UNIVERSITY OF CALIFORNIA,
IRVINE

Approaches to the Use of Social Choice and Voting Systems in Interactive Music and Live Performance

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF FINE ARTS

in Music

by

Jordan Watson

Thesis Committee:
Professor Kojiro Umezaki, Chair
Professor Christopher Dobrian
Professor Lukas Ligeti

2016

TABLE OF CONTENTS

ACKNOWLEDGMENTS

I would like to express great appreciation to my committee chair, Professor Kojiro Umezaki, who has been extremely supportive and encouraging throughout the entire thesis process. He continually provided an excellent balance of theoretical and creative insights and without his guidance, this thesis would not have been possible.

I would also like to thank my committee members, Professor Christopher Dobrian and Professor Lukas Ligeti, who provided very thoughtful and helpful advice on my artistic endeavors.

Finally, I would like to thank my fiancé, Kristina Nielsen, who has been a great source of support and love as I have struggled and stressed through this process. She has lent a significant amount of time, energy, and electronic devices to the cause.

ABSTRACT OF THE THESIS

Approaches to the Use of Social Choice and Voting Systems in Interactive Music and Live Performance

By

Jordan Watson

Master of Fine Arts in Music

University of California, Irvine, 2016

Professor Kojiro Umezaki, Chair

This paper tries to address the possible ways in which different ideas about social choice and voting can be integrated into interactive music and live music performance. First, the *Plurality Election Decision Procedure, Borda Election Decision Procedure, and Condorcet Election Decision Procedure*, all common methods of deciding the outcome of a vote, are presented and the relationship of these methods in music making are explored. An example of the early use of choice in music is then showcased in a discussion about Christian Wolff's *For 1, 2, or 3 People* from 1964. Exemplifying the use of choice in a more improvisational setting is John Zorn's game piece from 1984, *Cobra*. Next, the paper talks about the explicit use of systematized voting systems being a more recent development in music by looking at methods employed in the music of Jason Freeman, as well as the rock band Phish and Phish's bass player, Mike Gordon. Many of the voting systems used by these artists incorporate new types of computing technology and audience participation methods. The paper concludes by asking a series of questions that might allow for the expansion of incorporating social choice and voting systems in music.

Introduction

Social choice, which is defined as "the aggregation of individual inputs (e.g., votes, preferences, judgments, welfare) into collective outputs (e.g., collective decisions, preferences, judgments, welfare),"[1] has often been an element of music-making, particularly in group or ensemble situations and especially where improvisation is involved. By necessity, decisions on formal structure, melody, harmony, texture, etc. in collective musical improvisations are frequently made collaboratively by the ensemble members rather than by an individual. The decision-making processes are generally loose, unfolding verbally before (and sometimes even after) a performance, or non-verbally during a performance. In the last few decades, various musicians have developed approaches to harnessing the potential of collective decision-making, allowing it to systematically and deliberately affect crucial aspects of a musical work. Within the past 5-10 years, certain artists have developed technology-driven environments that allow for new types of interaction between real-time performance participants such as the players themselves, interactive computer systems, or participatory audiences in order to delegate, or arrive collectively at, decisions fundamental to the ultimate gestalt of a piece.

I will begin this paper by presenting some of the basic ideas that political scientists, social choice theorists, and mathematicians have about voting systems and how these ideas might relate to and be incorporated into existing decision-making processes that naturally occur in music. The bulk of this paper will then focus on four musicians whose work can either be considered precursory to, or directly involves, the use of voting as a tool for musical creativity.

---

[1] Christian List. "Social Choice Theory." *The Stanford Encyclopedia of Philosophy* (Winter 2013 edition) ed. Edward N. Zalta, Accessed May 2, 2016, http://plato.stanford.edu/entries/social-choice/.

