of a book through biofeedback [11]. *Biomorphic Type* is a set of fonts that respond dynamically to a writer's bodily signals [11]. Sommerer and Mignonneau created *Mobile Feelies*, which uses wireless technology and physiological sensors to transmit the heartbeats of users [25].

Mann works with surveillance, censorship, and chairs in *Sousveillance, Not Just Surveillance* [15] and *Seat Sale* [16]. *Sousveillance, Not Just Surveillance* demonstrates that surveillance is an activity that everyone can participate in. The French word *sous* denotes "under or from the bottom". In this work, participants mount video cameras on their persons, and record their day-to-day interactions. Conflict and irony arise in the cases of shopping malls and large chain stores, which forbid video recording by individuals, while operating their own surveillance cameras. *Seat Sale* is an art installation in which a chair with spikes, that without permission to sit, protrude through its seat is available for use with the purchase of a license. Upon purchasing the license, the participant must swipe its magnetic strip through a reader, which lowers the spikes and allows her/him to sit on the chair for a designated time. At the end of the time allotment, the spikes re-emerge forcing the user to vacate the chair. Behind the chair is a poster that shows examples of a person with a thought control implant chip built into their cranium. The poster addresses floating *thought licenses*, which allow for a specific number of people to think thoughts from a given category. Again, this raises issues of control, questioning who should be censored or allowed to part take in different activities and ideas. The fundamental question is, "What are our rights as human beings?"

3.4.3 Affective Computing

One of the goals of affective computing research is to give computers the ability to help communicate emotion by sending and receiving emotional cues [18]. *Censor Chair* is a form of affective computing: the GSR detects a signal from our participants, which is then translated from an electronic signal to an indicator of the participant's level of anxiety / arousal [5]. These cues are visually indicated as emotional readings on a bar graph meter, as well through the alteration of the video playing in the space (Figure 3).

The *Influencing Machine* is an affective computing art installation that bears many similarities to *Censor Chair* [24]. The *Influencing Machine* affects participants' emotional state by sharing with them its own emotional state through projected imagery. By utilizing imagery the *Imaging Machine* has moved beyond being an emotional intercedant, it has started a dialog about semantic indicators, cultural communication and translation. *Censor Chair* provides more clear feedback about what is taking place within it, but this feedback is really a glimpse into what is taking place within the participant. The *Influencing Machine* functions as a "cultural probe" [10][24] and our work builds upon this.

3.5 Presence

Presence is an important aspect of the experience of an art installation, especially so in *Censor Chair*. Virtual environment

(VE) guidelines have been developed by NASA, the U.S. Air Force, the U.S. Army, psychologists, VE developers, and social ergonomics developers [21]. The definition of presence varies with disciplines, there are common factors, and a good overall description could be: existence, as being in a particular location (external factors), and/or a mental state (internal factors). A measure of presence can be constituted as a psychophysiological level of focus, orientation, arousal, or excitement. The *Censor Chair* installation considers presence primarily from the view of the *you*, who experiences not only her/his own immersion in the system, but also the presence of other humans around him or her. The study of VE has a model of presence and explores concepts that are similar to those of *Censor Chair*. In the realm of VE, presence is traditionally thought of as the psychological perception of "being in" or "existing in" the VE in which one is immersed [21]. Presence is moderated both by the perception and mental state of the participant as well as the physicality and presentation of the environment [21].

There are three types of presence in VE: environmental, social, and personal [12]. Of the three, social and personal presences are the most relevant to *Censor Chair*. Participants in *Censor Chair* will experience presence when playing either role in the system.

According to [21], when the participant has a modality of control in the environment, s/he experiences a greater sense of presence. In *Censor Chair*, the participant experiences a level of control through the GSR, which leads to a more immersive experience. GSR has been built into this interactive system because it provides a continuous and immediate response, which affects control, and creates a biofeedback loop. This control factor is driven by the immediacy of the system's response, the correspondence of user-initiated actions, and by the naturalness of the mode of control [27]. As the user learns to control their arousal or orienting response they gain a direct interface through the GSR with which to control the projected imagery.

Social interaction reinforces the experience and thus intensifies the experience of presence [21]. The social interaction in this installation is between members of *The People*, as well as between *The People* and the *You*. Social interaction, user control and ease of interface are all contributing factors to this project.

4. TECHNICAL DETAILS

Censor Chair consists of several components that are brought together to create a coherent experience. Discussed here are the separate parts and how they interoperate.

