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Interacting with the Vocal Chorder - Re-empowering the Opera Diva

Figure 1. The Vocal Chorder, created for full bodily interaction.

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Figure 2. Autobiographical design - one of the authors creating accompaniment with the body.

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Abstract

With *The Vocal Chorder*, a large interactive instrument to create accompaniment, opera singers can get more power over the performance. The device allows performers to interactively accompany themselves through pushing, leaning on, and bending steel wires. The design was guided by the unique needs of the solo-singer, explored through autobiographical design and material explorations on stage, and later tested by other singers. Through our designerly exploration, we arrived at a device that offered (1) a tool for singers to appropriate and take control over the rhythmical pace and overall artistic and aesthetic outcome of their performances, (2) an enriched sense of embodiment between their voice and the overall performance; and (3) a means to empower opera singers on stage.

Author Keywords

Opera; Autobiographical design; Interactive instruments; embodiment; empowerment; appropriation

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Figure 3. Re-empowering the disempowered opera "diva".

Figure 4. Eight sensors in ceiling

Figure 5. Sensors with rubber-bands allowing for heavy duty interaction.

Introduction

There is an incongruity between the aura around famous opera-singers, "divas", supposedly mastering the end-result of their performances and the reality where even the celebrated stars reside at the bottom of the hierarchies when it comes to contribution and control over the creative process. Whereas opera originally constituted an innovative cultural movement where singers fully participated in the creative processes, contemporary opera productions are much more hierarchical and singers' influence on the creative process is limited – both off and on stage. This is what we set out to change with our device, building a large artifact that would allow singers to accompany their own voices through bodily interaction.

Designing for Empowerment

By designing for empowerment through putting the control of the accompaniment in the hands of the singer, we link our research to early operatic practices, as singers often accompanied themselves during performances in the early operas. However, as the requirements when designing for the opera is a novel domain for interaction design, we argue that our insights are relevant beyond developing the operatic art proper, and how material explorations and computer science can change performances through appropriation.

Related work

Researchers have explored empowerment within performances through relocating control to audiences and to artists in various projects. The audience can partake directly in the performance through interacting with it, as in [4], where musical and theatrical aspects were explored in public places. Through the introduction of movement sensors, the audience has been empowered

to influence both music and imagery, as in [6]. Interactivity has been introduced that puts artists, musicians and singers, in charge of the overall aesthetic form of their performance [5] & [3]. However, to our knowledge, few of these projects have aimed to bring out interactive instruments that can both empower opera singers and improve aesthetic and experiential qualities affecting the overall performance. The mundane, everyday reality of opera offered an intriguing possibility to design for empowerment for singers. Our work with The Vocal Chorder is therefore an example of research *through* art and design, as opposed to research *for* or *into* art and design, as differentiated by Frayling [1].

The Novel Instrument The Vocal Chorder

As opera is a highly physical art form, taking quite some space on stage, we built a large artifact that would allow singers to accompany their own voices through bodily interaction. We set out on our explorations with the wish that the design should dodge the need to be monitored from the outside by an artist sitting behind a computer screen. Rather, the performance should arise as an autonomous activity by the interactions with and through the instrument. Therefore we wanted to achieve a large bodily interaction that would allow the performer to create accompaniment with bodily movements. This wish for an emancipating instrument on stage placed strong demands on robustness and reliability of the components and in the overall design of the artifact as well as in the software. We could not risk designing an instrument where singers would not be able to fulfill a whole performance on stage in front of an audience.

Figure 6. Detail of one sensor with potentiometer and cabling

Figure 7. Mapping of incoming data from the singers bodily movement to audio and visuals

Figure 8. Probing the durability and stamina on stage through heavy interaction.

The Vocal Chorder Design Process

Drawing on autobiographical design procedures [2] that "rest(s) on the user's genuine need for the system", and that allows for "a much tighter coupling between user input and implementation", we departed on an intense journey of material explorations. The first incarnation of the Vocal Chorder had as its main goal to enable one of the authors of this paper to establish an autonomous, interactive embodied performance, where visuals and accompaniment created for a homogenous gestalt. Later we introduced the device to public audiences and to professional opera singers (Figures 3, 9 and 10) and throughout this trajectory we experienced how the Vocal Chorder more and more enabled a feeling of embodiment and empowerment for singers. The outcome of this process was not only an interactive instrument, the Vocal Chorder, but in fact several different versions of the instrument as well as range of performances with operatic music composed specifically to enhance experiential and aesthetic qualities of the artifact.

