Simpletones: A System of Collaborative Physical Controllers for Novices

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ABSTRACT

This paper introduces *Simpletones*, an interactive sound system that enables a sense of musical collaboration for non-musicians. Participants can easily create simple sound compositions in real time by collaboratively operating physical artifacts as sound controllers. The physical configuration of the artifacts requires coordinated actions between participants to control sound (thus requiring, and emphasizing collaboration).

Simpletones encourages playful human-to-human interaction by introducing a simple interface and a set of basic rules [1]. This enables novices to focus on the collaborative aspects of making music as a group (such as synchronization and taking collective decisions through non-verbal communication) to ultimately engage a state of group *flow*[2].

This project is relevant to a contemporary discourse on musical expression because it allows novices to experience the social aspects of group music making, something that is usually reserved only for trained performers [3].

Keywords

Collaboration, Artifacts, Computer Vision, Color Tracking, State of Flow.

1. INTRODUCTION

The system described in this paper is part of an ongoing project that examines how small groups of people using physical artifacts in collaboration can engage in simple sonic experiences. In doing so, the aim is to learn how a limited set of constraints can shape social experience and interaction in a musical context, in terms of how can the common goals be achieved and how the state of flow might be reached by participants.

Although the system poses certain rules, there is nothing to prevent participants from deconstructing them to generate new systems for emergent play[4]. This is relevant for improvisation and creative engagement, key components in group music making.

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2. SYSTEM DESCRIPTION

The system consists of a physical controller that is operated by participants in collaboration, a USB camera used as a sensor, and a computer vision-based program that reads the position of three tracking points attached to the controller. Visual and sonic feedback is provided using a large computer screen and speakers (Figure 1).

Sound is controlled by mapping the position of the tracking points to different sound parameters. For the artifacts described in this paper, tracking points are placed in an inverted triangular configuration (Figure 2).

The left and right points (A and B) control the modulation of two different sounds. The amount of modulation is determined by the height of these points with respect to the vertical axis of the two-dimensional plane of the screen.

A third sound is controlled by the central point (C). This sound is triggered when the middle point crosses the imaginary boundary drawn in the middle between the right and left points.

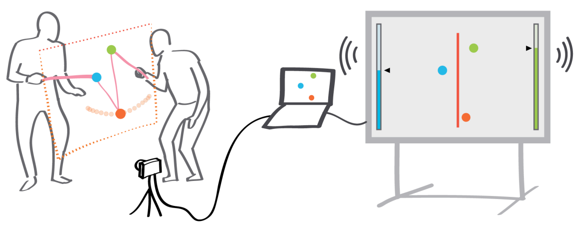

Figure 1. System setup.

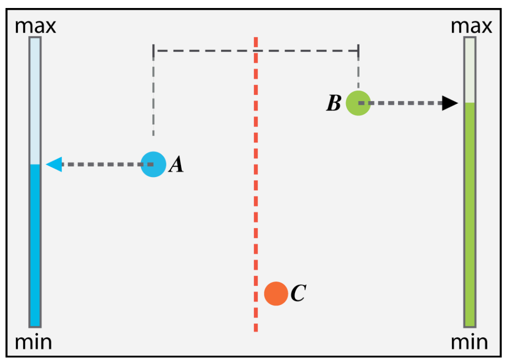

Figure 2. Triangular configuration and mapping.

2.1 Interaction and Physical Models

The mapping system previously described presents a model that can be applied to different physical configurations, thus creating very distinct controllers. It also communicates rules for participation. Among a series of prototypes built through ongoing study, two controllers were chosen for discussion here, because they exemplify the basic rules that are applied to all the possible configurations.

The first controller, called *Basic Triangle* is a controller operated using one hand. Three color tracking points are placed on each of the vertices of a fixed inverted triangle (Figure 3).