4.1 The Chair

At center of the installation is the *Chair* (Figure 1), augmented with two computer inputs: a custom-built GSR sensor and an Apple iSight digital web camera (Figure 5, top left). The biofeedback layer begins with the GSR, which reads a signal from the *You*. The GSR contacts are set into the arms of the *Chair* and the GSR circuit is mounted on the back underside (Figure 5, top right). The location of the contacts allows the GSR to read unobtrusively. The iSight is mounted on the back of the seat, looking behind the *You* (Figure 5, top left).

4.2 The Censoring Space

The censoring space is a computer display projection, generated by a Cycling '74 *Max/MSP* [8] signal-processing patch (discussed in Section 4.5). The censoring space shows the output created by the

software component of the system. This space completes the loop of the biofeedback layer and begins the influencing layer. The projection is where interactions are made explicit and all of the participants are able to see what is occurring (Figure 1).

Without any interaction, the censoring space will display only the curt message: “BE SEATED”, and only through interacting with the *Chair* will this change (Figure 2). Once a *You* decides to obey the sign, the display shifts to “RELAX” (Figure 2), and then to a video that was selected from the barcode catalogued media library (Sections 4.4 and 4.5), in a more or less censored form.

4.3 Video Feed Processing

To implement the influencing layer, a video feed from the iSight camera is processed by the patch to create a silhouette video of *The People* behind the *You*. This is done by obtaining a base frame at system initialization time, then subtracting it from the live feed. Obtaining the base frame requires a static background, as any changes in the background will be reflected as silhouettes in the video. We use this silhouette as part of the output video in the censoring space.

4.4 The Media Libraries

The media libraries and barcode reader are the essential components of the video selection layer. Participants of *Censor Chair* have options for what video to view during the experience. The video surrogates are barcoded filenames. The filenames are intended to be expressive, but not entirely clear (such as “thunder.mov” or “bannedbooks.mov”), leading to some ambiguity about exactly what video will play. Users interact with this component by swiping the barcode reader over the selected item (see Figure 5, bottom left), which causes it to play on the projection in the censoring space, as in Figure 3.

We determined from the demonstration sessions (Section 5.2) that it was important to have two types of media be represented in *Censor Chair* and each has its own implications in the context of our system. The two main categories are discussed below.

4.4.1 Calming imagery

The calming imagery videos consist primarily of slideshows of selected photographs. Photographs include images of New York City, the Texas countryside, and various locales in Japan. We also include videos of clouds, a thunderstorm, and an arboretum. Some video choices were influenced by responses to our user study.

The “calming imagery” media library leads to a sense that the *You* is being censored by *The People*. This experience of the individual conflicting with the crowd is essential to our work as it exemplifies the effect of *Censor Chair*.

4.4.2 Insightful video

Due to feedback from our initial demonstrations, we also added this second media library to our system. The “insightful videos” are taken primarily from old American newsreels. Included in this collection are videos that deal with censorship and civil liberties in the United States, such as Martin Luther King’s “I Have a Dream” speech, an interview with Rosa Parks speaking about her experiences, and reports on the Scopes “Monkey” trial. This library also includes a slideshow of the book covers of “challenged” (banned) books from the American Library Association’s 1990-2000 list [2].

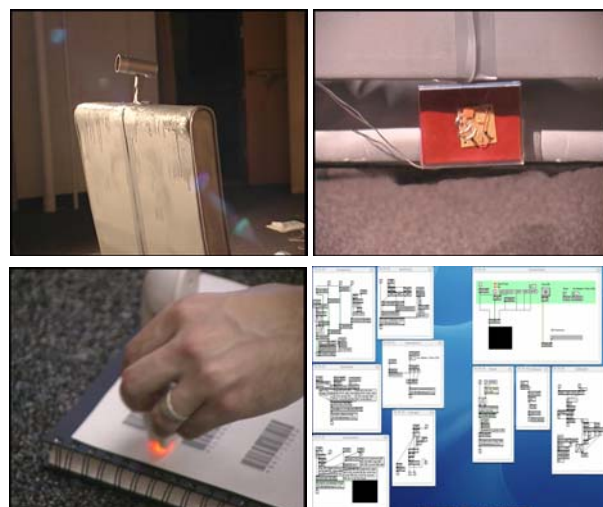


Figure 5. The components of *Censor Chair*: the camera (top left), the GSR circuit (top right), the barcode reader (bottom left), and the *Max/MSP* patch (bottom right).

The videos in this library are meant to help provoke thought from participants about censorship and its role in everyday life. Experience with this library will be very different from an experience with the “calming imagery” library. In this case, the participants become involved in censoring censorship.

