RFID Shadow Project:

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Documentation GitHub

Project Description

Overview

The goal of this project is to create a unique, interactive piece of audio-visual public art with emergent sound qualities, reflective of the indigenous environment of Montreal. The heart of the piece is a magnetic board visually representing Montreal. Alongside this, several unique, magnetic objects, each equipped with an RFID tag, may be placed upon the board. These objects will be constructed of precisely cut wood, designed to project a shadow image when placed upon the board, which contains a strip of lighting along its bottom edge.

Each of these objects corresponds to a sound-emitting element found in Montreal throughout its history - including fauna, machinery, and humans. When placed, the board emits a corresponding sound. As objects are added, or removed, and as they remain in contact with the board over time, new and interesting audio qualities emerge, representative of the dependencies and emergent traits which form when various agents exist alongside one another in nature.

Goal

The goal of this project is to foster within participants an appreciation for Montreal's native wildlife through means of complex interaction and play. The various systems present within nature can often be depicted on an overly large scale, both spatially and temporally, such that it can be difficult for individuals to gain an appreciation of the elements at play and their relationships to one another. With this interactive soundscape, users can see and hear the effects of their changes in real time, creating a user-friendly model of a very broad concept.

With the introduction of man and man-made elements, the project provides a greater understanding of the destructive nature of certain human impulses, while simultaneously depicting that humans themselves can and have peacefully coexisted with nature when a respect for the environment is present and prioritized.

Additionally, the interactive nature of this piece reinforces the power we each have to impart meaningful change - good or bad - on our ecosystem. The viewer is both removed from the depiction of the environment, providing them with a unique overview, while simultaneously given the opportunity to delve within, literally reaching into the landscape and shaping it.

Audience

This project will likely be placed within a public space at Concordia University, with the target audience being students. Students by nature are curious and learning-focused, while the student body of Concordia is largely composed of out-of-province or international students. As such, the student body of Concordia is assumed to be more likely to interact with an educational art piece, and are more likely to be unfamiliar with the native landscape of Montreal.

Alternatively, exiting the scope of the classroom, this project would be ideal in a location such as Montreal's own Ecomuseum Zoo; a conservation and education center surrounding Quebec's indigenous wildlife.

Sensors and Equipment

Radio Frequency Identification (RFID)

The RFID consists of two components; the Tag and the Reader. Each Tag has a distinct UID. RFID Tags are small, inexpensive and easily embedded within a variety of objects. We plan to embed RFID tags within the magnetic, moveable objects, while implementing the reader within the board. We hope to utilize this technology to allow for identification amongst tangible objects connected to unique UIDs, which can then be called to trigger reactions through code.

Microcontroller

Our project will be coded using the Arduino Uno. This microcontroller has many capabilities and can be used in conjunction with compatible boards such as the NFC reader. Additional positives are that it is small and compact which aids us in hiding the tech behind the experience from the audience.

Board Composition

Our board will be housing all circuitry and major components used within this project. This includes the Arduino Uno microcontroller board, speakers, and lighting. Speakers will ideally be small and hidden around or within the board, used to play sounds associated with the specific RFID tags embedded within the magnetic objects when placed on the board.

Magnetic Object Composition

Each moveable, magnetic object consists of a magnetic base, RFID Tag, and a small wooden structure designed to produce a shadow-image depicting the represented environmental element. Magnets allow for these objects to be easily placed and removed from the board, while the RFID tags allow for object identification, corresponding to an emitted sound.

