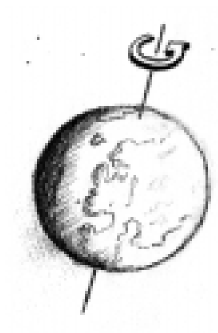

CULTURE WALLS:
Echoing Sounds of Distant Worlds Across Planet Earth — *A Proposal*

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Abstract. We propose an interactive installation consisting of three walls, each placed in a different part of the World. Instead of representing a barrier between cultures, these Walls create a bridge between them, connecting them in a pan-cultural audio artifact; the Walls encircle the Earth in a network of interconnected points, symbolizing the unification of its human inhabitants at each point. The principle is simple: Each Wall listens for human speech and laughter in the environment and records it using computer technology. The Wall then modulates the sounds in strange and beautiful ways and sends them to another Wall in a different part of the world, where it gets played back. The Walls thus echo the ambience and daily strife from one culture to another. Together the Walls create a pan-cultural, pan-continental audio artifact, connecting societies and people from different worlds through the medium of modulated audio ambience.

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Introduction

Imagine walking by a wall in the middle of public plaza. As you pass by you hear strange and beautiful sounds that seem to be floating your way. You walk closer and realize that the sounds emanating from the wall's brown and rusty surface are actually human voices. But they don't seem to be speaking any language you know; and they are strangely modulated in a kind of a melodic play on their rhythm and cadence. This wall you just walked by is obviously not of any ordinary kind. So what are these voices you are experiencing? The sounds you hear are generated by people in another place of the world, in another culture, as part of their daily routine; their daily strife. The wall carrying the voices is an Interactive Ambient Modulator. In other places on the globe are two more Walls, echoing the sounds you made as you walked by this one. Together the walls are called the Culture Walls — walls that echo ambience from one culture to another. The rest of this proposal explains how and why the Culture Walls exist. But before we go on we need to take a look at what ambient sound is, and why it is interesting to make it part of an interactive, pan-cultural experience.

Ambient sound — sound that sets a mood but doesn't require our direct attention — is usually not created on purpose; it gets created as a by-product of naturally occurring events in the environment: Voices, footsteps, doors closing, phones ringing, cash registers closing, computers beeping, horns honking. When architects design public spaces they seldom think of creating an "audioscape" within those places. If they consider sound at all it is usually in an attempt to minimize it, its transmission, and avoid noise's negative effects on work and play. This is mostly done by arranging the environment in various ways, and by using sound baffles and muffles. This is probably the most common manipulation of ambient sound in public spaces.

Occasionally *generated* audio is used as a means to control noise factors. Such deliberate use of audio has traditionally focused on music: in badly reverberating spaces in restaurants, for example, soft playing music is often used to help curb unwanted ambient sound and noise transmission. In this approach to ambient sound manipulation the creation of the music has no relation to the environmental sounds: A classical guitar piece sounds the same whether played in a busy restaurant or a dusty pawn shop. In spite of being generative, the audio space thus created is static, not interactive, in its nature, and the audio is not especially designed for the space where it is played, but is rather introduced as an afterthought.

With the advent of ambient music, pioneered by Brian Eno and others, environmental noise control and music merged. Eno wanted ambient music to blend in with the surroundings and "flavor" it in subtle, but subconsciously influential ways. In this he created a third way in which sound affected ambience; this time it was with music especially written to be played within its ambient environment—in subtler ways than had been done before. But the music reflected its author's static view of the environment; it did not change in response to the environmental sound in the space it was played.

This paper proposes a fourth alternative to sound manipulation in public spaces, through the