4.5 Bringing it All Together

At the core of *Censor Chair* is a *Max/MSP* patch that controls the computation for the system (Figure 5, bottom right), running on an Apple Macintosh computer under *Mac OS X*. Inputs to this patch include the analog signal from the GSR on the *Chair*, the video feed from the iSight, and any barcode scans from the barcode reader. Figure 5 shows the internal relationships between the components, and is explained in detail here.

The biofeedback layer is based on the GSR circuit. For convenience, the output of the GSR is read into the patch through the analog audio input. This signal is used to control the experience of the participants, as it directly affects all of the outputs for the system. The GSR controls the number of black censoring bars that appear over the video, the size of the crowd silhouette that appears at the bottom of the screen, and the reading of the “*You vs. The People*” meter at the top of the display.

The barcode reader, an integral part of the video selection layer, is used to select which video will be censored by the system during the experience. Typically, we expect this to be the *You*, but any participant in the space can pick up and use the media library catalog and there is no restriction on when this can be done.

The projector then displays the video from the library with the appropriate censorship, as determined by the GSR. This video, in turn, affects the participants of *Censor Chair*.

5. FORMATIVE EVALUATIONS

During the development of *Censor Chair* we were able to run a small user study on our initial prototypes, as well as garner feedback during two demonstration sessions. These evaluations were used in formative manner, serving to improve on the design and implementation of *Censor Chair*.

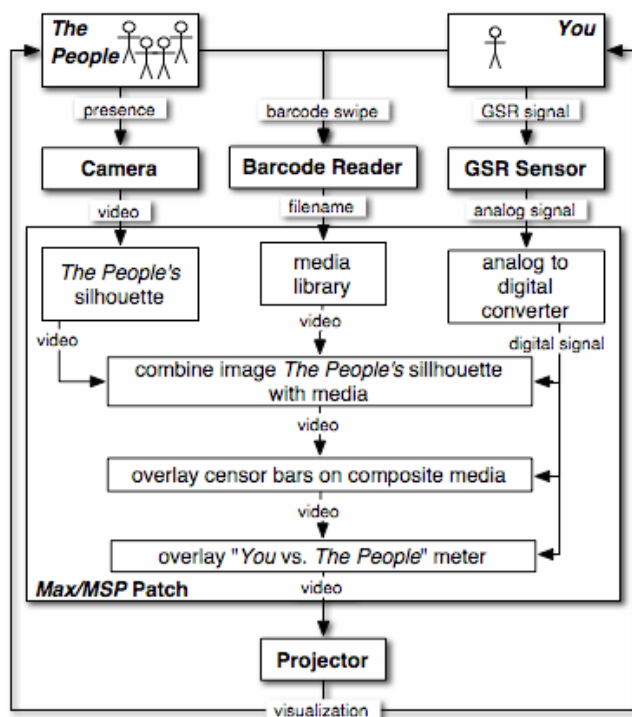


Figure 6. *Censor Chair* architecture.

5.1 User Study

For our initial user study, we used two survey instruments and a “Wizard of Oz” simulation in order to elicit feedback about our system. The simulation was based on our low-fidelity prototype and questions on the surveys focused not only on the subject’s self-perceptions, but also their perception of the prototype. One instrument was used as a pre-experience survey, while the second got the users’ final impressions. The user’s actual experience with the *Censor Chair*, along with discussion afterward, was video taped.

We used the suggestions by participants to add to our media library’s “calm imagery” section. The additions included slideshows of Texas landscapes and a video of the sky to the “calm imagery” library, among others.

5.2 Demonstration Sessions

In addition to the user study, we ran two demonstration sessions during Kerne’s Recombinant Media Ecosystems course at Texas A&M University. This class is focused on art as research and interface ecology [14]; as such, it is cross disciplinary, involving art and science, as well as a range of approaches and methodologies. Our demonstration sessions provided an informative arena for discussion about *Censor Chair* and allowed us to receive interesting and helpful suggestions about its implications, uses, and improvements.

It was thanks to the feedback from our demonstrations that we made the *Chair* more artistic, as the original was not attractive. Since that time, we have improved the look of the chair significantly: replacing the original small chair with a more imposing model. We have taken care to hide most of the electronics on the *Chair* and clean up the wiring, as well as painting the chair.

Originally, the design did not include a method for selecting a video. Instead, a facilitator would manually select the video, based

on feedback from each new *You* participant. Discussions during the demonstration sessions led to adding the barcode catalogued media library, to be used by any participant of *Censor Chair*.