Interaction Design Strategy

Project Journeymap

Installation walkthrough, features of note	**Impact upon viewer**	**Intended design**
The installation is in a public space. The main part seen is the board at first.	The viewer must confront the artwork. They can walk away or interact. The installation is noticeable, and viewers are urged to interact. ***Fig.1***	The fact it is in a public space is inherently confrontational; Tahe created space should be welcoming. We will investigate how this can be accomplished via the board's visual design.
The magnets on the board can be moved by the user, magnets cast shadows on the board.	The user will either need instructions by the board or have someone there tell them what to do. These magnets will look like abstracted forms initially but when placed on the board - their shadows will form the images. ***Fig.2.***	Generally, we want a smooth interaction between the user and the piece. When the general public thinks of art installations, they are conditioned not to touch. We will investigate different methods of explicit and implicit methods of communicating the intended interaction vi
The board reacts to the user's interaction via sound.	As the user is moving the magnet, it will be detected by the NFC reader attached to the board, which in turn will tell the arduino to play the specific sound attached to that UID of the tag. ***Fig 3***.	For the viewer to make a connection to their impact these magnets will be more sculptural in nature. This will make it easy to hold, more accessible if they are more raised and textured. The sound will come out of two speakers. We will record noises and artificially distort them with digital software to create sounds of flora, fauna and machinery.

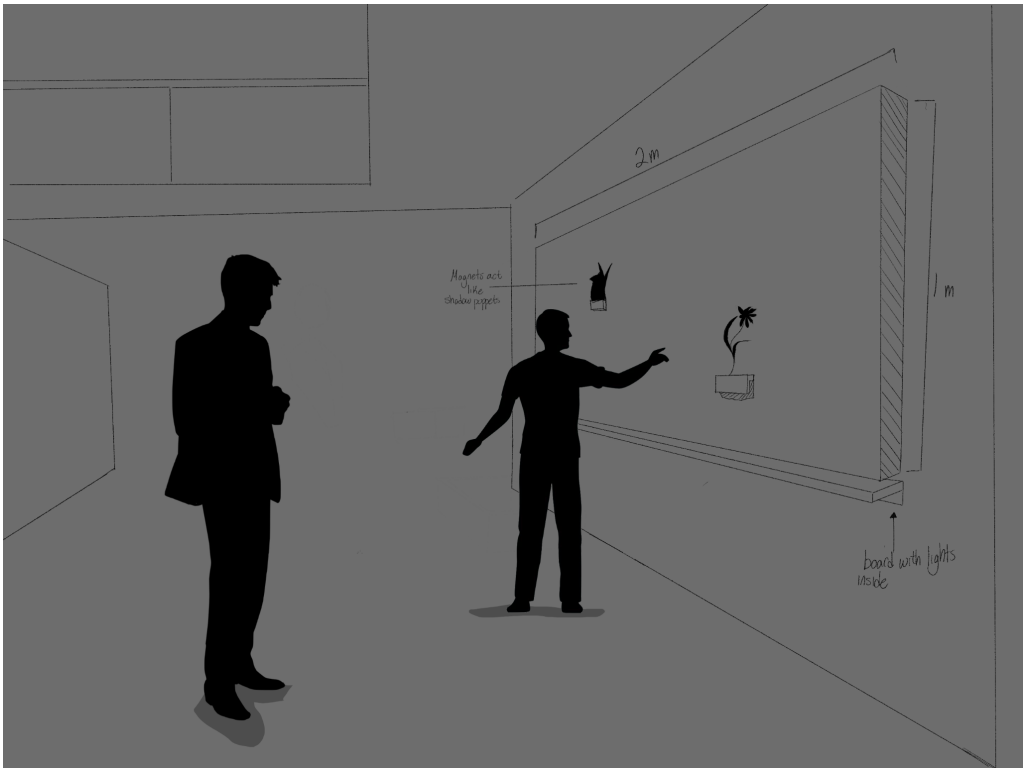


Fig.1 Example of space.