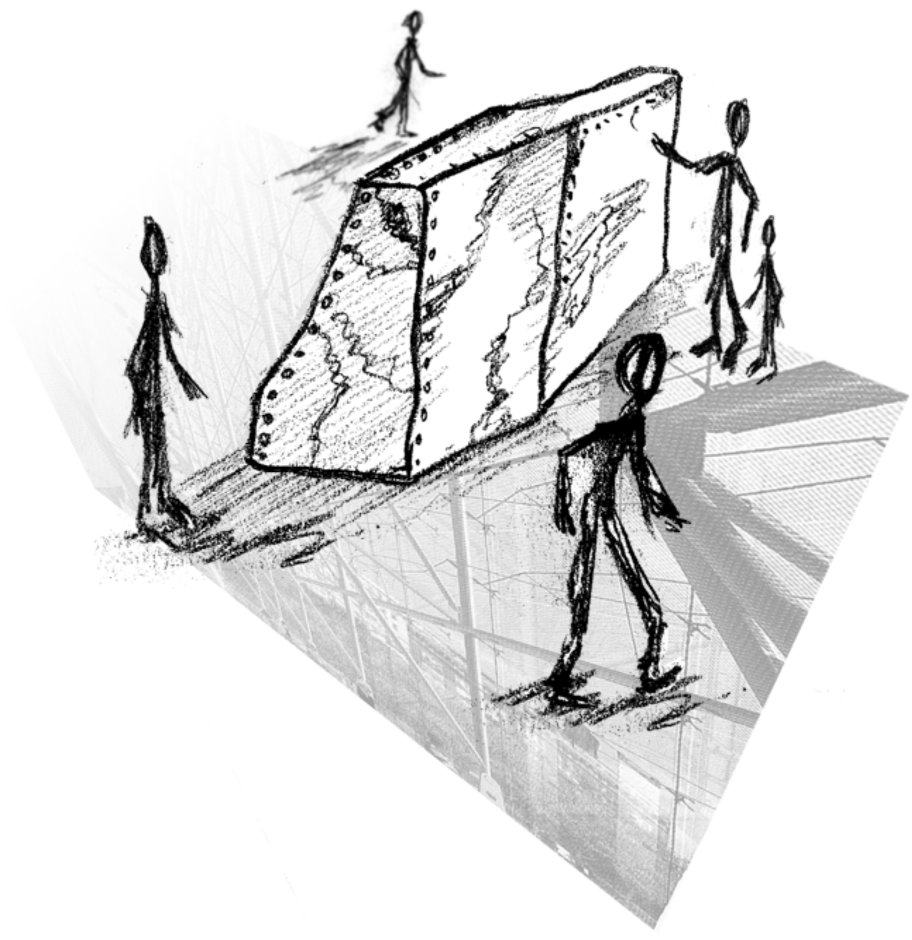

FIGURE 1. *The Culture Walls.* A Culture Wall placed in a public forum would becomes part of its audio ambience. As you walk by one of the Culture Walls, it may memorize your conversation, transport it to another Wall in another culture, where it gets played to those who happen to pass by.

Interactive Ambient Modulator (IAM).The IAM is an active environmental element that watches for naturally-generated ambient events, for example sounds, light or shadows, and reacts to them by playing them back in various forms, either through speakers or using video projectors. It is usually controlled by a complex algorithm, has multimodal sensory abilities, and listens, records, modulates and plays back ambient events based on what is happening in the environment. The concept of IAMs includes both audio and video. It is intended as an inspirational framework for building new types of "intelligent" installations, art pieces and sculptures. We envision multiple versions of IAMs—the Culture Room, the Culture House and the Culture Park, all of which may include multimedia. We explore such possibilities briefly in the section "The Future of IAMs". This paper proposes a version of the IAM that focuses on audio: *Culture Walls*. For the remainder of the proposal we describe the conceptual and technical realization of the Culture Walls concept. We begin by describing the general idea, and compare it to related work. Then an outline of its construction is given, followed by a section on its technical realization. Lastly we describe the physical construction of the Walls. Examples of software code, algorithms and sound filters are given; cost estimations for the project are given in the Appendix.

The Walls Have Ears

The Culture Walls are an incarnation of an Interactive Ambient Modulator. It consists of three Walls, located in different parts on planet Earth. Their role is to monitor those who walk by, listen to the sounds they make, and record them. A Culture Wall "remembers" an audible trace of the past in the form of recordings, and, at certain times of the day, sends these memories to another Wall in a distant place, far away. As a passer-by of a Culture Wall your senses will thus be extended into the past, to a different social context, giving you a flavor of what the ambience in another place and time has been like: busy, silent, noisy, loud; full of voices, full of noises, footsteps, doors opening and closing. Or silent—relaying the non-existence of people in a distant space, in a far-away land. Both of these will have meaning in the context of the Culture Wall, and color the mood of your own time and space.