Voting Systems

Voting can be categorized into different methods or systems that have been proposed and studied throughout the history of collective decision-making. The most common voting system, often referred to as the *Plurality Election Decision Procedure*[2] (PEDP), requires voters to choose their most favored candidate from a group of two or more candidates. The chosen candidate is the one with the highest percentage of votes. Although it works well for choosing between two candidates, this system becomes flawed and unfair as soon as more than two candidates are competing.[3]

There are many alternative systems that try to address this fairness issue. *Borda's Election Decision Procedure*[4] (BEDP) decides a winning candidate by comparing the voters' rankings of all candidates. The most preferred candidate in each voters' ranking is assigned n - 1 points (n representing the total number of candidates), while the second place is assigned n - 2 points, the third place is assigned n - 3 points, and so on. The total points for each candidate from each of the rankings are tallied and the candidate with the most points wins.[5] Another alternate system is *Condorcet's Election Decision Procedure*[6] (CEDP). In this process, all candidates are paired with all other candidates in a sequence of separate contests. The candidate that wins the most of all contests is the winner.[7]

---

[2] Leslie Johnson Nielsen and Michael de Villiers, *Is Democracy Fair?: The Mathematics of Voting and Apportionment* (Berkeley: Key Curriculum Press, 1997), 4.

[3] Ibid.

[4] Ibid., 31

[5] Ibid.

[6] Ibid., 23

[7] Ibid.

In the case of voting as it relates to the performance of music, the PEDP is an efficient way for voters to make a choice and experience the effect in real-time. This is largely due to the fact that votes generally need to be cast, tallied, and analyzed in a concise fashion. To utilize more in-depth systems, one must allow for the latency between the call for a vote, the voting process, and the execution of the voting results by human performers. Of course, computer programs can be developed to aid in the speedy organization and analysis of votes, allowing for the use of other voting systems like the BEDP and CEDP in real-time performance.

Existing already in music performance are many different ways for individual and collective choices to be made. Do these methods constitute explicit voting systems? An in-depth answer to this question is beyond the scope of this paper, but I would argue that some of these methods of choice can somewhat resemble voting systems–like in the context of collective group improvisation where the group is specifically working together to create a cohesive music that sounds composed. When someone in the group introduces a musical idea, the other players first decide whether that idea is intended as a complement to an idea that is already being executed. If the idea is deemed new or non-complementary, the players then make a decision whether or not to follow this new idea in their own playing. Generally speaking, this means that ideas with the most support, gauged either in number of players supporting an idea, by dynamic level of an idea, or by other similar musical parameters, tend to win out over other ideas. The trajectory of the improvisation is guided by these *winning* ideas. It is likely, however, that because there is no systematized voting method at play, the collective choice can become interrupted or distorted. For example, a player could incessantly play a phrase that the majority of other players have chosen not to acknowledge, at which point the other players may concede to the idea so as not to

allow the music as a whole to suffer from a fractured group. Though there are many situations where the aesthetic goals of group improvisation differ, situations like the one discussed above have been a major impetus for my exploration of how to utilize social choice and explicit voting systems in music performance.

Christian Wolff - *For 1, 2, or 3 People*

In the early 1950s, a group of composers began to "deal with what sound *is*, rather than what the composer may *think* it is or decides he *wants* it to be."[8] These composers–John Cage, Earle Brown, Morton Feldman, Christian Wolff, and others–were responsible for creating a type of music which is often referred to as Experimentalism.[9] I would suggest that these experimentalists, and the music and ideas they produced, helped to open the door for the implementation of explicit voting systems in music that are emerging in the present day.

Looking at one composer in particular, Christian Wolff, one can begin to see some elements of social choice being harnessed in the piece *For 1, 2, or 3 People (1964)*. The score for this piece consists of ten pages. Any number and combination of these pages can be given to the player(s), with each page having the option to be repeated up to ten times or not repeated at all. The symbols, arranged non-linearly as separate events on the page, can be performed in any order that is most convenient for the player(s). None of these events can be repeated during a single reading of a page. An exception to this instruction is set for page IX, which indicates that any of the events can be repeated any number of times as well as omitted altogether. Outside of

[8] Michael Nyman, *Experimental Music: Cage and Beyond,* (Cambridge: Cambridge University Press, 1999), 51.

