TITLE: iteration13
AUTHORS: Ivica Ico Bukvic, Carol Burch-Brown, Ann Kilkelly
MEDIUM: piezo pencil, tap, mylar, and interactive audio and visuals
DURATION: approx. 15 minutes
PERFORMERS: Ivica Ico Bukvic, Carol Burch-Brown, Ann Kilkelly
FORM: structured improvisation
TECHNOLOGY: Max/MSP/Jitter, custom piezo pencil, 2 hypercardioid microphones, Nintendo Wiimote and a Wii nunchuk, wireless or wired webcam, soundcard with two microphone preamps, laptop or desktop computer (Core 2 Duo 2.4GHz or better), stereo playback, projector, screen

DOCUMENTATION

SYNOPSIS
iteration13 is a structured multimedia improvisation employing unorthodox performance ensemble whose roles are often turned upside down: a visual artist who generates sound by drawing, a tap dancer, and a musician who performs using a camera. Throughout the piece, performers' parts appear to evolve, often cross-pollinating their domains and trajectories.

The work explores structure and program as predominantly orthogonal, yet nonetheless mutually influencing streams. The continually evolving juxtaposition of abstract attack-based aural events produced by a tap and smooth gestures of an amplified pencil and their permutations (e.g. point-based attacks by pencil and a dragging foot gesture) seeks to assimilate seemingly polarized streams. Likewise, through the use of pencil gestures the piece investigates poignant contrasts among elements of nature, such as water and fire. This absoluteness is superimposed by a literal poetry and a soundtrack that punctuates the ending. In part inspired by the visual content, the closing section embodies sea waves splashing against the shores of a newly discovered world, a landing following a long and perilous voyage.

iteration13 therefore can be seen as a theatrical audio-visual performance focusing on seamless integration of technology into an unconventional ensemble.

LOGISTICS
The work calls for approximately 40 x 30 ft. area in front of the audience. Ideally, the audience should be level with the stage and their placement can in part encircle the performance space (Figure 1).

The stage lighting should be warm, moderate, and focused on the mylar with little bleeding beyond the mylar's surface area. Ideally, the stage floor should be wooden or a parquet-like surface.

Video projection should be as large as possible with projector hung from the ceiling to minimize possible shadowing by the performers (ideally, there should be shadowing of the projected material). As an alternative, it should be positioned to the left, as far as the keystone feature and/or stage space allow. The projected image should be positioned behind performers.
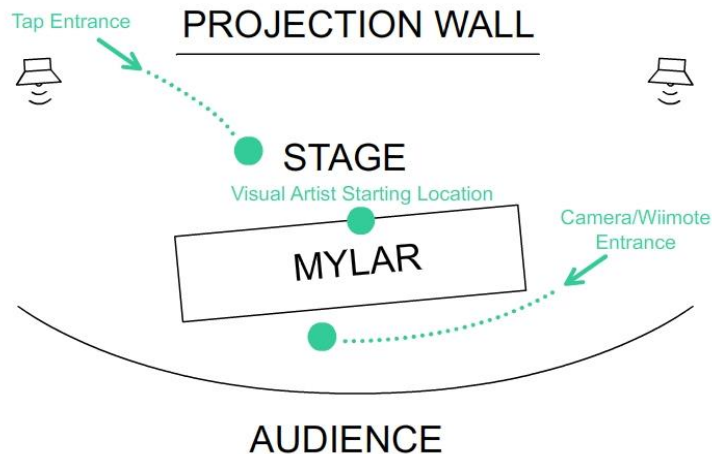
Figure 1. Ideal stage and audience positioning.

TECH SETUP

One computer should be used for performance, preferably Intel Core 2 Duo 2.4Ghz laptop/desktop or better. No special video card hardware is required, so either integrated or a dedicated video card will suffice. The piece uses the audio (**iteration13-audio-final**), Wii (**iteration13-wii**) and video processing (**iteration13-video**) Max/MSP/Jitter patches. Given that the video processing relies in part on matrix convolution, the video patch should be used as the primary benchmark of hardware's ability to run the piece. The target frame rate for the video feed is hardwired to 10FPS. Frame rates below 10FPS due to CPU limitations are deemed inadequate. Higher framerates can be optionally enabled.

The Max/MSP/Jitter patches rely upon several externals and a number of abstractions. For this reason, patches are provided as self-contained binaries offering basic configuration. Source patches are available upon request.

The computer should be used in conjunction with an external audio card that also offers audio preamp feature (e.g. Edirol FA-101). The first (ideally hypercardioid) microphone (e.g. AKG C-1000)[1] should be positioned center stage near the audience (Figure 2) as a vocal microphone and should be connected to the channel 1 on the soundcard. The second (also hypercardioid) microphone that will be used for tap monitoring should be mounted on a short neck near the floor, facing the floor at approximately 45-degree angle (Figure 2), and should be connected to the channel 2 on the soundcard. Preamp should be used as needed.