In the same fashion, as you walk by the Culture Wall, it may happen to memorize your own conversation. Perhaps as a payment for being allowed a peak at another culture's sound world, your voice may thus—whether you like it or not—be transported to a distant continent, to generate the ambience for yet another place. And to those in that part of the world the audio that resulted from your actions will form a new ambient audio experience, always changing, never repeating.

Most interactive installations use audio in very direct, often intrusive ways. An example is "Crowd Control" by Don Ritter (1999). In this piece a visitor can step up to a microphone in front of a large display showing a video of a large crowd of people. When the visitor speaks into the microphone the crowd cheers. The louder the visitor talks into the microphone, the louder the crowd cheers. The audio production in this piece requires the visitor to do something unusual, and therefore makes the experience a very active one.

In 1996 Peter Broadwell headed a group of researchers to come up with a piece for the Digital Bayou exhibit at the SIGGRAPH (Association for Computing Machinery's Special Interest Group on Graphics) conference in New Orleans. Their interactive installation, called "Plasm:Yer Mug", is a sort of electronic mirror in which passerbys can reflect on the SIGGRAPH experience, with suitable cultural distortions. It consists of a mock-up bar with two seats, lined with sensors. As you sit down the mirror behind the bar — which is really a large back-projection display, responds in some way to the visitors, teeming with artificial creatures and life-like entities.

The Kids Room is an installation at the MIT Media Laboratory (Bobick et al. 1999) which allows children to participate in a narrative about monsters in far-away worlds. The installation uses computer vision to estimate what the children are doing, using context as way to simplify the sensory task and make it more robust. Participants in the narrative are never told what they are supposed to be doing; they find out by experimenting in the environment. The use of artificial intelligence mechanisms in this installation make it stand out from others, although it still is designed for direct and goal-oriented participation.

These kinds of interactive installation require the visitors' direct engagement. In contrast, the Culture Walls only requires indirect engagement — they are at the opposite end of the intrusiveness spectrum. Their ambient orientation makes them part of the environment; their presence makes itself only known to visitors indirectly. With active sensing mechanisms such as those used in the Kid's Room the possibilities open up to make the art piece itself do more work as it were, and allow the experience to be a more natural one.

As the World Turns...

Artistically the Culture Wall is conceived in a modular way, consisting of three elements: (1) The sounds, (2) the manipulation and transmission of the sounds, and (3) the interaction between users and the Wall, which is ambient and non-intrusive (making it an instance of an Interactive Ambient Modulator).

FIGURE 2. *Linking the Walls across the planet.* As the Earth rotates Eastward around its axis, the ambience from one Culture Wall travels Westward (large arrows) towards another, roughly a third of a circle around the globe, and is experienced by a new group of people as strange and beautiful sounds that emanate from a Culture Wall, representing a completely different culture.

As mentioned, there are three walls. These three walls are placed several thousand kilometers apart, each one in a different city. They are all installed in a busy environment, e.g. in the hallways of an office building, a Museum, or other public space where people walk by, meet or interact. The Walls know what time of day it is, and will synchronize their "listening" and "playing" to the loudness and amount of human activity in the place they are. For example, if we have one Wall located in an office building on Manhattan, NY, it will listen to and record the sounds of people coming to work in the morning. These sounds will be collected during a period ranging from a few seconds to several minutes. As the day passes the Wall will get audio transmissions from a Wall in another place on Earth, for example Tokyo. As the planet rotates Eastward, the audio from the Tokyo Wall travels Westward toward the NY Wall. Depending on the time difference between the Walls' locations, the sounds they play may be anywhere from two to several hours old. In our NY-Tokyo example sounds from the hustle and bustle of a busy noon in Tokyo will be played 9 hours later, again at noon, in NY. The ambience created by busy New Yorkers will travel to the next place, Hawaii for example, and the ambience of Hawaii will travel to Tokyo, closing the Culture Walls' audio loop around the world. Cities can be selected based on geographic as well as cultural distance. Some possible combinations of places that could be interesting:

- Tokyo - Delhi - Rome
- Sydney - Cairo - Lima
- New York - Moscow - Beijing
- Calcutta - Dakar - Vancouver
- Reykjavík - Bankok - Mexico City
- Rio de Janeiro - Stockholm - Jakarta

The Culture Walls thus transcend both time and place in the auditory domain. Their ambient nature places them firmly in the social realm, transcending the solo experience of a long distance phone call or a voice mail message. They transcend place by covering a whole trip around the planet; they transcends time by forwarding the sounds along the surface of the Earth via the Internet.