[9] Ibid., 50-51

this basic framework, Wolff indicates many more instructions which correspond to musical parameters like pitch, rhythm, dynamics, and duration. Many times these elements are not specified and are to be decided by the player(s) during a performance.[10]

The basic ideas of choice that exist in this piece and others like it, have played an important part in opening up the possibilities of further exploring how decision, social choice, and voting can impact live music making. The in-the-moment decision of what each person will play is an individual choice of a specific set of event candidates. Each player's miniature "election" of an event to play doesn't necessarily affect the group directly, but the event the player does choose to play can potentially limit the choices another player can decide upon. Since the ultimate outcome of the piece is somewhat unclear, each player is required to be completely tuned into what the other players are doing or have done in order to derive the information needed to follow the instructions set by Wolff. It's this type of extreme mental awareness and physical agility of the players that Michael Nyman thinks give this piece its character.[11]

John Zorn - *Cobra* and Other Game Pieces

The "game pieces" by New York-based composer, improviser, and Downtown Scene founder, John Zorn, expand upon the work of the Experimentalist composers[12] and take steps toward incorporating explicit social choice elements. Because these pieces were conceived as

---

[10] Christian Wolff, *For 1, 2, or 3 People*, (New York: C.F. Peters Corporation, 1964).

[11] Michael Nyman, *Experimental Music: Cage and Beyond,* (Cambridge: Cambridge University Press, 1999), 69.

[12] John Zorn, "The Game Pieces," In *Audio Culture: Readings in Modern Music* ed. Christoph Cox and Daniel Warner, (New York: Continuum International Publishing Group, 2004), 196.

"music for improvisers,"[13] the sort of inherent social choice elements of improvisation I discussed previously are at play. What Zorn does in the game pieces with the rules and instructions he establishes is create explicit systems in which the players, in real-time, can individually choose some elements of how a piece will work for the entire group. This results in more clearly defined structures than what is often found in an free, group improvisation. For example, many of the game pieces make use of pre-defined, physical gesture-based cues[14] for players to indicate or request a desired action in the music.

By using these cues, early game pieces such as *Klarina (1974), Lacrosse (1977), Fencing (1978),* and *Archery (1979)* allowed the performing group to essentially govern themselves as long as the rules were observed. Beginning with *Pool (1979)* and continuing on through the final game piece, *Bèzique (1989)*, a prompter role was introduced.[15] The prompter's job is to guide or facilitate the group by relaying to the everyone the desired actions requested by single members of the group. The prompter does possess the power to ignore requests,[16] though, and as such he/she exercises a higher level of control over how a piece plays out. Zorn speaks of the prompter role:

> Only someone who really knows the rules can be a good prompter; someone who is extremely hyper, omniattentive, and can make split-second decisions when three people are raising their hands and each one wants something different. A lot of times, people make calls that I know are going to end up in a train wreck, and I have to know when to say no…You've got to pick the right person for the job [of prompter]. It's crucial. The prompter can make or

---

[13] Ibid.

[14] John Brackett, "Some Notes on John Zorn's *Cobra,*" *American Music* 28, no. 1 (2010): 50, accessed August 14, 2015, http://www.jstor.org/stable/10.5406/americanmusic.28.1.0044.

[15] Ibid., 63-66.

[16] Ibid., 48-50.

> break a performance, no matter how inspired the band is. The prompter is a direct source of energy and inspiration for the group.[17]

Even though there is a large amount of choice awarded to the performers in game pieces with a prompter, there is also the possibility that this choice can be rejected or overridden by the prompter. It's also entirely possible that the choice of the prompter may not have been a result of a fair process.

Cobra (1984), often regarded as one of Zorn's most well-known pieces,[18] was the pinnacle of the game pieces where the goal was to, "harness the personal languages that the improvisers had developed on their own…[to] deal with *form*, not with *content*, with *relationships*, not *sound*."[19] Incorporating many of the systems and cues devised in the pre-*Cobra* game pieces, *Cobra* functions primarily in a mode called "Operation 1," which consists of nineteen different cues that players can call to a prompter. Once the prompter decides to decline or accept the call, he/she holds up a sign to the whole group that is color-coded and contains the corresponding cue. When the prompter lowers the card, the players execute the cue. This execution is referred to as a "downbeat."[20]

Within Operation 1, there also exists what are called "Guerrilla Systems." A player who wishes to become a guerrilla, alerts the prompter and puts on a headband. If the prompter wishes to accept the guerrilla request, he/she also puts on a headband. A guerrilla player gains the freedom to ignore the rules and to employ special "Guerrilla Tactics" to engage with the other

---

[17] Ibid., 50.

