A Noise-Based Curriculum for Technological Fluency

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General Education

- At the University of Utah: Three of four “intellectual exploration” areas
  - Humanities
  - Fine Arts
  - Social & Behavioral Science
  - Applied Science

What about technology?
Engineering problem solving?
Technological fluency?
Computational thinking?
Technological Fluency

- Technological literacy
  - Implies only basic knowledge of the subject
  - A skills-based idea
- Technological fluency
  - Enables manipulation of the medium
  - The ability to handle unintended and unexpected problems
Technology Focus

“Electronic technology is pervasive in our modern world but how it actually works can be a mystery to many people. In this class students will explore the fundamentals of electronic technology with a goal of increasing their technological fluency.”

But Not an “Engineering” Course

“Through hands-on labs and projects students will gain a fundamental understanding of how electronic things work and what are their capabilities and limitations. This will be explored in the context of making art and noise with electronic components, some of which will be built from scratch, and some of which will be discovered from existing cast-off or broken devices.”
Technology / Arts

Engineering Problem Solving
Creative Design Thinking

Making Noise: Sound Art and Digital Media

• Semester-length general education course
• Carries either Fine Arts or Applied Science designation
  … at least for two years
• Developed through a program sponsored by our Office of Undergraduate Studies
• Introduce technology in an arts context
  • Specifically Sound-Art
Textbook

• Handmade Electronic Music
• Nicolas Collins

Curriculum

• Reading assignments
• Listening assignments
• Projects
• Induction coil recordings
• Arduino sound
• Toy hacking
• Oscillators
• Final project
Readings / Context

• Experimental and electronic music
• Precursor to contemporary Sound-Art

Russolo - The Art of Noises
Varèse - The Liberation of Sound
Cage - The Future of Music - Credo
Ussachevsky - Music in a Tape Medium
Stockhausen - Advice to Clever Children
Harley - The Electroacoustic Music of Iannis Xanakis

Intonarumori
Listening (Ear Training)

• From 100 Exercises in Listening and Sound-Making by R. Murray Shafer, Arcana Editions, 1992
  • Listen to sound/noise around you
  • Practice listening/hearing from a critical perspective
  • Examples:
    - Take 10 min and write down all the sounds you hear
    - Find a pitched sound in your environment, hum that pitch, walk around the block, what happens?
    - Bring an interesting sound to class
    - Make lists of old sounds and new sounds

Project: Inductive Coil Recordings

Use inductive coil to record EM noise in your environment
Project: Arduino Sound

Simple programmed sound using Arduino “tone” library

```cpp
#include "pitches.h"

int speakerPin = 9; // attach the speaker to pin 9

void setup()
{
  pinMode(speakerPin, OUTPUT); // Make speakerPin an output
}

void loop()
{
  tone(speakerPin, NOTE_A4); // tone Frets up an A#
  delay(1000); // play it for 1 sec
  noTone(speakerPin); // stop the tone
  delay(2000); // "play" some silence
  tone(speakerPin, NOTE_B4); // play another tone
  delay(1000);
  tone(speakerPin, NOTE_C5);
  delay(5000);
  tone(speakerPin, NOTE_G5);
  delay(8000);
  tone(speakerPin, NOTE_A5);
  delay(1000);
}
```

Project: Circuit Bending

Creatively hacking and re-purposing (upcycling) electronics in the service of making sound

Hardware Hacking vs. Circuit Bending
Project: Circuit Bending
Project: Oscillators

- Very simple Schmitt-trigger oscillators
- Inverters and NAND gates
Project: Oscillators

Final Project: Sound Art
Chosen/proposed by each student — Use “raw material” from previous projects
Final Project: Sound Art

Conclusions

An attempt to design a new general education course that promotes technological fluency

Through the lens of Sound-Art and Digital Media

Readings and listening for context, projects for raw materials (and learning opportunities), final project for synthesis