October 2018

Application for

MUSC 420 Special Topics: Capstone Project in Music Technology

Project Title: C.H.I.M.I.R.A. (Color-Hearing Interface + Motion-Image Relaying Apparatus)

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Degree Program: Bachelor of Kinesiology

Year of Study: 5

Specialization: Interdisciplinary Stream

Expected month/year of Graduation: May 2019

Preferred semester for project (Semester 1 or Semester 2): Semester 2

Proposal:

The software component of this project is called the Color-Hearing Interface (C.H.I., *pronounced /kaɪ/ like the Greek letter χ*). The hardware component of this project is the Motion-Image Relaying Apparatus (M.I.R.A.). Together, the software and hardware components of this project form a tabletop instrument hybrid involving both visual and auditory senses, or simply a C.H.I.M.I.R.A.

Much like the Spanish imperative *mira* (meaning "look!"), M.I.R.A. is the eye of the project. It involves a camera overlooking a pre-determined area where the visual input will be expressed. The visual data, particularly its colors, will be relayed to C.H.I. which will interpret and translate them into aural outputs. The visual stimuli relayed from M.I.R.A can range from the use of temporary objects with varying colors, shapes, and their changing locations, to more permanent visual changes like a stream of different coloured paint. These visual cues will trigger C.H.I. to respond acoustically, producing different sounds depending on certain variables of the visual cues.

The acoustic reactions can vary from pre-recorded sample files to generated sine waves. They can even control the change of other sounds by altering effects such as pitch changing, equalization, delay, and reverb. In a performance, audience members would be able to see a projection of the visual changes and hear the sounds they provoke.

There are countless combinations of audiovisual art this instrument can produce. For example: an introduction of red objects can trigger samples of different bell sound files; or a moving color, like a paint streak, can lead to changes in pitch shifting; or the placement of a blue substance in the upper right quadrant can generate higher frequency sine waves than those produced when the blue substance is placed in the lower left quadrant. These can all be controlled and determined in the interface, allowing for an immense opportunity for variety in performance.

The main problem this project addresses is how to simultaneously track different colors in MaxMSP. Additionally, this project will be challenged with tasks including the construction of M.I.R.A.

(including having consistent lighting, camera depth-of-field, …), how to translate visual data into their specific sonic effects, and how to utilize these different sounds and effects in composition to create an interesting performance.

Approach:

In order to track different colors at the same time, I aim to create multiple instances of color-tracking using objects similar to the [poly~] MaxMSP object. Each instance would recognize and track different colors separately. Some experimentation would be required to see how sensitively this can be done, discovering the limits in tracking colored objects. This includes exploring the sensory thresholds required to detect color in objects including their size, speed (of a moving object), and discriminating between different characteristics of colors including their hues, brightness (value or tints/shades), and saturations (chroma or intensity).

The construction of M.I.R.A. with respect to having consistency in visual data input will require physical adjustments between different lights and distances from the camera. Rehearsals may occur in the dark under the same light source/lamp to achieve consistency among results.

Translating the visual data to sound and the utilization of these sounds in composition will require exploration and creative decisions with the choice of MaxMSP objects, modules, and resources including BEAP, VIZZIE, and UBC Toolbox.

Biweekly Timeline:

Week 1-2: Create C.H.I. with MaxMSP

- Start with creating a single instance of color recognition and tracking
- Determine how to duplicate these instances simultaneously
- Determine the maximum amount of instances possible and how many to use

Week 3-4: Work on different sounds that colors can create (audio processing)

- Explore what instruments can be used (e.g. create a synthesizer with signals, use UBC Toolbox pluck player, use keyboard player, use MIDI percussion instruments…)
- Explore what effects can be used (e.g. pitch shifting, delay, reverb…)
- Collect sample files to be used (e.g. bells, windchimes, clangs, thumps, pops, hums…)

Week 5-6: Work on creating/altering different colors (video processing)

- Explore capabilities and applications in Jitter (e.g. distorting video, inverting colors of video feed, changing to infrared video…)

Week 7-8: Build M.I.R.A.

- Include a raised platform for color-tracking surface
- Include a pole (perhaps with adjustable heights) for a camera to face the working area

- May need to include an attachment for a consistent light source (shining over working surface, or possibly projected underneath)
- Decide on what materials to use to build M.I.R.A. (e.g. acrylic, wood…)

Week 9-10: Experient with methods of producing sound

- Collect colorful materials required for these sounds (e.g. using paint/crayon/markers, paper (rolls and sheets), moving objects, textured materials, lights/LEDs, liquid interactions, dyes/coloring, colored washi tape…)
- Experiment with different performance options and decide on factors to be used for year-end Bang! Festival performance (e.g. choreograph the use of what materials/colors to use at what times and what sounds they are coded to trigger, determine the length of piece, decide on what sample files to use, decide on settings of triggered sound effects…)
- Prepare visual materials (Powerpoint presentation) for presentation at Bang! Festival

Week 11-12: Optimize patch for performance

- ensure easy initialization of patch with minimal user interface objects
- have objects for turning on/off of projected visual data for transitions in performance…
- clean project patch, organize MaxMSP Presentation view, prepare a list of technical requirements and equipment…

Week 13: Rehearsal and Submission

- Rehearse presentation and performance for Bang! Festival in April
- Submit all software and hardware, documentation, final description of project, and other related materials for evaluation of MUSC 420 Music Technology Capstone Project.

Outcomes:

Outcomes of this project include submission of a working MaxMSP Patch (C.H.I.), a Tabletop Apparatus (M.I.R.A.), a demonstration video, help files and examples, a performance score/instructions, a final description of the project, a website documenting the process of the project, PowerPoint visual aids, and a presentation and performance using C.H.I.M.I.R.A. at the 2019 Bang! Festival.

This project will contribute to my further activities in music technology as it will challenge and further improve my abilities and creativity related to coding in MaxMSP, hardware construction, and in performance.

Evaluation:

Below is a possible approach to evaluating my project/its components:

- 30%: Documentation of the process of creating C.H.I.M.I.R.A. (e.g. detail, frequency, professionalism, organization, development, problem solving…)

- 30%: Presentation of C.H.I.M.I.R.A. at Bang! Festival (e.g. clarity, comprehensibility…)
- 40%: C.H.I.M.I.R.A. Instrument
  - 20%: Design, Usability, Functionality, Versatility
  - 20%: Performance of Composition using C.H.I.M.I.R.A. at Bang! Festival (e.g. creativity, completeness, effectiveness, preparedness…)

Other considerations:

There are many materials that may be required for this project including:

- C.H.I. – MaxMSP, computer
- M.I.R.A. – camera, light source, raised tabletop, construction tools
  - Media: paper, canvas…
- Color sources: paint/crayon/markers, paper (rolls and sheets), moving objects, textured materials, colored film, lights/LEDs, liquid interactions, dyes/coloring, colored washi tape…
- Cleaning and organizational materials

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