The custom-built piezo-mounted amplified pencil should be connected into the line-level channel 3 on the soundcard and must not be used with a preamp. The main output is stereo with speakers positioned in the back of the stage. Alternately, speakers can be moved closer towards the audience to minimize potential audio feedback due to use of the two microphones.

The Wiimote patch requires computer to have a Bluetooth capability. Although many laptops provide built-in Bluetooth feature, such solution should be generally avoided because:
1. the hardware signal strength renders connection unreliable
2. on Windows OS, drivers offer inadequate support for Wiimote-like devices

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[1] We are also considering piezo-mounted tap shoes as an alternative to the hypercardioid microphone monitoring of taps. However, this hardware solution is still in development.

Therefore, an USB Bluetooth dongle should be used instead (e.g. Belkin), preferably with signal rating for up to 100ft. Unlike the audio and video Max/MSP/Jitter patches, the Wiimote patch has a minimal CPU overhead.
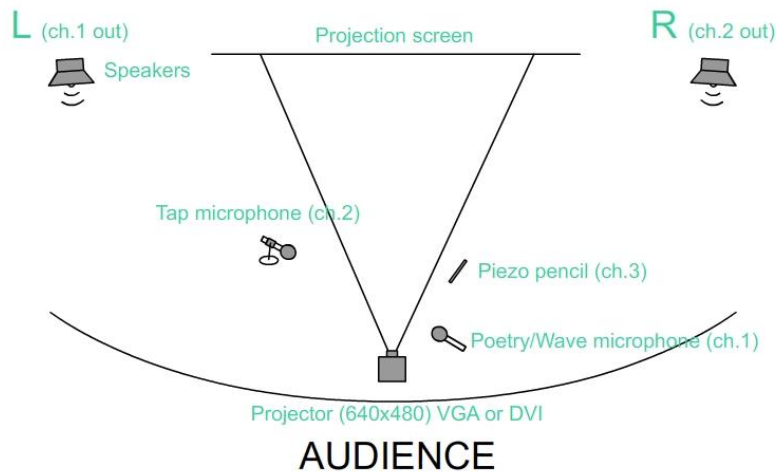

Figure 2. Tech setup.

The video processing patch requires a webcam. In its current version we rely upon the *Logitech QuickCam Cordless* for this purpose. Considering this is a discontinued model and more importantly that its wireless signal is susceptible to the Bluetooth signal interference, as an alternative a Firewire-based webcam such as Fire-i can be supplemented. Generally, any other wired/wireless solution will do provided:

1. it does not significantly constrain performer's movement on stage
2. the hardware fits comfortably in one hand
3. it can provide 640x480 resolution at 15fps or better
4. the hardware is detected by Max/MSP/Jitter as a webcam using jit.qt.grab (Mac) or a jit.dx.grab (PC) object

The main mix as well as individual audio levels are controlled via Wiimote. Therefore, the main mix can be run at unity or as deemed appropriate. The prerecorded end of the piece is considered one of the loudest parts and can be used as a good reference for adjusting the main mix.

ADDITIONAL SOFTWARE DOCUMENTATION
Most patches have preset boxes. The first preset should be selected to initialize the respective patches. Before running patches, it is necessary to pair Wiimote with the computer. Please consult the tk.wii external documentation on how to do this.

The video playback can be toggled full-screen using the "RETURN" key on the computer. In addition to the preset setting, the audio patch also requires enabling of the audio output. Once everything is properly configured, main mix levels should be adjusted before any audio output will be possible. The following chapter describes this and other Wiimote commands.

In case patches fail to open due to lack of an external, the piece relies upon the following externals (available via www.maxobjects.com):
- gigaverb~
- tk.wii

WIIMOTE CONTROLS

The Wiimote and Wii nunchuck (Figure 3) are the control hub for all aspects of the piece and its performance, including the main mix, video processing, audio processing of the two inputs, as well as triggering various aural events and cues throughout the performance. The Wiimote should be strapped to performer's <u>lower left arm</u> using a masking tape or similar method and preferably hidden under a sleeve. Its role is primarily to relay data from the nunchuk and more importantly to provide tactile feedback in the form of vibrations that can be sensed due to its close contact to the arm. Namely, whenever a particular option is toggled on or triggered, the Wiimote will vibrate acknowledging the command. The nunchuk's cord should be hidden inside the sleeve and the controller held in the <u>left hand</u> as inconspicuously as possible.

Figure 3. Nintendo Wii Nunchuk (left) and Wiimote (right).