Finally, we decided to add the media library “informative videos” because of comments at the demonstration sessions. Students in the class suggested that these videos might better exemplify the goals of *Censor Chair* and provoke more thought about the issues and history of censorship, at least in the United States.

6. CONCLUSIONS

Censor Chair is a provocative interactive environment for the exploration of censorship and its implications between society and individuals. It provides filtered access to a small media library, mitigated through the emotional response of an individual both to the library and to the other participants in the piece.

We intend *Censor Chair* as a means to provoke individuals to comprehend, notice, and question censorship in all its forms.

6.1 Privacy, Censorship, and New Technology

With questions of censorship also come the issues of information access, public forum, and private forum. With this dialog also comes people’s right to privacy, government and corporate interests in security, and product promotion. What are reasonable boundaries and guidelines? These are issues that are prevalent as communication and technology change. With development of affect sensing systems, emotions are computationally recognized. Who can access recognition results, and what use should be made of recognized emotions? Detecting emotions is now a form of computer interface. This can be used as an invasion of privacy. Will users be comfortable with having their emotions sensed?

Affective sensing systems are being designed and used in ways that raise important ethical concerns [19]. For instance, “Integrated System for Emotional State Recognition for the Enhancement of Human Performance and Detection of Criminal Intent,” is the subject of a recent US Defense Advanced Research Projects Agency Small Business Innovative Research grant [19]. This initiative emphasizes technologies that can be used without the consent or knowledge of users. Such developments introduce ethical concerns for those whose information is being collected. Christa Sommerer warns that “You can take any technology...in the opposite direction” [6].

6.2 Active Response

Cultural probes are a means for evoking and gathering cultural responses [10]. Like the *Influencing Machine* [24], *Censor Chair* steps into a dialog about cultural communication and translation. It explores boundaries between censorship and privacy. These works function as cultural probes, as defined by Gaver and Dunne [10]. *Censor Chair* constitutes an active responsive form of cultural probe. In addition to eliciting participants’ social and cultural positions in an issue-driven field, it responds to their positions, creating a feedback loop. Our intention is to stimulate participants to consider and rethink their notions of the role of sensory systems in social and political processes of expression and inhibition.

The purposes of *Censor Chair* are to provoke thought about censorship, and to elicit active forms of expression and response through participants’ presence and interactions. Participants are situated in relationship to each other, as well as to the systematic technology of the installation. People’s relationships, and their own internal senses of relaxation and anxiety become crucial in the

balancing of *Censor Chair* equations. Self-observation of intermediate states is part of this process. Censorship is about communication and its inhibition, which in turn functions as a form of metacommunication. The installation is being presented as society at large is at a critical point in history regarding freedom of expression and systematic control.

6.3 Future Work

Censor Chair can be used not only as an interactive exhibition, but also for experimentation. We consider *Censor Chair* as a platform for the study of psychophysiological effects with relation to social situations and intend to explore this avenue further. While psychological experiments are often carried out in a laboratory setting, such study will be most effectively conducted *Censor Chair* “in the wild” of an exhibition context. We see *Censor Chair* as a jumping-off point for development into psychophysiological data retrieval and storage systems, focusing games for children with attention deficit disorder, and active meditation systems that help users through biofeedback.

7. ACKNOWLEDGEMENTS

We would like to thank Dr. Louis Tassinary for his assistance in providing relevant research and information. We also wish to thank everyone in the Recombinant Media Ecosystems class for their feedback and support during the creation and testing of *Censor Chair*.

