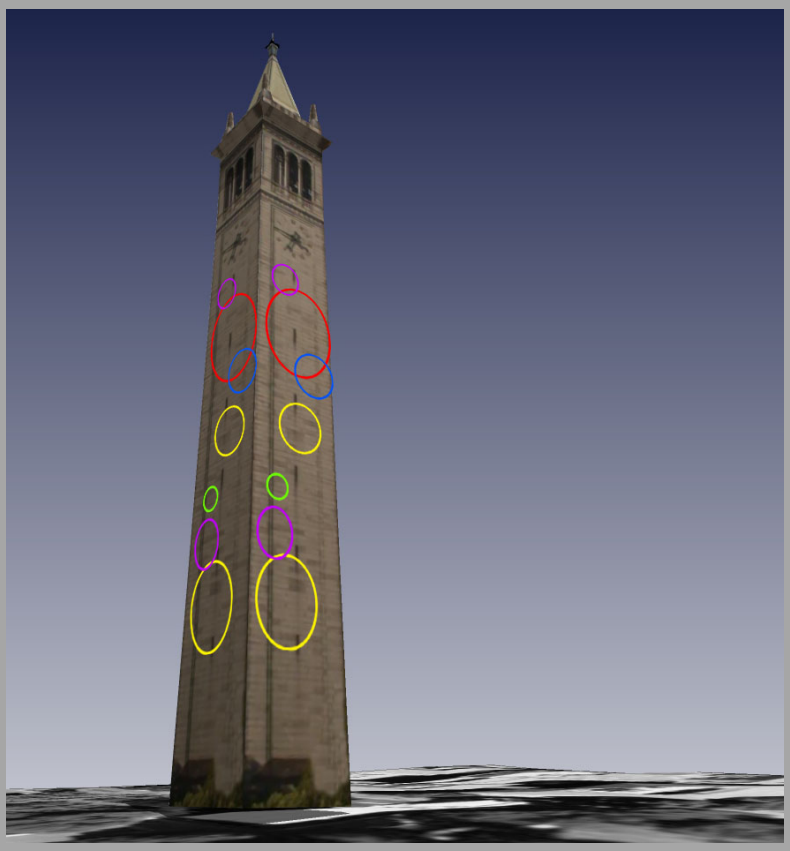


WATCH THE BELLS

A CONCERT FOR THE DEAF AND HARD OF HEARING

Cal Day 2015, Evening

Performance/Projection/Music/Art Proposal for Hack the Bells

Frank Allison

Scope of Project

Introduction

The Campanile Carillon has been called the “Peoples Bells”, yet there is a class of people who are not able to enjoy public music in a traditional manner. This performance will be a collaboration of music, visual art, and engineering to provide a pathway for the deaf and hard of hearing, as well as all others with a view of Sather Tower, to experience carillon music in a way not previously possible. The performance will also enhance the reputation of the university and facilitate research into accessibility and alternative representations of music.

Objectives

Three primary needs have been identified for the success of this project:

The work will elicit an emotional response to music, similar to one felt by those who listen to it.

The work will be visually appealing and will serve to enhance the aesthetics of the Sather Tower, including to those who are not in hearing distance of the carillon and those who do not know the purpose of the visualization.

The work will be representative of music played on the carillon and translate in real time an illustrative visualization of musicality.

