

# Luminance

*Interactive Art Experience*



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shortattentionspan



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## **Introduction**

Short Attention Span consists of Lee Marrs, J.J. Toothman, and Scott Wong – three students currently in the Multimedia Graduate Program at Cal Sate Hayward. Short Attention Span has worked together to create Luminance, a multimedia installation that allows participants to interact with digital media using physical bodily movements. This installation has been used as the foundation for a period of exploration that focuses on the design and production of engaging and creative digital content within a physical interactive environment.

Using image recognition techniques, participants of Luminance will not be required to use traditional computing input devices such as a mouse or keyboard. The aim is to tap into users' natural physical impulses so that the participants may exercise their bodies and their imaginations. Through iterative user testing, content has been developed and adjusted in order to create evocative content for a delightful and more complex experience than a majority of art installations.

## **A Period of Creative Discovery & Exploration**

The core effort of Short Attention Span during the thesis year has been spent on a development process to support the design and production of unique interactive content for the multimedia installation. An examination of previous multimedia installations in which image recognition is a key component shows that their only aim in content development is to provide a visual or aural response to user movements. Often, the participant in the installation is solely a trigger, acting to activate a motion-graphics piece.

What seems to be missing from multimedia installations using image recognition is advanced content which encourages further user participation, investigation, and curiosity levels within the participant. Processes and guidelines for the development of multimedia content have evolved in the areas of film, animation, sound, web, and other mediums of the digital age. Terms of usability, information design, and user experience have influenced the interactivity of all of these mediums. However, a set of guidelines incorporating these fundamentals do not exist for content creators interested in creating unique interactive installations based on the new methods of interactivity and action-response. Emerging mediums existing in spaces beyond the screen, distant from traditional input devices, deserve a careful study into how disciplines of design and production can deliver complex content. This is the area of study for Short Attention Span.

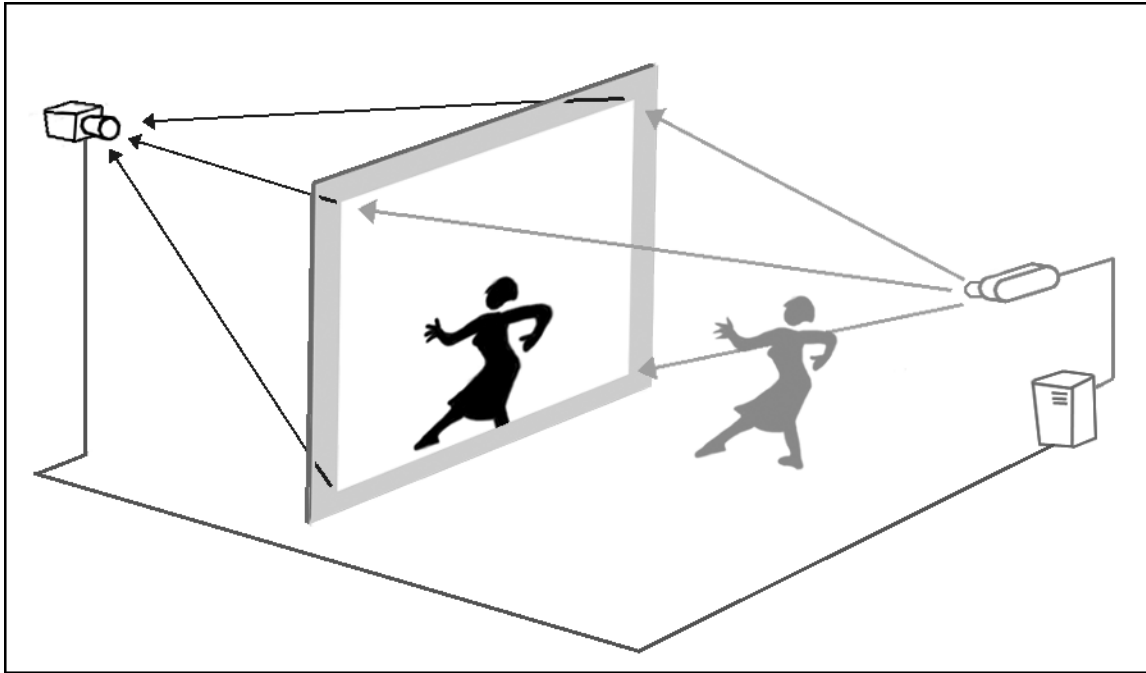
## **Description of Luminance**

Luminance is an interactive installation which is dependent on shadow recognition as a mechanism for creating action-response feedback systems. Therefore, the light available in the installation environment is an important consideration. In order to provide the ideal contrast and improve the performance of pattern recognition software, the preferred installation environment for Luminance is one with limited natural light. While dark rooms are an obvious choice, Short Attention Span is also interested in unconventional environments for installation such as tunnels or underground walkways.