The nunchuk offers three planes of control (Figure 4):

1. **Downward Sidewise or Low** (the thumb is pointing towards the right with the index finger pointing downwards, designated as **L**) - used for global settings, such as main mix, section triggers, and contextual cues (context changes in each section).
2. **Sidewise or Medium** (the thumb is pointing towards the right with the index finger pointing forward, designated as **M**) – used for video processing.
3. **Upright or High** (the thumb is pointing upwards with the index finger pointing forward) – used for audio processing, primarily for the second section. (designated as **H**).

Figure 4. Planes of control (L = left, M = center, H = right).

Each plane of control offers 2 analog axes (designated as **x** and **y** relative to the arm and joystick plane) or 4 triggers (designated as **left, up, right,** and **down** relative to the arm and joystick plane) using the Nunchuk joystick. These behaviors can be modified using the two buttons in the front of the Nunchuk, using the index and middle fingers, as follows:

1. **No button** pressed (designated as **b0**)
2. **Top button** (index finger) pressed (designated as **b1**)
3. **Bottom button** (middle finger) pressed (designated as **b2**)
4. **Both buttons** (both fingers) pressed (designated as **b3**)

CONTROLS CHART

- **L b0 y** = main mix 0-100%
    - Relative control - farther the joystick from the center, greater the rate of change.
- **L b0 left** = main mix 0%
- **L b0 right** = main mix 100%

- **L b1 left** = initialize section 1
- **L b1 up** = initialize section 2
- **L b1 right** = initialize section 3
- **L b1 down** = initialize section 4

- SECTION 1
    - **L b2 left** = toggle multitap delay of the pencil and tap
    - **L b2 up** = execute "glitch" delay A on pencil and tap
    - **L b2 right** = execute "glitch" delay B on pencil and tap

- SECTION 2
    - **H b0 left, up, right, down** = navigate a recursive 3 x 3 plane of possible sonorities

    - **H b1 left** = toggle bamboo sound for pencil
    - **H b1 up** = toggle fire sound for pencil
    - **H b1 right** = toggle water sound for pencil
    - **H b1 down** = toggle comb filtering (channels 2 and 3)

- SECTION 3
    - **L b3 left** = toggle sustained amplitude-driven sound (channels 1 and 2)
    - **L b3 up** = toggle water ripples (channel 1)
    - **L b3 right** = toggle multi-tap delay (channels 2 and 3)

- VIDEO
    - **M b0 x** = video delay 1-60ms (relative—farther the joystick from the center, greater the rate)
    - **M b0 y** = video convolution 18-75x (relative—farther the joystick from the center, greater the rate)

    - **M b1 left** = fade out instantly
    - **M b1 right** = fade in instantly
    - **M b1 up** = fade in over 5 seconds
    - **M b1 down** = fade out over 5 seconds

SCORE

Given that the piece is a structured improvisation it does not easily lend itself to a conventional notation. Although the Max/MSP/Jitter patches in conjunction with this document should provide adequate documentation for its performance, the work is specifically tailored towards talents and interests of authors/performers.

Performers are split into:
- **visual artist (artist)** who uses piezo pencil to draw on mylar
- **tap/gesture dancer (dancer)** who uses tap shoes to produce aural texture, and
- **interactive audio-visual performer (musician)** who controls the camera and computer output using Nintendo Wiimote/Nunchuk

PERFORMANCE TIMELINE

1. PREFACE (approx. 2 minutes)
   - The artist quietly draws on mylar using piezo pencil. The pencil's amplified output should be off. The mylar should be unrolled approx. 10 feet, containing most if not all drawings that have been created during rehearsals. A collection of white papers with drawings on them should be scattered across mylar's surface. If applicable and provided it does not hinder or detract from its performance, this part can overlap with the previous piece on the program in which case its duration can be extended beyond the suggested 2-minute timeframe.

2. INTRODUCTION (approx. 3-4 minutes)
   - Musician slowly enters the stage with the camera pointing towards the artist. He is intently observing what artist is doing. The two should be at least 10 feet apart. The video feed should be blank.
   - **L b1 left** - Musician initializes section 1 (pencil will become amplified).
   - **M b1 up** – Slowly fade in video. Make sure its settings are in the least obscure position (delay = 1, convolution = 18). Musician is now free to move around the stage (as much as the webcam allows in the case wired version is used), varying positions around the mylar.
   - Dancer enters and listens to the sound of the pencil. Then, it slowly begins mimicking and eventually interacting with the artist's aural texture until artist notices her.
   - **L b2 left** - toggle multitap delay of the pencil and tap ON. Play with **L b2 top** and **right** to enrich the texture to build the momentum.
   - **L b1 up** –initiate the development by adding water sound to the pencil and sonority to the tap. This is a strictly timed action and as such requires eye contact and coordination among all three performers. First the artist, then the dancer are introduced to the change which they both notice and are visibly surprised. Their surprise should be punctuated by a momentary cessation of activity. This signifies beginning of the development.