[18] Ibid., 44.

[19] Zorn, "The Game Pieces," *Audio* Culture, 199.

[20] Brackett, "Some Notes on John Zorn's *Cobra*," *American Music*, 50.

players. A person's guerrilla status, however, can be cut by request from other players and approval of the prompter. By recruiting two other players, called "Spotters," a "Guerrilla Unit" is formed with the original guerrilla player being referred to as a "Squad Leader" for the remainder of the unit's existence (seven downbeats). These units can decide to enact a second set of operations referred to as "Operation 2," wherein all non-guerilla unit members stop playing. Some aspects of Operation 2 include the squad leader becoming the main prompter for a time and either spotter choosing a player from outside the unit to take their place. Guerrilla Units can only be cut by a member of the unit, an alternate member chosen during a specific subset operation of Operation 2, or by a "Spy." The original prompter holds up a sign which alerts the unit of a spy. If the unit can identify the spy in the group, nothing changes, but if they cannot, Operation 2 ends while Operation 1 begins again.[21]

With the way *Cobra* is composed and executed, social choice elements are featured along with elements that deny that choice. According to John Brackett, who has done extensive research on Zorn:

> …Conflicting tendencies are integral to the overall design of *Cobra*, ranging from the freedom for players to choose any cue they desire and to play anything they wish all according to the particular rules of the game. Extending the political metaphors even further, it is also possible to perceive "fascist" strains in *Cobra*, from the guerrilla units' ability to "take control" of other players to the prompter's ability to ignore requests from the ensemble.[22]

Since Zorn himself has mentioned that he considers the game pieces essentially continuations and expansions of the ideas explored by Experimentalists[23] like Christian Wolff, it is interesting to see how his version of real-time decision making, as compared to *For 1, 2, or 3*

---

[21] Ibid., 53-54

[22] Ibid., 55

[23] Zorn, "The Game Pieces," *Audio* Culture, 196.

People, moves toward or away from the inclusion of specific, systemized voting systems based on the idea of social choice.

Jason Freeman

The work of Jason Freeman, Associate Professor at Georgia Tech University, focuses on the use of computer-vision, real-time music notation, and networked music to create experiences where composers, performers, and audiences collaborate and communicate. Freeman writes:

> I often create music that moves beyond the printed score. The context within which the work exists, along with my relationship to its performers and listeners, are important design elements. The dynamic process by which we collaboratively create the work's musical content — through live audience participation or in online environments — can be as important to me as any specific musical product that may result.[24]

I am particularly interested in how Freeman approaches audience participation since this type of interaction in live performance seems like a rich area to explore in regards to social choice and voting systems. In fact, Freeman has not only created pieces that allow audience members to cast votes, he has also helped design and create a web-browser based, client-server system called massMobile that facilitates large-audience participation through the use of mobile devices.[25]

Since 2011,[26] massMobile has been developed with the goal of expanding the possibilities of interface design to further accommodate participatory audiences. Although there has recently

---

[24] "Jason A. Freeman," *Georgia Tech School of Music,* accessed October 27, 2015. http://www.music.gatech.edu/people/jason-freeman.

[25] Nathan Weitzner, Jason Freeman, Yan-Ling Chen, and Stephen Garrett. "massMobile: Towards a Flexible Framework for Large-Scale Participatory Collaboration in Live Performances," *Organised Sound* 18, no. 1 (2013): 30, accessed September 13, 2015, doi: 10.1017/S1355771812000222.