Three features will help make the Culture Walls a success. (1) Interesting spaces will be selected; places where interesting sounds are produced, mainly by passing people; (2) the mechanisms that sense people and determine what sounds are remembered will select important events in the environment, to ensure that "interesting" sounds are stored. If for example emotionally-laden voices are sensed, selectively recorded and stored, the Walls have a highly interesting source material to reminisce about; and (3) audio algorithms will produce unusual modulations and variations of the sounds that are heard, making certain that the ambience transmitted between Walls is not only a curiosity but has a certain sense of artistic beauty. A list of potential cities appears in the Appendix. Now we turn to the technical realization of the Culture Walls, addressing points 2 and 3 above.

Technical Realization

The Culture Walls use mostly off-the-shelf technology, in a modular fashion, combined with a custom written control program. The main technological elements for each Wall are:

- Control: A LISP program called the Controller, running on the same computer, interfaces between the audio recording/processing and the environment sensing using MIDI signals, and controls the transmission of audio between Walls.
- Sensing: Two microphones, hidden inside the Wall at each end. Distance-sensitive, infrared motion sensors, mounted at equal distances on one side of the Wall (the one with the most traffic), audio filters and MIDI-based pattern matchers that together can sense people in various ways, including the sounds they make.
- Audio Manipulation: A Kyma-Capybara audio system, controlled by a Macintosh computer, for monitoring, audio filtering, sampling and playing back modulated audio.

We will start by looking at the Controller, followed by an example of sensing and perceiving, and then discuss the audio manipulation part. In many ways, sensing the environment and making sense of this input data is a key to making the Culture Walls work; without intelligent sensing, the Walls cannot respond in interesting ways. Therefore, this aspect of the Walls will receive most of our attention in the next section.

The Controller

The Controller program determines what state the Culture Wall is in: when to record ambient sound, when to listen and sense the environment, and when to send audio to the other Walls. The program is made up of three main parts: (1) The Perceiver, (2) the Decider, and (3) the Communicator. The Perceiver takes the input from the microphones (via the Kyma-Capybara system) and the motion sensors and combines them to express what is happening in the environment surrounding the Wall. This information is produced using various techniques, and represented in symbols. As an example of perceptual data is the Voice Filter (Figure 3), which, upon detecting voices in the environment, generates MIDI events. The Decider looks at the symbolic output of the Perceiver, as well as a world clock. Using Boolean logic it determines which state the Wall should be in at any given moment (perceiving, playing, transmitting; the first two are mutually exclusive, transmission can happen at any time in the background). If for example motion is sensed at the same time as voices are heard, the Decider sends a MIDI signal to the Kyma-Capybara system to turn on sound recording. The Decider also determines which audio manipulation program (explained below) shall be used to replay audio from another Wall. A Communicator handles the Internet connection and the