8. REFERENCES

- [1] Ahuja, N. D., Raghavan, V., Lath, V., Patil, A., & Pill, S. Heart rate variability and its clinical application for biofeedback. In *CBMS '04: Proc IEEE Symposium on Computer-Based Medical Systems 2004*, 263.
- [2] American Library Association. *ALA / 100 Most Frequently Challenged Books of 1990-2000*. <http://www.ala.org/ala/oif/bannedbookweek/bbwlinks/100mostfrequently.htm>. 2005.
- [3] Cacioppo, J. T., Petty, R. E., Tassinary, L. G. *Communication, social cognition, & affect*. Erlbaum, 1988, 219–245.
- [4] Cacioppo, J. T., Rourke, P. A., Marshall-Goodell, B. S., Tassinary, L. G., & Baron, R. S. Rudimentary physiological effects of mere observation. *Psychology* 27, 2 (March 1990), 177–186.
- [5] Cacioppo, J. T., Tassinary, L. G., & Berntson, G., Eds. *The Handbook of Psychophysiology*, 2nd ed. Cambridge University Press, 2000.
- [6] Campion, S. *January 27th: Interview with Christa Sommerer*. <http://www.artificial.dk/articles/sommerer.htm>. 1/29/2005.
- [7] Chen, D., & Vertegaal, R. Using mental load for managing interruptions in physiologically attentive user interfaces. In *Proc CHI 2004 extended*, 1513–1516.
- [8] Cycling '74. *Cycling '74: Max/MSP for Mac and Windows*. <http://www.cycling74.com/products/maxmsp.html>. 2004.
- [9] Federal Communications Commission. *EB – OBSCENE, PROFANE & INDECENT BROADCASTS*. <http://www.fcc.gov/eb/broadcast/opi.html>. 3/7/2005.
- [10] Gaver, W., Dunne, A., Projected realities: conceptual design for cultural effect, *Proc CHI 1999*.
- [11] Gromala, D. *DGr – Art*. <http://www.lcc.gatech.edu/~gromala/art.htm>.
- [12] Heeter, C. Being there: the subjective experience of presence. *Presence: Teleoper. Virtual Environ.* 1, 2 (1992), 262–271.
- [13] Janzen, T., Graap, K., Stephanson, S., Marshall, W., & Fitzsimmons, G. Differences in baseline EEG measures for add and normally achieving preadolescent males. In *Biofeedback and Self-Regulation* (1995), vol. 20, pp. 65–82.
- [14] Kerne, A. doing interface ecology: the practice of metadisciplinarity. *Proc. SIGGRAPH 2005 Art and Animation*. 181–185.
- [15] Mann, Steve. *Sousveillance: not just surveillance, in response to terrorism*, Feb. 24, 1995 (updated with Newsweek article July 1995), <http://wearcam.org/>
- [16] Mann, Steve. *Seat Sale: Licence to sit*, http://wearcam.org/seatsale/seatsale_walkerart_mann_index.html
- [17] Nold, C. *Bio Mapping – Christian Nold*. <http://www.biomapping.net>. 5/28/2005.
- [18] Picard, R. W., & Klein, J. Computers that recognize and respond to user emotion: Theoretical & practical implications, *Interacting with Computers* 2002 14, 141–169.
- [19] Reynolds, C., & Picard, R. Affective sensors, privacy, and ethical contracts, *Proc CHI 2004 Extended*, 1103–1106.
- [20] Royal Philips Electronics. *Relax to win Sensor – Royal Philips Electronics*. <http://www.design.philips.com/about/design/section-13691/article-14560.html>. 2005.
- [21] Sadowski Jr., W., & Stanney, K. *Virtual Environment Handbook*. Lawrence Erlbaum Assoc., Chapter 45. Measuring and Managing Presence in Virtual Environments.
- [22] Sakurazawa, S., Yoshida, N., Munekata, N., Omi, A., Takeshima, H., Koto, H., Gentsu, K., Kimura, K., Kawamura, K., Miyamoto, M., Arima, R., Mori, T., Sekiya, T., Furukawa, T., Hashimoto, Y., Numata, H., Ichi Akita, J., Tsukahara, Y., & Matsubara, H. A computer game using galvanic skin response. In *ICEC 2003: Proc. International Conference on Entertainment Computing*, 1–3.
- [23] Scerbo, M. W., Freeman, F. G., Mikulka, P. J., Parasuraman, R., Nocero, F. D., & Lawrence III, J. P. The efficacy of psychophysiological measures for implementing adaptive technology. Tech. rep., 2001.
- [24] Sengers, P., Liesendahl, R., Magar, W., Seibert, C., Müller, B., Joachims, T., Geng, W., Mårtensson, P., & Höök, K. The enigmatics of affect. *Proc DIS 2002*, 87–98.
- [25] Sommerer, C., & Mignonneau, L. *Home Page Christa Sommerer & Laurent Mignonneau*. <http://www.iamas.ac.jp/~christa/index.html>.
- [26] The Wild Divine Project. *Wild Divine: About the Game*. <http://www.wilddivine.com/Game>.
- [27] Witmer, B. G., & Singer, M. J. Measuring immersion in virtual environments. Tech. Rep. 1014, U.S. Army Research Institute for the Behavioral and Social Sciences, 1994.
- [28] Young, K. *Social Psychology: An Analysis of Social Behavior*. Alfred A. Knopf, New York, 1930, 632–652.