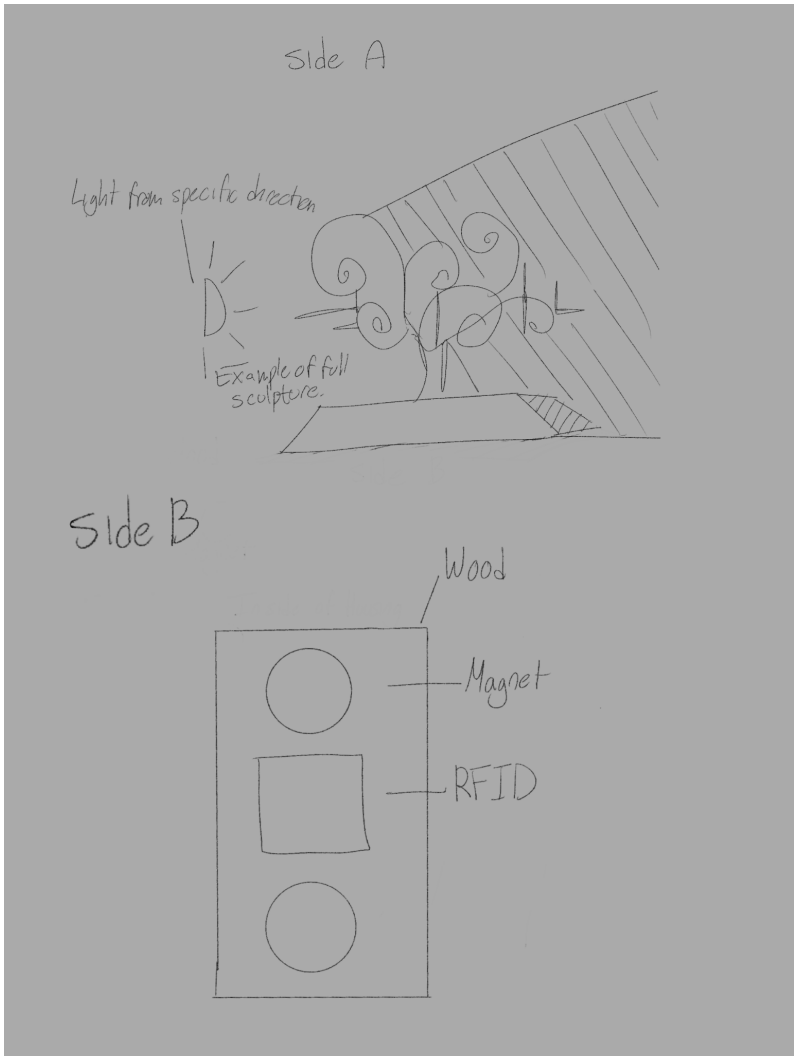


Fig 2. Composition of magnetic objects.