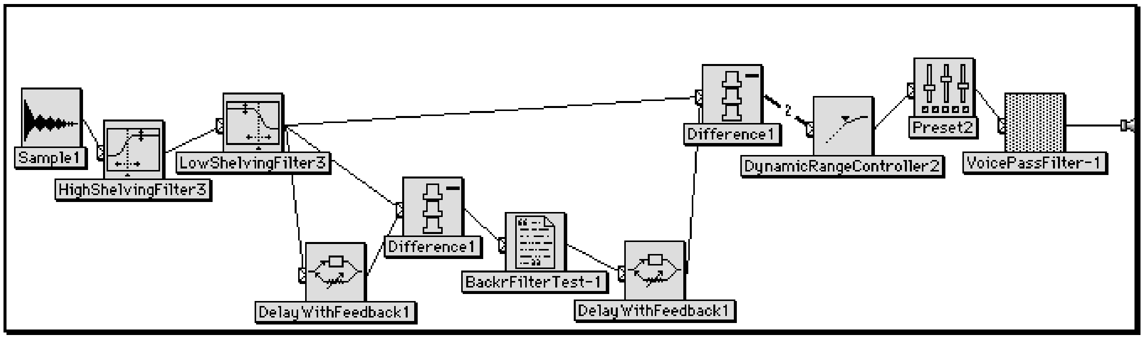

FIGURE 3. *Filter program to separate human voices from noise.* This filter will enable the Culture Wall to determine when to record the ambient, environmental sounds (recordings are unfiltered). Sound travels from left to right: "Sample1" is the output of a microphone situated in the Wall, which is band-pass filtered ("HighShelvingFilter3", "LowShelvingFilter3"), to leave a center region around 1000 Hz with a bandwidth of 2000 Hz, the region where human voices lie. By delaying the signal and subtracting this from the original signal, using a series of delays (feedback set to 0), we take out the background reverb and echo and are left with a relatively clean voice signal, depending on the amount of background noise. This signal is further treated in an expander that acts as a noise gate (DynamicRangeController2). "Preset2" stores the settings for all the parameters in the program, "VoicePassFilter-1" pipes the output to other processes (see Figure 5).

transmission of audio from Wall to Wall, upon receiving commands from the Decider. In addition to these three parts are (4) a MIDI Server takes care of MIDI routing, and (5) a Setup Handler allows saving and retrieving all of the program's settings. The Controller intermittently sends out the Wall's local time to the others, along with an ID, so that all Walls know the time difference between their locations and can take this into account when sending audio data. This automatic synchronization makes it easier to move the Walls from one location to another.

Each Wall comes with a collection of audio manipulation programs. A subset of these programs are selected when the Wall is set up, taking into account the current locale the Wall is in. (These are then selected at runtime by the Decider using heuristics.) Since the system knows the time of day, as well as the day of the week, interesting daily and weekly patterns can be set up For example, if a group of preschool children come by the Wall on Saturdays, the Wall can be set up to respond especially to high-pitched voices on Saturdays, and to play back ambience from the other Walls in a way that complements this weekly change in the audio environment.

Sensing & Perceiving

Input from microphones streams into the two audio input channels on the Kyma-Capybara system. Both of these are used in the Culture Walls for sensing (and for recording the ambient audio). Filters separate voices and footsteps from other random noises coming in through the microphones (Figure 3). The distance-sensitive motion sensors trigger when people are moving within 4 meters of the wall. Other types of sensors and perceivers include rhythm and pitch detectors. Here we will give an example of a rhythm perceiver, implemented in LISP, which takes in timed events, generated for example by an audio source (such as that described below), and identifies rhythmic patterns in the event stream.

In the current implementation of the Rhythm Perceiver, MIDI events are generated by the voice filter (Figures 3 & 5). Rhythmic events such as footsteps and rhythmic clapping span a broad spectrum, and therefore pass through the voice filter (Figure 3). The output from the voice filter is passed to a mechanism that generates MIDI events when the volume goes above a certain threshold. These events are fed to the Rhythm Perceiver algorithm (Figure 4), which identifies repeating, rhythmic patterns. This algorithm has to take into account that there could well be a very noisy signal in the environment (i.e. lots of non-beat events intermingled with the actual beat events). Therefore we look for repetitions of intervals. It works in the following way: The time of a new event is compared with the time of all prior events (a certain amount back in time) and if such an interval has happened before (i.e. there

```
(defun repeated (new-event midi-buffer)
  "Check how often new interval is repeated in past."
  (let* ((num-of-repeats 0)
         (?current-interval nil)
         (?max-event-age 3000) ;; AGE OF THE OLDEST INTERVAL STORED (ms)
         (?tolerance 0.2)      ;; ALLOWED VARIATION ON EACH BEAT (0-1)
         (num-of-repeats 0)
         (new-event-TS (gettimestamp new-event)))
    (dolist (old-event midi-buffer)
      (setf ?current-interval (- new-event-TS (gettimestamp old-event)))
      (dolist (old-interval-list *interval-buffer*)
        (if (equal-within-range ?current-interval old-interval-list ?tolerance)
          (setf num-of-repeats (1+ num-of-repeats))))
      (push (list ?current-interval new-event-TS new-event) *interval-buffer*)
      (setf *interval-buffer*
            (time-trim-buffer *interval-buffer* ?max-event-age)))
    num-of-repeats))
```