## **The User Experience**

Users of Luminance enter a defined physical space in which the user will be positioned between a video projector and a large video projection screen. As the video projector is creating light, the user is positioned in a manner to cast

shadows upon the screen. Meanwhile, a properly positioned capture device such as a camera interprets the activity on the screen. The capture device is connected to a computer with software that can interpret the captured image. Specifically, the software must be able to process the shadows as a unique object within the image, converting it to a digital entity that can relate and interact with other digital entities.



### Conceptual Explanation

The SAS team has created an art installation. Unlike designing commercial installations, which contain very specific information targeted to elicit predetermined responses, building an art piece is an exploration with surprising results. Certainly there are parameters in every artistic venture, but the value comes from the juxtaposition of the known and the unexpected. The journey of that exploration – to deeply investigate interactive content at the most direct user level – is a worthy endeavor.

Current multimedia installations the team investigated address two areas of interest that speak to a direct level of enjoyable human activity: sheer physical movement and the ability to transform things in the environment. Many of the most enjoyable of human activities involve body movement – dance, sports, mud wrestling, and charades. It was also discovered that people love to transform things – sand castle building, landscaping, finger painting, burning effigies.

Most current installations in this category are either performances by an artist, exhibiting interactivity that is observed by an audience, or they are constructions whereby participants can have a restricted affect on an element. But, however ingenious and entertaining these latter art pieces are, they all manifest content that is one effect. They are one trick ponies. Sometimes the one trick is spectacular, as in Setpixel’s “Firecaster”. But very few have compelling content that engages the user for more than a few moments, or attempt even the level of absorption found in a haiku poem.

For example, in Adam Frank's "Shadow", users may step on a surface with a moving shadow. If the user approaches the shadow quickly, it flees to an opposite corner and cowers. If the user tries approaching it slowly, it "relaxes" and moves toward the user, arms outstretched.

This is not to sneer at the technical achievement of such work, but the emphasis on delivery systems too often has been at the expense of the content. To create an art piece where the interactivity actually works correctly has been the measure of success. Where SAS would like to engage its users is more in the realm of imagination that's found in reading.

No avatars, no 3D gloves. Adapting current technology in order to concentrate on the interactive content will provide an opportunity to delve more deeply into its possible lively scope and variety. Our creation process is designed to explore the interplay of direct physical action; manipulation of images and the user's imagination with iterative user feedback to develop more powerful content than is most often encountered.

### **The SAS Process for Complex Playful Content**

Because the interactive art installation arena is one where, for the most part, creating only one effect has so far been sufficient, the parameters of content development are not as well developed as in more mature media. The "language" has yet to be established.

Secondly, the effectiveness of interactive art depends mightily on users' activities as well as the creators' ideas. We intend to utilize user feedback from various testing sessions as a strong component in crafting the ultimate subject matter(s).

Therefore, as much as we looked to current examples for inspiration, the true source of evocative and lively content would be from pursuing ideas evoked by actual tests with our own prototype. By playing around with rudimentary content, we would recognize, imagine, and plan new content.

### **Prototype Play**

Information about user interactivity was gained from just the few times our working prototype was up and running. When we had the full scale setup working in the lab, non-team users began fully characterizing simple shapes, assigning them identities and responding to the varying latency of the moving dots and circles as though the images were alive.

This was especially true when the real-time objects became a tiny bit more visually complex. Once users were interacting with translucent circles of varying sizes, they "identified" them as bubbles and became more playful in their physical movements. This is encouraging for the evocative nature of abstracted images rather than literal ones as an avenue to pursue for complex subject matter. Users do (as with other art forms) bring their own experience and imagination to the art installation.

### **Nature of Play**

Our aim is to tap into users' natural impulses so that the participants may exercise their bodies and their imaginations. Investigations into the nature of play directly reinforce our initial intentions: to provide an opportunity for voluntary physical activity that can evoke feelings – of amusement, enjoyment, pleasure, surprise. But we're especially alert now to the dual purpose often ascribed to some play forms that experiencing an activity in relaxed ease can engender more complex realizations.