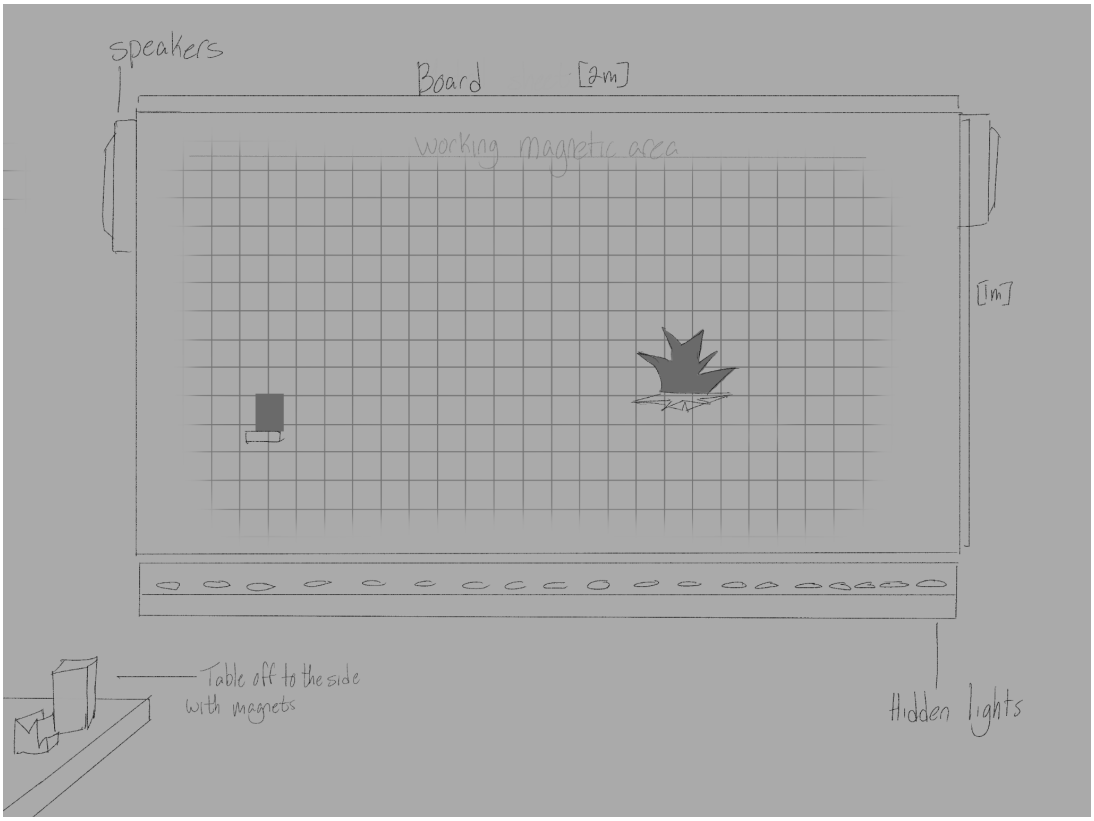
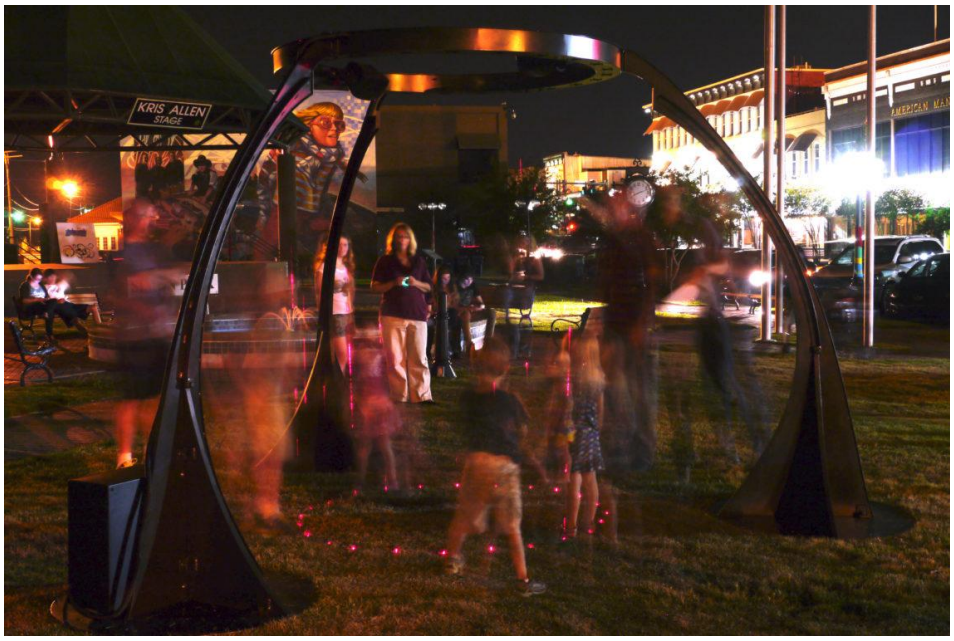


Fig.3 Board layout (active area, lighting placement, speaker placement).

Related Projects

Project 1: *Chandelier Harp* by Jen Lewin



Chandelier Harp, Jen Lewin (2012).
https://www.jenlewinstudio.com/portfolio/chandelier-harp/

Jen Lewin's *Chandelier Harp* is an interactive exploration of sound and movement. Most effective with multiple participants, the harp consists of a grand housing structure (or is alternatively hung from a ceiling), and a suspended hoop which emits several low voltage laser beams. When a participant interrupts the beam by moving within the piece, a musical note is produced much like the plucking of a harp chord, with pitch corresponding to movement speed.