FIGURE 4. *LISP code responsible for perceiving rhythmic patterns in the ambient audio.* Considering its simplicity, this algorithm works surprisingly well; combined with one or two other methods for detecting beat, and a fuzzy logic classifier, the presence of man-made rhythm — even in the presence of noise — could reliably be detected and reacted to.

are other intervals of equal length—within a given tolerance) the new event is counted as a beat. The of this algorithm is its relative immunity to noise; it's weakness is that it may find rhythms where there really are none. To deal with that a threshold is set to the minimum number of repeats required (`num-of-repeats`) to count it as a rhythm. For example, setting the threshold to 5 would require 5 beat events before the Wall would perceive it as a rhythm. The precise settings of these parameters will need to take into account the setting in which the Wall is, human behavior in the environment and the acoustic properties. Further adjustment of the algorithm's sensitivity can be done by changing the `?tolerance` variable, which indicates the maximum variation that is allowed to count an interval contributing to a beat.

Other sensor mechanism that will be implemented in the Walls are detecting (1) the direction of motion that people are walking in; detecting (2) people who walk up to the Wall, and estimating (3) the amount of people in the vicinity by the incoming signals from the microphones and the motion detected. The first mechanism will be implemented by looking at a sequential activation of the four motion detectors and the second will simply use put a threshold on the strength of the signal from the motion detectors (which is stronger at close ranges). The third will use heuristics to combine signals from the motion detectors and the audio input. Off-the-shelf infrared motion detectors are used for this purpose.

Audio Manipulation

The Kyma-Capybara commercial digital signal processing (DSP) system has significant programmability. As already mentioned, it is programmed for three functions: (1) A filter system, with the purpose of detecting the presence of people through the microphones, (2) recording audio into AIFF files and storing them on the Macintosh computer, and (3) play back and manipulating the audio from other Walls.

Audio manipulation is done in several ways. A primary feature of the selected audio manipulation algorithms is to leave a recognizable trace of the original sound in the playback (otherwise one could simply play any sound). This is achieved by playing the original recordings interleaved with a modulated versions of them. To achieve interesting modulations of ambient sounds, algorithms are selected that morph and twist samples in subtle ways. For example, voices sound especially intriguing when pitched up or down while holding the time constant; granulation creates a other-worldly soundscape that is very effective for stirring a listener's imagination. Granulation is also well suited to fit in with ambient sound. This, and other modulation effects, are achieved by using the sample manipulation programs in the Kyma-Capybara system (Kyma Manual, 1997).