Material Explorations

Our hardware development was revolving around a novel use of eight potentiometers as sensors for bodily interaction (See figure 6). A potentiometer is a simple device where turning a knob changes the amount of voltage that is allowed to pass through it. By turning the knob, changes in current would occur that we wanted to transform to MIDI and later to music and visuals. To find means to twist the potentiometers we needed to transform movement from the body in space to the turning of the knob. The most straightforward way to do this would perhaps have been to mount larger knobs on the potentiometers, but we wanted to achieve a larger interaction that would allow the performer to inflict changes with bodily movements. We tried various ways of turning the

knobs with cords that were wrapped around them. But the need for more performativity led us to try steel wires leading from the floor to the ceiling enabling the performer to stand when pushing and pulling them over the potentiometers. The potentiometers were therefore mounted in the ceiling on wheels made of styrene which were mounted in metallic housings enabling the steel wires to roll them back and forth. Thereby the wires influenced the eight potentiometers. As we wanted the movements of the performer to be large and even allow the artist to lean on the wires, we needed a construction that would endure the weight of a person. Therefore, thick rubber bands were fixed at the end of each wire (Figure 5). Thus, the rubber bands allowed for flexibility that let the wires roll over the wheels to twist the potentiometers with large pressure (Figures 5 & 8).

Accompaniment of the voice

To be able to use The Vocal Chorder for accompaniment, music that could be performed via the wires was needed. Most music can be analyzed and subsequently parsed into a block of tones that sound simultaneously, called a *chord*. When a row of chords is at hand, they constitute a *chord sequence*. We devised a long chord sequence that would allow a novel composition to be forwarded by the performer by bending one of the strings, so that the singer/performer would control the ongoing pace of the music. The other wires were mapped via Max/MSP/Jitter¹ to inflict changes in the sounds as well as modifying the interactive visuals projected by the two projectors, as seen in Figure 2. For example, bending wire number three would inflict changes in the sound of the chord and at the same time make the pyramid turn slowly in space. Likewise, bending wire number five would change the

¹ See www.cycling74.com

Figure 9. External singer performing with the device.

Figure 10. The second singer in The Vocal Chorder, creating accompaniment for her own voice through bodily interactions with prerecorded vocal sounds.

volume of the chords, and at the same time alter the colors and patterns of the projections (see Figure 7).

Performing with The Vocal Chorder

The first incarnation of the Vocal Chorder had as its main goal to enable the first author of this paper to establish an autonomous, interactive embodied performance, where visuals and accompaniment created for a homogenous gestalt. Our next iteration of the artifact was an audience-interactive version, after which we shifted away from the general public, back to professional singers to test and further develop the instrument. This time we worked with two professional sopranos. We recorded the singers themselves performing the chords needed for the accompaniment. The sounds were then allocated along the wires so that the sounds were scratched by precise interaction by the user. One of the singers later reports on this:

We got to play in a way opera singers rarely get the chance to do; exploring movement and playing with sounds, everything did not necessarily have to be beautiful or perfect [...]. It was much more like a theater monologue than a regular song. As I got to know Vocal Chorder and felt confident in improvisation, I got a completely different relationship to it, and when we came to the last concert I felt really totally free."

The other singer relates to the bodily experience:

"There was also a strong and nice experience to see how it became like dance and choreography of the various arias we did together with technical instruments, how the instruments, in combination with us, gave the music form and life in unexpected ways."

Through our designerly exploration, lasting over several years, several incarnations of the instrument, we ar-

rived at a device that offered (1) a tool for singers to appropriate and take control over the rhythmical pace and overall artistic and aesthetic outcome of their performances, (2) an enriched sense of embodiment between their voice and the overall performance; and (3) a means to empower opera singers on stage. Here we made opera singers perform in ways that were, in some respects, quite the opposite of what they typically do. When singers took the demand over crucial musical and visual elements in the performance, it not only changed their performance, but it also led to reflections on their profession. Using a designerly process in order to uncover hidden assumptions in an established, and in this case almost stagnated, practice, not only opens for innovations but may also help to question the practice itself through a tool for empowerment.

References

- [1] Frayling, C. *Research in art and design*. Royal College of Art London, 1993.
- [2] Sengers, P. Autobiographical design. *CHI 2006 Workshop on Theory and Method for Experience-Centred Design*, (2006).
- [3] Tanaka, A. Musical Performance Practice on Sensor-based Instruments. (2000).
- [4] Taylor, R., Schofield, G., Shearer, J., et al. Designing from within: humanaquarium. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM (2011), 1855–1864.
- [5] Waisvisz, M. The hands. *Proceedings International Computer Music Conference*, 313–318.
- [6] Winkler, T. Audience participation and response in movement-sensing installations. *Proc. of the International Computer Music Conference (December 2000)*, (2000).