[26] Ibid., 36

been a sizable number of other applications and systems geared towards similar goals available for mobile devices, this system is specifically looking at "enabling rapid development of a new participatory interface; enabling plug-and-play deployment at performance venues; and facilitating simple use by audience members on a variety of mobile device platforms." The use of a customizable software interface that is accessible to audience members via a web-browser on their personal mobile device is a big factor in massMobile being able to address all three of these goals: it is quicker to update and deploy than native operating system applications, it eliminates the steps of requiring audience members to download and configure an application, and it has a higher level of cross-platform compatibility than native operating system applications.[27]

Audience voting via the massMobile system was first incorporated into the piece *Filter (2011)* by choreographer Jonah Bokaer. Freeman and his team collaborated with Bokaer to allow audiences to vote on how a solo dancer on stage should be lit. The change of lighting cued by audience voting also cued a change in choreography for the dancer. Visual feedback of the audience members votes were displayed via video projection. One of the more interesting aspects of this piece was the development of group dynamics. During the piece, different leaders would naturally emerge, and when they would change their vote, other audience members would choose to follow one of the leaders and change their vote as well.[28]

Saxophone Etudes (2012), another piece by Freeman, was one of the most substantial pieces to use the massMobile system. In the first movement of the piece, 'Harmony,' the audience members access a webpage on their personal mobile-devices that displays a music staff

[27] Ibid., 34

[28] Ibid., 36

containing two to four note heads. A participant can choose which note they want to hear, voting as often as they wish. The vote tallies for each note are displayed on each participant's device as a percentage. In addition, semi-transparent circles that encompass a note will grow or shrink based on the popularity of each note. The saxophone player can choose to play the notes in proportion to their popularity or only play the most popular. In the second movement, 'Melody,' participants vote on a portion of a notated melody that they wish to hear. This is done by dragging two vertical bars to a preferred starting and ending point of the notation. A gradient horizontal bar underneath the notation displays the popularity of any given section with the darkest areas corresponding to the most popular sections. The saxophonist uses this information to develop expressive elements such as articulation to shape the phrase as it is looped, opting to omit less popular sections if they so choose.[29]

The voting system used in both *Filter* and *Saxophone Etudes* can be categorized as a PEDP system, as each audience member essentially chooses their preferred option out of at least two. It avoids processes less compatible with real-time participation in which voters rank all of the choices or go through a series of pair-wise elections to arrive at the final choice. It also benefits from most probably producing a 'winner' decided by a majority. However, as is the case with the 'Harmony' movement, there is some representation of less popular choices if the saxophonist decides to play all of the notes on the screen in proportion to the results rather than playing just the most popular notes.

[29] Ibid., 37-38

Phish and Mike Gordon

Another artist who has explored both audience participation and choice is the band Phish. In the Spring of 1992, the band taught audience members what they called the "Secret Language," which consisted of a series of signals that could be played at any time by some members of the band. Audience members who were privy to the "Secret Language" could then respond to the musical signals in a variety of vocal sounds and physical gestures. Some examples of this include: the "Simpsons" signal–where both the band and the audience shouts the catchphrase, "D'oh!", in the style of Homer Simpson after the first phrase of the theme song for *The Simpsons* is played; the "Random Note" signal–where both the band and the audience sing a random note after the highly recognizable ten-note sequence from Julius Fučík's *Entrance of the Gladiators* is played; the "All Fall Down" signal–where the guitar player or bass player from the band plays a series of four descending notes, with descending glissandi on each note, and the audience responds by falling down to the floor.[30] Later in 1992, Phish introduced an improvised piece of music called *Big Ball Jam* that relies on four large inflatable balls being tossed out into the audience. As the guitar player, Trey Anastasio, explains, "One of each of the four balls corresponds to one band member, who plays only when the audience hits the ball, thereby letting the audience jam the band for that period of the show."[31]

The bass player of Phish, Mike Gordon, has recently been taking a technological approach with regards to audience participation. The EEL, deployed in the 2014 and 2015 tours of Gordon's solo band, was a series of triggers lined up along the front of the stage like a giant

---

[30] Phish, *Secret Language Instructions,* Concert. The Music Hall, Portsmouth, NH. 6 Mar. 1992.