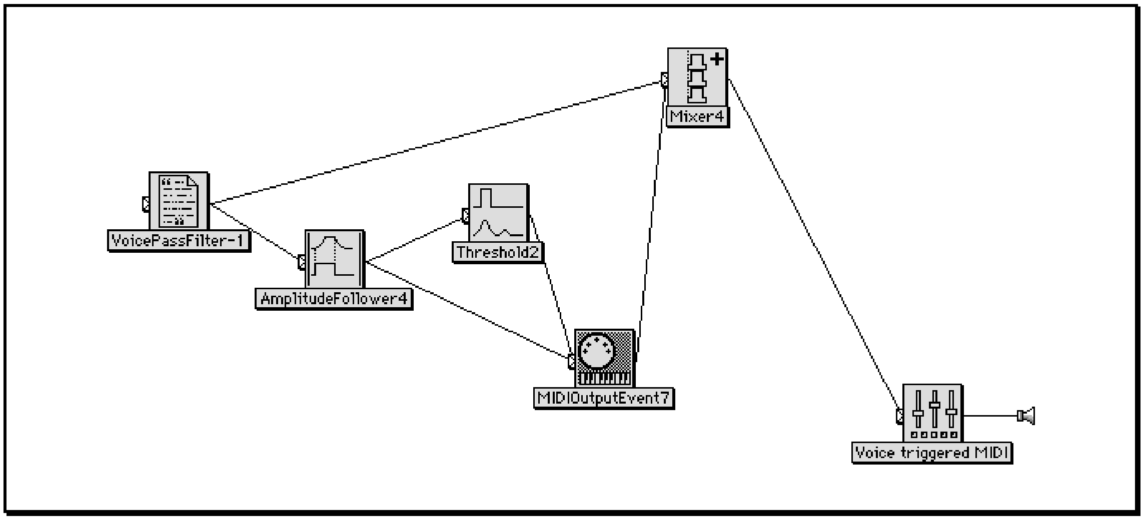

Figure 5. *Threshold function.* The VoicePassFilter in Figure 3 is fed into a threshold function that outputs MIDI signals on a particular channel when human voices are detected. The Kyma-Capybara system sends these signals to the LISP program, where they are combined with the output from the motion sensors.

Physical Construction and Design

The Walls are to be positioned in central places, e.g. in the middle of walkways, entrances and lobbies, where people pass by often. Their presence and physical make has to speak to the passer-by claiming "I don't really belong here", asking "What am I doing here?", thus encouraging people to question its presence. However, we must also keep the ambient theme and avoid intruding into the space. We don't want people to obviously perceive the Walls as "interactive art". To achieve this the Walls will be monolithic, with all the mechanisms underlying their functionality hidden. Their look follows a theme not very common inside buildings: A rusty outer shell, made from treated, molded plastic that looks like aged, rusting metal. Inspiration for the design comes from Jules Verne's fiction from turn-of-the-century Captain Nemo's submarine Nautilus, with clunky sections visibly bolted together, a rough surface and heavy feel (Figure 1).

Dimensions are 250 cm length x 220 cm height. All electronics, recording and sound reproduction technology will be hidden inside the Walls. To do this the width is slightly more at the bottom than at the top: 80 cm x 50 cm (see Figure 4). All electronics, speakers and sensors are integrated into the Walls. Each Wall is built so that the audio it produces is non-localized, sounding like it's coming from the Wall itself, rather than a particular place on the Wall. This is achieved by using four flat speakers hidden inside the Wall, and connecting them directly to its surface. One of the two output channels of the Kyma-Capybara allows playback programs to create sub-woofer effects, making the Wall vibrate.

Installation & Moving

Each Wall is carried in parts and bolted together on location. Its placement is chosen to make sensors and microphones as sensitive as possible to human movement and sounds in the surroundings. Since all electronics, speakers and sensors are integrated into the Walls, no cables need to be strung into the environment except for power and phone connection. The interaction and tuning of the main functionalities of the Wall (sensing, recording and modulation) is then done in the control panel of the Controller program.

The Walls are moved periodically to new locations in the world. In each place an Internet connection is required, preferably an ISDN or higher bandwidth communication link. To ensure that the Walls always have enough audio material to play, an ISDN or faster connection is sufficient.

Future Extensions

The Culture Walls is one possible instantiation of many possible using the idea of Interactive Ambient Modulators. Now let's look at some other interesting options that could be made in the future.

The Emotional Wall. A modification to the Culture Walls, the Emotional Wall is a single wall that listens exclusively for emotionally laden sounds, people in a hurry, babies crying, or loud vocal outbursts.

The Remembrance Wall. A Remembrance Wall is like a Culture Wall except it simply plays back audio to the same space it was produced, reflecting on the space itself and its inhabitants. Walking by such a wall you will hear echoes of past sounds, possibly even your own.

The Communicative Wall. One interesting version of the Culture Wall is the Communicative *Wall*, which is able to talk to you directly, in a "face-to-wall" dialogue, about what it has heard or seen in the past. This version would use speech recognition and synthesis, plus state-of-the-art artificial intelligence techniques to make the dialogue possible.

The Audio Mirror. Another version builds on the idea of telepresence. By making the connection between two Walls in different locations duplex (two-way), the Audio Mirror create a two-way "social telephone" connection where both sides of the wall can hear each other without interference. Such an implementation would require sophisticated noise-cancellation techniques to work well.