Chandelier Harp is extremely effective as an interactive art piece. Participants enthusiastically engage with the piece, despite its lack of overt signifiers; the piece communicating itself expertly via its design. This quality is found across much of Lewin's works, which often take the form of public, interactive art, and we intend to reference this throughout our own creation process. Lewin does a fantastic job of allowing for interesting, emergent interaction and audio outputs from a set of relatively simple parameters. While we reference this success within *Chandelier Harp*, we also recognize the lack of narrative communicated through interaction. Within our own work, we hope to foster the same potential for playful interaction, expanded to communicate the interaction of distinct and unique agents, aggregating as a narrative.

Project 2: *Jelly Swarm* by Tangible, Joseph Wu

Jelly Swarm, Tangible & Joseph Wu, (2011).
https://www.tangibleinteraction.com/artworks/jelly-swarm

Created by new media collaborative *Tangible* and origami artist Joseph Wu, *Jelly Swarm*, was designed to teach broad concepts surrounding jellyfish communication and bioluminescent properties. Hosted within the Vancouver aquarium in 2011, these ceiling-suspended origami jellyfish are equipped with various sensors, illuminated by color changing lights. Interaction between the viewer and piece occurs via remote controller, with which the participant is able to disturb an area of the swarm, prompting a change in lighting originating in that area; mimicking the natural bioluminescence of the jellies. When no participant disruptions are occurring, the lighting evolves of its own accord, flowing throughout the piece to mimic swarm proximal communication.

While, like our proposed project, this piece explores naturally occurring concepts and phenomena in a novel, interaction-oriented manner, the swarm's system of interaction is substantially more linear and removed than our intended system. While the use of a remote controller is practical - the jellies are delicate and suspended - its use results in an added level of removal between the piece and participant, and prevents a truly hands-on approach. Additionally, this piece operates truly as a swarm: a substantial collection of principally identical objects, behaving in identical ways; with the sense of evolution or change originating from a positive correlation between proximity and time required for communication between agents. Contrasting this, each element in our piece will behave differently, being uniquely identifiable. In this use, the sense of evolution derived from the ways in which these unique agents interact with one another.

Project 3: *musicBottles* by MIT Media Laboratory, Hiroshi Ishii et al.

musicBottles, Hiroshi Ishii et al. via MIT Media Lab. (1999)
https://tangible.media.mit.edu/project/musicbottles/

musicBottles, a research-creation work led by Hiroshi Ishii of the MIT Media Lab, explores unique sensors and sound production techniques. The project consists of a deceptively complex custom table, housing electronic equipment, with a series of corked bottles placed atop. Each bottle corresponds to a different instrument, and is embedded with a unique electromagnetic tag which wirelessly identifies (while placed on the table) whether the bottle is corked. Bottles are freely moveable, and when uncorked, 'release' their contained sound. The table is additionally equipped with dynamic lighting, which reacts to changes in pitch and volume.

The novel sensors and atypical inputs are of particular interest in relation to our proposed project. Our current intention is in utilizing RFID sensors, though it's important to consider alternatives and backups. There is quite detailed documentation on the construction of these tags and sensors, which may be of use to our development. Regarding interaction and the user's experience, while this project produces a comparable end result to our proposed project (use of atypical objects to prompt the production of sound), *musicBottles* are actually quite static. The audio emitted simply corresponds to a portion of a song, and the interaction is quite binary; corked or uncorked, off or on. In contrast, we hope to create a work fostering emergent auditory properties, a communicated concept/narrative, and deeper, more meaningful user interaction.

Conclusion

In conclusion, we aim to create an interactive audiovisual art piece with emergent audio qualities responsive to participant interaction. We aim to communicate the desired interaction implicitly through the piece's design, and hope to create an experience which challenges the

user to critically analyze the effects their actions can have on their environment. We hope similarly to foster through our piece a curiosity and appreciation for the wildlife indigenous to Montreal and Quebec.

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