3. DEVELOPMENT (approx. 5-6 minutes)
   - Use following commands:
     - **H b0 left, up, right, down** - navigate a recursive 3 x 3 plane of possible sonorities that are triggered by percussive attacks of the tap dancer.
     - **H b1 right** - toggle water sound for pencil (introduce first)
     - **H b1 up** - toggle fire sound for pencil (introduce second)
     - **H b1 left** - toggle bamboo sound for pencil (introduce last)
     - **H b1 down** - toggle comb filtering (channels 2 and 3)
   - Allow for the interplay between dancer and artist to develop. The two should improvise and respond to each other's patterns, increasingly becoming entangled both aurally and physically on the mylar's surface. As the section develops increase variation of sonorities for the tap and gradually enrich the pencil texture (water, followed by fire, and eventually bamboo textures). Occasionally introduce comb filtering. Visuals should now use increasing amounts of delay and convolution. Occasional fade-ins and fade-outs should be used to vary the texture and allow for scene interruptions. Camera should focus on the pencil, tap, and mylar. As the section approaches climax, maintain eye contact to precisely time the onset of the following section. By the end of the section the rhythm, sonority changes, and texture density should become thick, rapid, and varied. The section's ending should be punctuated by the accentuated attacks from both pencil and tap in conjunction with the **L b1 right** (initialize section 3) command. A temporary fade-out or a cross-fade of the video can also accompany this dramatic change.

4. DISSOLUTION (approx. 2 minutes)
   - After letting go of the pencil, artist and dancer quickly, yet gracefully shift towards the front microphone (channel 1) stepping over the mylar and begin to whisper in turn lines from the poetry. Their transition will be punctuated by a dissipating multitap delay that is cued by the **L b1 right** command initiated at the end of the previous section.
   - **L b3 left** - toggle sustained input amplitude-driven sound ON (channels 1 and 2). Allow for poetry to end.
   - **L b3 left** - toggle sustained input OFF.
   - Immediately **L b3 up** - toggle water ripples ON (channel 1). Artist picks up one of the papers she has drawn on and begins waving gently with it in front of the channel 1 microphone, thus generating waves of air that impacts microphone's membrane resulting in audible water ripples.
   - The dancer slowly retreats next to the mylar and sits down reveling at it.
   - The video should explore the mylar and the waving paper. Visual delay and convolution filtering should remain moderate and varied.

5. LANDING (CLOSURE) (approx. 3 minutes)
   - **L b1 down** - initialize section 4. After several of the water ripples that signal the end of the third section, this command signals the onset the "landing" soundtrack that explores evocative qualities of the drawing.
   - Musician should be near the front vocal microphone (channel 1) with the back turned towards the audience and facing artist.
   - The video camera should be focused onto the paper the artist just used for making water ripples at a distance of no more than one foot. With the artist and musician standing and dancer sitting near or on the mylar, all performers should remain calm with their heads bowed down, as if suspended in time. The only sign of activity should be slight waving of the paper in front of the camera.
   - Video fade-ins and fade-outs should be used to further enhance the exploration of the drawing. As the soundtrack ends, slowly fade out the video.
   - Ideally, piece ends with lights faded out.

For additional info on the structure, medium, and performance, please refer to the online preview of work's premiere downloadable from DISIS YouTube channel (http://www.youtube.com/vtdisis).

DIGITAL SIGNAL PROCESSING
The piece thrives primarily on amplitude tracking and amplification of acoustic noises. Both tap and pencil are captured discretely to generate distinct soundscapes. Additional processing techniques, such as reverb, comb filtering, multitap delays, and measured "glitches" are employed throughout the piece, commonly being triggered via the Wiimote cues. Likewise, additional sounds are cued using Wiimote or modulated using acoustic input amplitude. A recursive matrix of harmonically dependent textures is used to manually traverse tap sonorities within the section 2.

Video processing consists of capturing live feed of the stage action, primarily drawing, and processing it using varied visual delay, convolution, and edge detection, as well as through the use of manual cross-fades.

POETRY

Ideally poetry should be memorized. Alternately, a music stand should be placed near the channel 1 vocal microphone center stage near the audience. Should a music stand be used for this purpose, special care should be taken in its placement to minimize visual obstruction of the stage from the audience's perspective.

Dereliction, the abandonment or forsaking--
Or that which is abandoned or forsaken--
That which is left over after colonization
Remains
Onboard ship.

You watch the coast recede,
You cross--
Then, you land
And move inland

Where your end is not where you started.

The landing, the transfiguration,
The relief of arrival
The oceanic experience
May be the brain's way of stopping the torment of endless epiphanies--
Like--
How we die,
The cell membranes explode--
Little tiny explosions, calcium, fireworks

The moment between leaving and arriving
Decays--
Becomes memento –
Derelict

Derelicts of time--
After months at sea
Nothing but sky, water
And grey horizon terminus,
At last, landing.