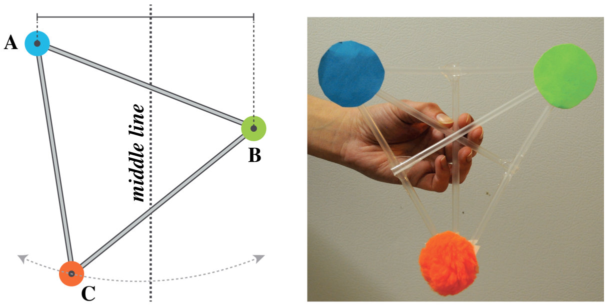

Figure 3. Basic Triangle.

The second controller, called *Pendulum,* is a model for use in collaboration between two participants, where the triangle created by the tracking points changes its dimensions while in use. This consists of a weight hanging from a string that connects two rods at their extremes. While maintaining the inverted triangle configuration, it creates a completely different interaction in comparison to *Basic Triangle*.

Each participant holds one rod in hand. When moving the rods up and down alternately in a coordinated pattern, the tension on the string provokes the weight to move as a pendulum. This configuration was deliberately designed so higher levels of coordination and collaboration between participants are required to achieve the desired rhythmic pendular movement (Figure 4).

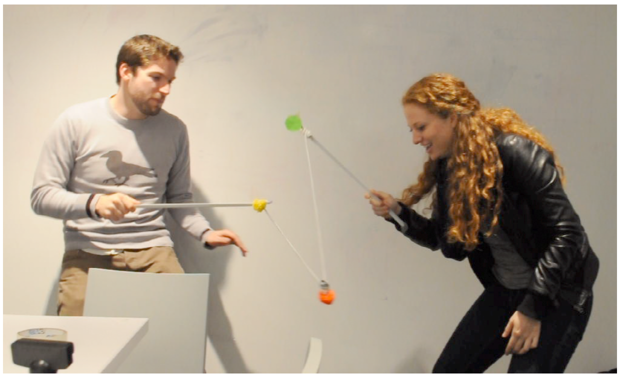

Figure 4. User testing with Pendulum.

2.2 Software

The relative position of each one of the tracking points is sensed by a videocamera placed facing one side of the participants. A program written in *Open Frameworks* analyses the data obtained from the tracking points and maps their position into coordinates in a two-dimensional plane. The variation in the position of the points is translated into OSC messages and sent to a second software called *Osculator*, that translates these messages into MIDI protocol. A third software, *Ableton Live*, receives the MIDI messages to produce and control sound [5] [6] [7].

2.3 Sound Generation and Control

In *Ableton Live*, three tracks of sound were created, one for each control point on the artifacts. Specific parameter controls for each track—such as resonance filter—are modified by the MIDI information received from the points.

The first and second track (corresponding to point A and B) are pre-composed loops that when played together create a harmonic composition. The control possibilities are restricted only to modifying filter frequency. These variations in filter frequency provoke drastic changes in sound timbre, allowing high levels of expressivity without altering the harmonic intervals, which would provoke a dissonant composition.

The third track (corresponding to point C) is a sound that is triggered only under the circumstances previously explained, becoming then a percussive element.

3. CONCLUSIONS

Simpletones is a catalyst for the *State of Flow,* encouraging groups to maintain a constant rhythm in a collaborative manner. The point when the state of flow is reached becomes evident when the movement of the physical artifacts is co-rhythmic to the participants' movements.

Simpletones provides a fertile ground for improvisation and creative engagement when exploring the affordances and physical possibilities of the controllers, allowing participants to create their own rules of interaction [4].

Relieving the participants from the responsibility of music composition, and balancing the level of expressivity and control range, *Simpletones* allows complete novices to experience the collaborative and expressive aspects of making music as a group.

4. REFERENCES

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[4] Katie Salen and Eric Zimmerman. *Rules of play: Game Design Fundamentals*. London: The MIT Press, 2004.

[5] http://www.openframeworks.cc/about

[6] http://www.osculator.net/

[7] http://www.ableton.com/live-8

5. Appendix : Video Documentation

A video documentation of *Basic Triangle* and how the system works can be found at http://vimeo.com/32167826

An early test with *Pendulum* can be found at http://vimeo.com/36369712

User testing video of a different controller for *Simpletones* based on two tracking points: http://vimeo.com/36203831

User testing video of a finished version for three participants: http://vimeo.com/39610319