Interactive sonification in circus performance at Uniarts and KTH: ongoing research

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INTRODUCTION

Contemporary circus artists are beginning to use new tools and technologies. Aligned with this trend and with interest to applying interactive sonification to circus performance a collaboration is currently in progress between the *Sound and Music Computing Team* at KTH Royal Institute of Technology and the *School of Dance and Circus*, part of Stockholm University of the Arts. The collaboration includes the Gynoïdes Project[1] and also works on a series of proofs of concept. This collaboration allowed us to gain experience and mature practical knowledge (see [1]) and a range of further activities are planned in the near future of which a description is given herewith.

1. MOTION SONIFICATION AND CIRCUS DISCIPLINES

Motion sonification will be further experimented in four circus disciplines, each named after the tool used i) Cyr Wheel, ii) Aerial Hoop, iii) Sway Pole, and iv) Tight Wire.

The Cyr Wheel is a large metal hoop used by a performer to roll around the stage keeping him/herself suspended inside by pushing the arms and legs on its inner side; the Aerial Hoop is a 1.5 meters in diameter metal ring hanging from a single rope with a swivel so as to rotate freely, and where the performer can hang from or sit in; the Sway Pole is a long pole or bar that can be pivoted for body lifting or hanging; the Tight Wire is a horizontal metal wire lifted off the ground, on which the performer walks, jump and dance, optionally using a balancing tool (e.g. an umbrella, a fan, or a balance pole).

Within above mentioned collaboration we plan to track movements of both tools and performers by means of wireless inertial sensors. The choice of this particular kind of motion tracking comes from the experience gained in previous research: wireless inertial sensors fit better to the onstage circus performance compared to optical motion systems, allowing movement in much bigger spaces and not subjected to lighting interference problems.

For each of the four circus disciplines tests will be conducted in the form of performances. Motion data and video data will be recorded and evaluated also by means of a comparison with the related performance video recording, so to choose the most suitable motion parameters to represent the movements, and to be mapped to sound.

Figure 1. Sarah Lett performing with a Cyr wheel (photograph by Einar Kling Odencrants).

Three different kinds of sound source will be experimented in order to represent the motion: pre-recorded sounds, synthesized sounds, and live sound and noise generated by the performers and captured by the sensors.

Pre-recorded sounds will be just triggered, or processed in real time using techniques such as scratching and filtering, that proved to be suitable in the past research.

Synthesized sounds will be produced by using computationally efficient algorithms such as Scanned Synthesis (see [2]) that has already been positively tested in interactive gesture sonification (see [3]).

Live sounds will be processed in real time using mainly filtering techniques, as already tried succesfully in a preliminary test. In the case of the Tight Wire an electric guitar pickup will be employed to get a signal from the wire oscillations, as if it was a big monochord.

Mapping strategies for the sonification of physical quantities identified by Dubus and Bresin [4], will be taken into account, compared and evaluated, with respect

[1] http://www.cirkusperspektiv.se

to each of the four circus disciplines considered. In addition to quantitative mappings also qualitative mappings will be tested, e.g. as in the Elementary Gestalts for Gesture Sonification approach [5] where the geometrical features of the trajectory are considered.

2. TECHNICAL ASPECTS

We will use wireless inertial sensors for tracking both performer's and tool motion, but instead of using those built in the Nintendo Wii remote controllers[2] will use those on x-OSC boards[3], that are better in many respects to include:

- usability, due to the smaller size
- lower system latency, due to much higher data rate transmission
- data transmission via OSC messages over WiFi and not Bluetooth, allowing for faster connection and better range from the base station
- a magnetometer, in addition to accelerometer and gyroscope, so as to be able to track the orientation with respect to all three axes of the terrestrial reference system, by means of sensor fusion algorithms such as those described by Yun et al [6] or those already implemented in Max MSP library AHRS[4].

3. METHODS

The sonification design process will be run according to the so-called spiral approach. The experiments on the four disciplines will be done in parallel and diversified in the choice of motion parameters, type of sounds, and type of mapping. First tests will be evaluated, positive outcomes selected and negative ones discarded. Thanks to the knowledge gained new models of sonification will be created to be tested again, thus creating a virtuous loop that allows to get better and better solutions.

4. EXPECTED RESULTS

All four new interactive sonification environments will be developed and tried during public performances of circus art. New insights in sonic interaction applied to circus art will be achieved. Several diverse interactive sonification mapping strategies will be implemented, compared and evaluated. For each circus discipline considered the most suitable motion parameters, to provide an expressive representation of the movement, will be identified. Taking into account the circus tool's characteristics, 3D rotations data will be extensively employed and new sound design competences for that kind of movement will be acquired. New compositional strategies in circus performances will be achieved.

5. REFERENCES

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