[31] Phish, *Big Ball Jam*, Concert. Ross Arena, St. Michael's College, Colchester, VT. 19 Nov. 1992.

keyboard. At certain points during the show, sections of the triggers would light up, inviting to the audience to tap on them. Once tapped, the trigger would flash and play a sound from a bank of samples out of the PA system. The EEL was revamped in 2016 so that the triggers surround the outside of a large padded ring that gets paraded through the audience in order for more people to have a chance to participate in playing with the band. In this form, the device is referred to as the REEL.

With regards to voting and choice, both Phish and Gordon have attempted to give audience members the chance to vote on musical elements involved in real-time improvisation. At a 1996 a gig in Amsterdam, Phish asked for the audience to yell out names of chords and groove types. Four chords were chosen (am–GM–DM–EM) to form the chord progression for an improvised song with a "Ska" groove as voted by the audience.[32] In 2016, Gordon instructed the audience of a Dallas, TX show to make one of two hand signals throughout an improvisation: one signal was a vote for the band to continue improvising and the other was a vote for the band to stop improvising and move on to the next song. If the majority of signals called for the band to move the next song, they would do just that.[33] When asked about his thoughts on this process while he signed merchandise for the audience after a show in San Diego, CA on January 30, 2016, Gordon mentioned that he felt it didn't work as effectively as he had hoped.

Conclusion

By looking at the artists discussed in this paper, and how they have begun to rethink the relationship between music and social choice, one can see that they have laid the foundation

[32] Phish, *Jam*, Concert. Melkweg, Amsterdam, Netherlands. 12 Jul. 1996.

[33] Mike Gordon, *The Field*, Concert. Granada Theater, Dallas, TX. 24 Jan. 2016.

upon which one can continue to experiment and expand. Ultimately, I hope that voting systems like the PEDP, BEDP, and CEDP can help to ask some important questions about social choice and voting in live performance. Can these ideas be incorporated in a way that is appealing and engaging for the performers, audience members that participate, and audience members that don't participate? Are the systems simple enough to understand yet complex enough to keep the resulting music interesting? With feedback from all of the potential types of performance participants, I think the answers to these questions can provide invaluable insight into how social choice and voting can successfully continue to be expanded and incorporated into interactive music and live performance.

Bibliography

Brackett, John. "Some Notes on John Zorn's *Cobra*." *American Music* 28, no. 1 (2010): 44-75. Accessed August 14, 2015. http://www.jstor.org/stable/10.5406/americanmusic.28.1.0044.

"Jason A. Freeman." *Georgia Tech School of Music*. Accessed October 27, 2015. http://www.music.gatech.edu/people/jason-freeman.

List, Christian. "Social Choice Theory." *The Stanford Encyclopedia of Philosophy* (Winter 2013 edition) edited by Edward N. Zalta. Accessed May 2, 2016. http://plato.stanford.edu/entries/social-choice/.

Mike Gordon. *The Field.* Concert. Granada Theater, Dallas, TX. 24 Jan. 2016.

Nielsen, Leslie Johnson and Michael de Villiers. *Is Democracy Fair?: The Mathematics of Voting and Apportionment*. Berkeley: Key Curriculum Press, 1997.

Nyman, Michael. *Experimental Music: Cage and Beyond.* 1974. Reprint, Cambridge: Cambridge University Press, 1999.

Phish. *Secret Language Instructions*. Concert. The Music Hall, Portsmouth, NH. 6 Mar. 1992.

Phish. *Big Ball Jam.* Concert. Ross Arena, St. Michael's College, Colchester, VT. 19 Nov. 1992.

Phish. *Jam.* Concert. Melkweg, Amsterdam, Netherlands. 12 Jul. 1996.

Weitzner, Nathan, Jason Freeman, Yan-Ling Chen, and Stephen Garrett. "massMobile: Towards a Flexible Framework for Large-Scale Participatory Collaboration in Live Performances." *Organised Sound* 18, no. 1 (2013): 30-42. Accessed September 13, 2015. doi: 10.1017/S1355771812000222.

Wolff, Christian. *For 1, 2, or 3 People*. New York: C.F. Peters Corporation, 1964.

Zorn, John. "The Game Pieces." In *Audio Culture: Readings in Modern Music* edited by Christoph Cox and Daniel Warner, 196-200. New York: Continuum International Publishing Group, 2004.