After observing our initial users, the role of tension is of interest: the expectation that comes from being called to a situation where alertness is needed to participate. Not knowing exactly what happens next automatically quickens users' interest.

### **Emotional Design**

A growing area of product design theory seems germane to our investigations. Don Norman, author of The Design of Everyday Things, has developed a way of categorizing design by how people process aspects of products. In his new book, Emotional Design, Norman describes three levels of perception in ways that parallel interactive art concerns.

Norman's levels of engagement are:

**Visceral:** biologically set preferences, emotional, unreasoning, attracted to bright colors, warm & lit places, appealing smells

**Behavioral:** ease of use and performance based on practicalities, how well something functions for whatever it does

**Reflective:** messages, culture-based, analytical, relating to self and/or self image

An effective, playful activity would have visceral appeal, engage the user on a behavioral level of mental processing (be easy to operate), and should have evocative elements to be reflective. His emphasis is on moving beyond functionality to playfulness and fun, and speaks to Luminance's aims in creating engaging content.

"These levels where hope and fear, and satisfaction and anger reside. Deliver on positive expectations and people experience pleasure. Deliver something different than expected, but equally satisfying, and people have fun."

### **Social Justification**

For over forty years, computation has centered about machines, not people. We have catered to expensive computers, pampering them in air-conditioned rooms or carrying them around with us. Purporting to serve us, they have actually forced us to serve them. They have been difficult to use. They have required us to interact with them on their terms, speaking their languages and manipulating their keyboards or mice. They have not been aware of our needs or even of whether we were in the room with them. Virtual reality only makes matters worse: with it, we do not simply serve computers, but also live in a reality they create.

In the future, computation will be human-centered and pervasive. It will be freely available everywhere, like batteries and power sockets, or oxygen in the air we breathe. It will enter the human world, handling our goals and needs and helping us to do more while doing less. We will not need to carry our own devices around with us. Instead, configurable devices embedded in the environment, will bring computation to us, whenever we need it and wherever we might be. As we interact with these "anonymous" devices, they should adopt our information personalities. As users of machine, we should not have to type, click, or learn new computer jargon. Instead, we should communicate naturally, using speech and gestures that describe our intent ("send this to Hari" or "print that picture on the nearest color printer"), and leave it to the computer to carry out our will.

New interaction systems should boost our accessibility to digital content by lowering the barriers which hinder the usage of the system. To understand this interactivity, a focus on interactive methods to creating action-response feedback loops with physical movements must be explored. As multimedia content developers, we need to understand how to create

systems that create accurate responses and how these responses are understood by the user. It is these responses which begin to craft the possibilities of content creation.

A project of this type has significance in its discovery of process and method for content creation. Success of multimedia art installations are often dependent upon the environment in which they are encountered and the audience they are reaching. This project explores content itself and how different types of interactive content create a compelling installation and experience.

With the growth of new means of creative expression, these processes of discovery are necessary in order to determine the potential of the medium. Only with concentration in the content area will the depth of interactive experience be expanded. The processes Short Attention Span hopes to discover should not be considered different than the processes uncovered by painters faced with a blank canvas or a sculptor with large chunk of clay. This journey of discovery can serve as a roadmap for effective installation content creation.

## **Installation Components**

The Luminance installation consists of the following components:

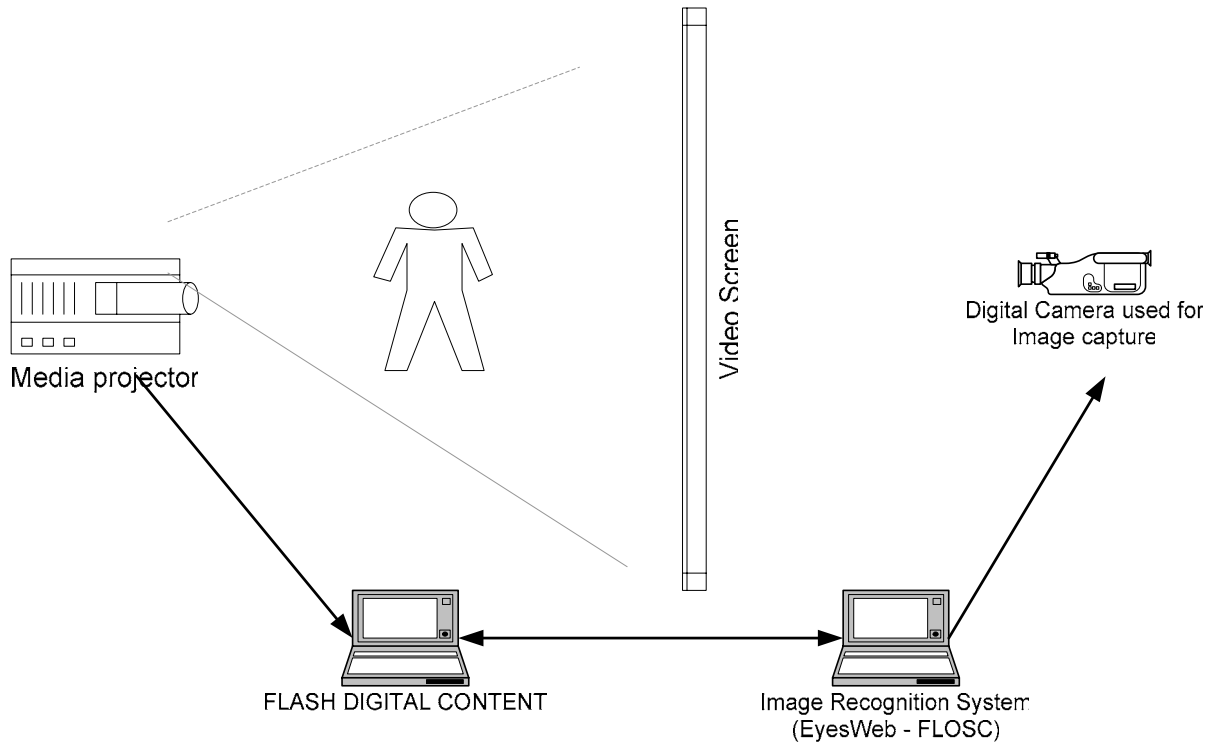
- **Video Camera:** Used for capturing shadow movements against the video screen
- **Motion Recognition System:** Consists of a PC running Eyes Web and FLOSC. A video camera is connected to this system using Firewire. A custom patch configuration using Eyes Web has been developed by the team to capture the video input from the camera, separate the shadow movements from the rest of the image, and assign moving points along the shadow. These points are converted to X,Y coordinate positioning data formatted as Open Sound Control data and transmitted through the FLOSC gateway.
- **FLOSC (Flash Open Sound Control):** FLOSC is custom java gateway which converts Open Sound Control formatted data (OSC) into XML data which is transmitted to Flash SWF file connected to the gateway
- **Macromedia Flash:** Receives XML formatted data from FLOSC. Flash parses the XML and converts the coordinates into individual movie clips. The movie clips can interact with other movie clip objects on the Flash stage.

## **Physical Setup**

The key to effective interaction between the installation and the user is a 1:1 correlation between the screen image perceived by users and the screen image perceived by the computer. Users must feel that their actions have direct and immediate effects on the projected world. Therefore, the users' bodies must not block the camera's view of the screen, as the system would likely perceive them as additional shadows. It is necessary, then, to have the camera capture the screen from an angle that eliminates this possibility.

The Luminance setup involves a free-standing screen with the camera placed on the far side, with a straight view of the screen's rear. In picking up the users' shadows as silhouettes, the system would only need to invert the image horizontally for the captured image to be very similar to what the users see. An advantage of this configuration is that the entire space in front of the screen is open to users. The main disadvantage is that it requires a free-standing screen and enough space behind the screen for the camera to capture its entire surface, which limits this configuration's portability. Additionally, some of the space in front of the screen is consumed in moving the screen forward. The improved accuracy of this configuration may, however, be worth this sacrifice.

## Luminance Setup | March 2004



### Influences and Inspirations

Luminance is informed and inspired by many previous efforts of research, artistic exploration, and experiments. Luminance has been influenced by projects and theories of human computer interaction, human sociology, and learning theories. A compilation of these influences and their impact on Luminance follows.

#### Myron Kruger – “Responsive Environments”

Myron Kruger’s work in the 1970’s investigated the interaction between machine and humans, with the interaction serving both as interface device and as a tool to develop social relationships. Kruger used concepts of responsiveness to create artistic experiences and environments in which the ultimate goal was for “full-body participation in computer events that were so compelling that they would be accepted as real experience.”