The Audio-Visual Remembrance Room. We conclude by suggesting an audio-visual version of the IAMs As you enter a room, shadows and ghost-like appearances of people who have gone before appear around you. You hear their voices as murmur in the background, emanating from the places where their shadows and outlines appear. With audio-visual synchronization, spatial video projection and 3-D audio recording and playback, such a system could be spectacular.

It should be clear from these examples that Interactive Ambient Modulators have great potential to inspire a variety of interactive sculptures. They open up possibilities where social, technical, and architectural aspects combine in interesting and new ways, creating new and exciting experiences for private and public spaces.

Acknolwedgments

I would like thank Peter Becker and the members of the Experience Studio (formerly Emotional and Intellectual Interfaces Studio) for supporting this work, and especially Roland Söderberg for his contribution to the final form and concept of the Culture Walls.

Appendix: Cost Estimation for a Single Wall*

Modelling		
Creation of 3D computer model: 80 hours @ $80/hr	6400.00	
Materials		
Plastics for outer shell	$1000.00	
Misc. hardware for construction	$2000.00	
Audio Equipment		
Kyma-Capybara 320	$3000.00	
Microphones	$600.00	
Other Electronics		
Macintosh Computer	$1000.00	
Motion Sensors	$300.00	
Cables & misc.	$400.00	
Labor		
Design: 100 hrs @ $80/hr		$8,000.00
Control Programming	$4000.00	
Audio Programming	$3000.00	
Building (molding; surface; assembley; etc.): 120 hrs @ $80/hr		$9,600.00
Other Cost	$3000.00	
TOTAL		$39,300.00**

*Estimation is in addition to work to date
**Subsequent Walls will be less expensive

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The Creative Zone — amazing pages at: http://www.creative-zone.com/

The F.A.B.R.I.CATORS is an Italian company specializing in the integration of art and technology — "Architects of culture, fabricators of ideas"): http://hpux.dsi.unimi.it/imaging/LAST_SUPPER/fabricators.html

MIT Media Lab's Brain Opera - a huge, travelling interactive sound installation: http://brainop.media.mit.edu/index.html

Planet Theory "is a company specializing in interactive kiosks and related installations": http://www.planettheory.com/

Royal College of Art: http://www.crd.rca.ac.uk/

Artists

Ken Feingold is an interactive artist with interesting pieces in his portfolio. http://www.kenfeingold.com/notes.html

LACMA. In October 1998 the Los Angeles County Museum of Art - LACMA - opened its new Experimental Gallery. "This innovative 8,500-square-foot exhibition space, located in LACMA West, the former May Company facility, is designed to make the experience of viewing art more engaging for children and families and give the museum a venue for trying new ideas about presenting art and information." http://www.lacma.org/info/press/ancestor.htm, http://www.lacma.org/

Paul De Marinis "has been working as an electronic composer since 1971 and has created numerous performance works, sound and computer installations and interactive electronic inventions." http://www.well.com/user/demarini/

Don Ritter, an interactive installation artist: http://www.users.interport.net/~ritter/

Tsai Wen-Ying - amazing "cybernetic" sculptures, a few of them interactive: http://www.ap.att.com/news/events/Tsai/index.html

Exhibits, Conferences, etc.

European Media Art Festival: http://www.emaf.de/english/

http://www.aec.at

FACT. "The Foundation for Art & Creative Technology [FACT] is the largest commissioning body for electronic media art in Britain. Established [as Moviola] in 1988 it has been responsible for commissioning and producing more than 80 projects by British and international artists in partnership with galleries, museums and other producing or exhibiting agencies." http://www.fact.co.uk/

Museum of web arts: http://www.mowa.org/

SIGGRAPH 1996, Peter Broadwell: "Plasm: Yer Mug", at http://www.plasm.com/peter/public_html/YerMug.html, http://www.plasm.com/peter/public_html/proposal.html.

Prix Ars Electronica, competition: http://prixars.orf.at/

Projects: http://www.aec.at/futurelab/artists/projects/projects.html