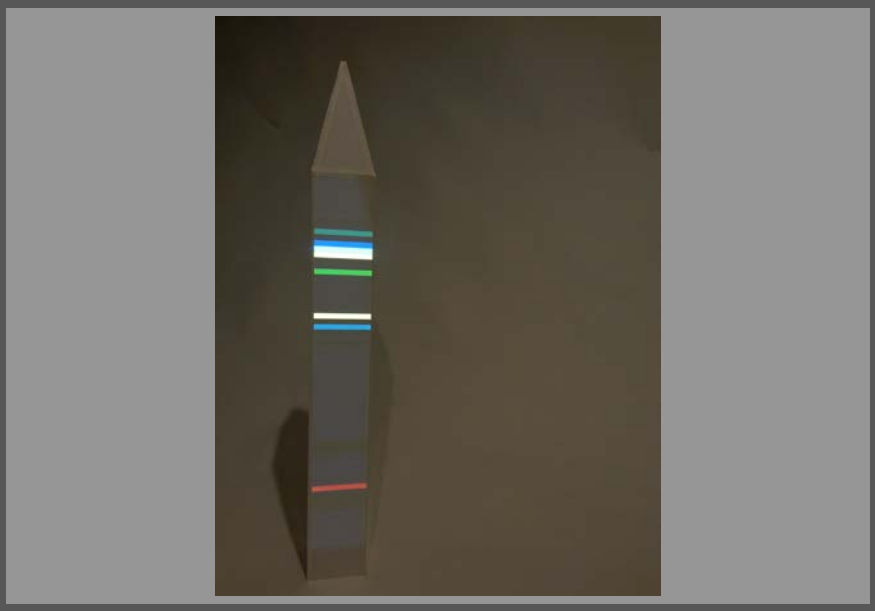
Description of Performance

The performance will be an evening recital on the Campanile Carillon, accompanied by real-time music visualization projected onto the sides of Sather Tower. The bell tower at UC Berkeley will become the world’s largest visual instrument.

The performance will use high powered projectors. Using bright projection will allow viewers who are close to the tower to experience dynamic ambient lighting due to the nature of the additive light space when multiple notes are played. Areas near the tower will be brighter through surface reflection as the music grows louder and can create a mood response beyond that of a simple projection. This effect will generate emotion to music beyond visual feedback alone.

Through color and geometric combinations, many visualization solutions can be very pleasing to watch even without the driving audio. Mapping the artists color wheel onto the circle of fifths will provide many interesting relationships between the music played and the color palette shown.

The visualization will be driven by an array of sensors capturing physical movement of the instrument. The purpose of the sensors is to have individual note data available for visualization and not rely on waveform analysis techniques that are common in many digital music playback programs which do not accurately represent music in a tangible fashion. The sensor array will allow note data to be captured while forgoing the need for audio translation to illustrate the carillon music representation. In this manner, the primary tone of a bell will be linked to a dynamic color and shape representation. Shape growth and movement will be linked to note dynamics and color and position will be linked to tone and pitch.



Proof of concept

Please see Proof of Concept video attached to this proposal

Campanile carillon notes were visualized and projected onto a 1/96 scale model of Sather Tower at UC Berkeley. This prototype uses audio samples provided by Hack the Bells, controlled by a computer keyboard acting as a midi controller. The visualization is programmed in the Processing 2.x language and projection mapping techniques were also used in processing to fit projection to the model.

The primary tone of each bell is linked to a horizontal bar that appears on the note attack and fades slowly as the bell resonates. The color wheel is mapped according to the circle of fifths to represent tone, and the height of the bar represents the pitch, with octave equivalent notes having equidistant relationships on the visualization. Using height in this manner takes full advantage of the height of the tower and is a natural representation.

Concept iterations

Further development of the representation may include visualization of timbre, which is a research topic at Berkeley's Center for New Media and Audio Technologies. Many overtones are an integral part of the sound of the carillon bells and they should be represented if it is feasible.

Another concept is Dynamic Circles representation, with circles to be used instead of rectangles. Other concepts to be prototyped may include generative drawing that will show the history of a song as it is played, and fast-refreshing cellular automata that will use current note data for initial conditions. These concepts will be tested with hearing-impaired people for emotional response.

Also, due to the static nature of the computer keyboard used in the prototype, object dynamics will be linked to note velocity data previously not available. Geometry of the visualizations will be adjusted to fit the features of the tower.

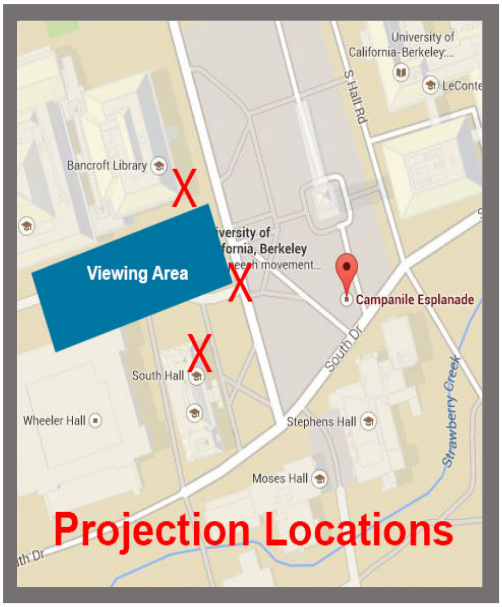
Logistics

Sensor Array

Although polyphonic pitch detection software did win a Technical Grammy award in 2012, it has not matured to the point of being feasible to use in a live performance (the analogy is that it's like removing the eggs from a cake that has already been baked). Physical sensors are needed to overcome this limitation and allow the visualization to be reflective of the music.