Marshall McLuhan stated that the “message is the medium.” Similarly, Kruger’s work explored the notion that “response is the medium.” The idea of full-body interaction creating action and reaction systems is a core fundamental characteristic of Luminance.

#### Camille Utterback – External Measures Series

Interactive installation artist Camille Utterback explores interactive mediums that provide a fertile environment to explore the connections between physical bodies and the myriad of representational systems possible in the digital realm. Utterback attempts to bridge the conceptual and the corporeal in exploring how people use bodies to create abstract symbolic

systems, engaging people's bodies instead of just their fingers and eyes. Interactive systems determine the grammar of interaction with digital media, and ultimately its possibility for meaning. Her External Measures series attempts to create aesthetic medium which responds fluidly and intriguingly to physical movement in the exhibit space.



Utterback's influence upon Luminance is to develop an interactive installation that respond to a participant's actual gestures, body language, and physical location with the installation space. By developing physical-digital systems that engage people's bodies instead of just their fingers and eyes, the intent is to refocus attention on the embodied self in an increasingly mediated culture. In addition, Utterback places a great deal of emphasis upon aesthetics. Similarly, Luminance will explore different types of multimedia content to engage participants. Visual and audio aesthetics will be a significant variable of content exploration.

### **Norbert Wiener – The Human Use of Human Beings**

Norbert Wiener's insights into human-machine interactions are the premise behind all human-computer interactivity and interface design. Wiener observed that the quality of data transmission between man and machine is affected by system feedback and noises. Wiener also promoted the idea that interactions between man and machine should be based upon natural communication methods from person to person.

The influence upon Luminance should be obvious. The communication between man and machine in Luminance depend upon natural physical communication of man. In addition, Short Attention Span's will heavily explore notions of two-way feedback between the systems of man and machine as well as the use of sounds to enforce machine responses.

### **Jean Piaget**

Jean Piaget's theories of cognitive development influenced Alan Kay's developments of the graphical user interface and the Dynabook while he was at Xerox PARC. Piaget outlines four stages of cognitive development which had certain characteristics with Short Attention Span will incorporate into Luminance. Short Attention Span will use Piaget's theory that supposes that people develop *schemas* (conceptual models) by either assimilating or accommodating new information. These

concepts can be explained as fitting information in to existing schemas, and altering existing schemas in order to accommodate new information. This will be a cornerstone of the initial content developed within the user interface

Piaget's also pointed a need for hierarchical nature of learning stages. Short Attention Span will use this hierarchical nature in the content developed. Users will encounter different types of interactive digital content that will become progressively more intriguing to adapt to and learn how to influence.

### **Burning Man**

The annual art festival Burning Man encourages not only creative artistic expressions but also promotes an atmosphere in which everyone is a participant. Similarly, Short Attention Span is developing Luminance as a multimedia installation that demands active participation. Luminance is not for the casual observer.

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<http://www.mine-control.com/> "We believe that art can be fun, playful, and simultaneously thought provoking"

<http://www.setpixel.com/content/?ID=105> Firecaster

<http://www.creativityandcognition.com> Creativity Cognition Studios

<http://www.uni-weimar.de/~bimber/research.php>

[http://www.artcom.de/index.php?option=com\\_acprojects&page=6&id=7&Itemid=115&details=1&lang=en](http://www.artcom.de/index.php?option=com_acprojects&page=6&id=7&Itemid=115&details=1&lang=en) Images that COMPEL folks do things, close relationship between physical activity & resulting change in images (ice breaks, water ripples) which evokes SPECIFIC & clear activity > stomping, schuffling.

<http://interactivity.stanford.edu/projects/barehands.htm>

"BareHands uses recognition of the shape of the touching hand (one finger, two fingers, side, etc.) to combine the convenience of direct touch with the power of multi-key interactions."

<http://www.3dluvr.com/voltaire/plaything>

<http://www.idonline.com/imdr02/body.html>

A camera-based tracking system monitored the coordinates of overlaid shadows in real time, using movement as an agent of change.

<http://www.flatblackfilms.com/> mesmerizing, translucent, shapes.

<http://www.unfinished.com/index.html>

Recent Discoveries from The Dept. of Shape Research

Camille Utterback - <http://www.camilleutterback.com>

### **Media:**

Linklater, Richard. "Waking Life" feature film. 2001. "interpolated rotoscoping" programmed by Bob Sabiston.