Technology has evolved so that this sensor array may be developed economically and with acceptable time-delay from the instrument to the projection. Dr. George Anwar of the UC Berkeley Mechanical Engineering Dept. in mechatronics has graciously agreed to assist with development of the sensor array. The sensor array will consist of 61 accelerometers multiplexed into a microcontroller where the data will be converted to Midi protocol and sent wirelessly to a visual processing workstation and projection at the base of the tower. The sensors will be arrayed from a single bar that will be positioned between the batons and the adjusters on the clapper control cables in the rear of the console, where it will not interfere with either the musician's ability to command the instrument or the aesthetics of the carillon itself. This will not be a spaghetti pile of wires in the Carillon! **Most importantly**, the sensors will not harm or damage the instrument and utmost care will be exercised throughout the design, installation, use, and removal phases of the project. This will be ensured through using felt between all connections to the instrument and creating custom 3-d printed assemblies to fit the form exactly.

The sensor array will be designed so that it is easily removed, installed, and re-used; it will be gifted to the University upon completion of the project. We will build a platform for other artists to use, and release any data gathered under Creative Commons licensing for re-mix and re-use. Midi protocol will be output from the sensor array in order to maintain the universality of the platform for all artists to use. An example of the use of this sensor could include an app for tele-listening, broadcasting the same visualization and midi audio/sample data to Campanile Carillon fans around the world. An app could also be used for haptic feedback during the Cal Day performance. The visualization may also be installed on a smaller screen in the belfry for those who wish to experience the vibrations at the same time.

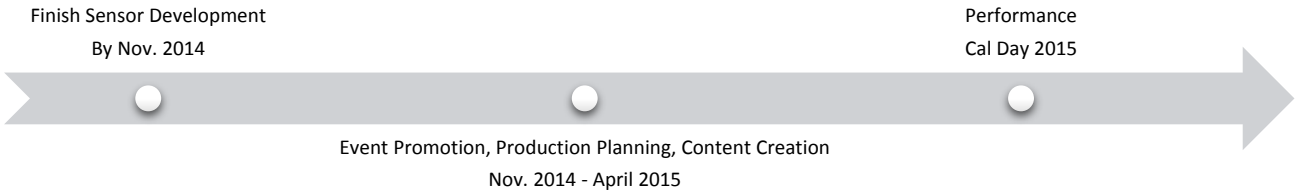


Site Layout

A viewing area will be set up at the intersection of Campanile Way and South Hall Road. The best viewing will be along Campanile Way, but the projection may be visible from anywhere with line-of-sight to the tower. Two Ideal projection sites have been scouted: one position is through a window in the near corner of Moffit Library and another location is the opposite corner in front of South Hall. An alternative location is to place projectors on a double-high scaffolding bay at the end of Campanile Way. There is adequate power service available at these locations to run the projection. It may be necessary to open the bathrooms in a nearby building as the event will take place in the evening, this may require extra security to be staffed as dictated by the University.

Timeline

The concert is to be held on the evening of Cal Day 2015. This date is chosen to take advantage of the large amount of visitor and alumni foot traffic to the campus. Sensor development will be completed by late November 2014 so that any new media artists, VJ's, programmers, digital animators, etc. will be able to utilize the system. Completion of the sensor array by this date will also allow ample time for the final visualization systems to be realized and to allow for production planning and event promotion.



Funding

Funding for the project will be acquired through application for student grant programs at UC Berkeley. There are two major components which need funded, the sensor array and the projection equipment rental. Due to the public nature of the event it is foreseeable that there may be industry funding available for the sensor array and these routes will be fully explored. I also have a good working relationship with may live event production companies in the bay area and am confident that rental equipment can be obtained for a fair price if there are no high end digital projectors (20,000+ lumens) available to use through the university.

Openness and Availability to Artists

The project will be a collaborative and multi-disciplinary effort, and it will also provide opportunities for many artists to produce and showcase their work. The use of the Midi protocol will keep the universality of the platform for future artists to use without having intimate knowledge of the sensor array itself.

The projection event may also provide an opportunity for other visual artists, VJ's, and animators to exhibit their work, as well as provide a venue for "façade signage" on events such as the 50th anniversary of the Free Speech Movement and the centennial of Sather Tower. For additional projection mapping content please see the attached additional concept reel.

Thank You for Your Consideration of This Project!

3-d Models used for projection mapping courtesy Google Geo models

Audio Samples courtesy of Hack the Bells

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