

Mondgewächse: a Collaborative Methodology for Inclusive Audiovisual Mappings in Instrument Design

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ABSTRACT

Mondegewächse is a ShareMusic & Performing Arts production created by the authors in 2014. This demo will draw from the instruments, interfaces, and interactive situations developed for the *Mondegewächse* project in order to propose a collaborative methodology for the development of audiovisual mappings, with the core goal of creating an expressive and engaging experience for users with different abilities. A primary feature of this methodology is the fluidity of roles and functions in the decision-making process, such that the binaries of user/designer and creator/performer are blurred. This is in keeping with ShareMusic's inclusive practice of producing cutting-edge productions in which amateur workshop participants and ensemble members perform alongside established musical ensembles and other professional performing artists.

The presentation will feature both video documentation of the *Mondegewächse* production and a demo illustrating the mapping strategies for one instrument in particular, the 'mouth-organ', developed in collaboration with long-time ShareMusic associate and performer Peter Larsson, in consultation with Clarence Adoo MBE, founding member of the Paraorchestra, as well as case studies of other instruments, interfaces and interactive computer vision situations designed for this project.

Author Keywords

#inclusiveperformance #audiovisual
#audiovisualperformance #instrumentdesign #expression
#mappingstrategies

CCS Concepts

• **Applied computing** → **Sound and music computing**;
Performing arts; • **Information systems** → *Music retrieval*;

1. INTRODUCTION

The *Mondegewächse* project consisted of a year-long residency by the lead author at ShareMusic & Performing Arts - joined by the second author for the last six months of the project - articulated in a series of collaborative workshops and culminating in an audiovisual production premiered at the Gothenburg Concert Hall as part of the Gothenburg Arts Sounds (GAS) 2014 festival. The collaborative participants and performers were the In:fluence Ensemble - comprised of participants in previous ShareMusic workshops - and members of Gageego!, one of Sweden's leading contemporary music ensembles.

Key themes emerging from the work included the playful reimagining of identity in relation to the external gaze and individual agency in embodied performance. These themes

were viewed through a phenomenological framework [1], in which an individual's experience of their body may be prosthetically extended by a number of 'external' factors, such as clothing or a tool or instrument, and informed by the quotidian use of a wheelchair by some of the performers. To engage with these issues, in addition to a central main projection screen, two smaller paper screens were erected for the performance, placed on either side of the stage for shadow play by the performers. The Share ensemble were represented by their shadows for much of the performance, emerging from behind the two screens for solos and duos employing the instruments and interactive situations to whose development they had contributed. The performance ended with a collective shadow play of all performers behind a single screen.

The performance therefore consisted of seven scenes: one featuring each of the In:fluence Ensemble members as a soloist or duo chamber player, in addition to the final scene bringing the performers together in making collective shapes while performing. The title and general prompt for the project came from our initial conversations of the above themes in the workshoping and brainstorming process (see below). *Mondgewächse* or 'moon plants' was proposed as an image for the shadow play: to create forms and sounds that are organic and yet have something other-worldly about them. This title comes from a combination of two pieces by Arnold Schoenberg: *Herzgewächse* and *Pierrot Lunaire*, which we listened to in our collective workshop meetings and discussed in terms of text and imagery..

2. COLLABORATIVE DEVELOPMENT

After the initial stages of the project - consisting of workshop shadowing and training of the authors and the formation of the In:fluence Ensemble from among ShareMusic participants - we proceeded with a creative process allowing each member of the In:fluence Ensemble to pursue their particular interests and needs in shaping the development of an interface, instrument, or interactive situation. We also considered shared interests and commonalities to allow for group performance, and consulted with other amateur and professional musicians in the inclusive performance field (see section 3 below). This process resulted in the development of three distinct interfaces: 1) a wireless, squeezable 'shadow-puppet' interface - based on the NoiseBear [2] - used by all members of the In:fluence Ensemble in the opening and closing scenes (see section 3.1 below); 2) the 'mouth-organ' developed with and for Peter Larsson (see section 3.2); and 3) feedback systems for two performers, based on their individual abilities and prior performance experience.

For two ensemble members who wished to explore visual art and physical performance respectively, an interactive audiovisual performance space was created. While some In:fluence Ensemble members performed with the shadow puppets behind a paper screen, another performer traced the

shadows they created with brightly-colored spray paint. Through computer vision techniques, the painting and gestures generated visual material displayed on the central large projection screen as well as cues for the performers. The In:fluence performers using this system thereby exerted extensive agency over the shape of the piece through their gestures and artistic choices. Later, the traced painting on the paper functioned as a seed for the dynamic visual processing of a pantomime between performers in front of the screen and those exerting shadow play behind it. It also resulted in the production of a physical artefact, allowing the performers to have a lasting artistic representation of themselves and their performance.

3. INSTRUMENT CASE STUDIES

3.1 Shadow-Puppets

The shadow-puppets were based on previous research and development at Goldsmiths on the NoiseBear project, combining its squeezability with gestural motion. This multiplicity of function allowed it to be performed by two players at the same time, and to be flexibly adaptable to different physical abilities.

The design process played out in the following manner over the course of the workshops: first, ShareMusic workshop participants - including members of the In:fluence Ensemble - were given a non-sonified version to manipulate, and video and data from their play with the puppet interface was recorded; then a fairly simple synthesis with very clear mappings - particularly in relation to gesture and space - was employed and recordings were made a second time; finally, more complex mappings were employed, such that the participants engaged with the interface specifically to make the sounds they desired. The final sonic mappings were drawn from all three categories of recorded data, sound and video, such that the relative success of the more complex mappings could be evaluated, and personification gestures that felt natural and expressive to the workshop participants could be meaningfully integrated into the mapping strategies and final interface design, realized in collaboration with Gunnar Oledal and the Interactive Institute Swedish ICT in consultation with Peter Ljungstrand.

3.2 Mouth-organ

The mouth-organ, a wireless audiovisual interface, was designed for In:fluence Ensemble member Peter Larsson, who wanted to perform on a 'colour organ' to create colours corresponding to sound. The first stage of the development consisted of consultations with Clarence Adoo MBE, who has many years of performance experience using HeadSpace [3], a wireless wind digital instrument designed by Rolf Gehlhaar that uses head movements to determine pitch. There were two expressive aspects in particular that Clarence Adoo highlighted. The first was lip pressure, which he had previously employed during his professional career as a trumpeter. The second was the realistic form of radiation of sound from the body of an instrument close to one's own body, as opposed to through speakers directed into a concert hall or an individual monitor. The first of these aspects was realised in an interface with lip-pressure sensing in addition to breath pressure detection and spatial orientation sensing, created once again in collaboration with Gunnar Oledal and Swedish ICT. The lip pressure was then mapped to the timbre of the organ synthesis to create an additional expressive layer to the control of notes and amplitude. The second aspect was not integrated into this instrument, but rather into the feedback membrane described in section 3.3.

In addition to the sound synthesis, data from the interface was used to manipulate an abstract landscape on the central screen

created from footage of the performers' shadow-play. The shadows of the performers were thereby coloured and composited according to the notes played on the organ against, creating a kind of night garden scene in which the shadows grow like plant

3.3 Feedback membrane

This self-diffusing, naturally-haptic feedback membrane consists of a metal plate equipped with built-in contact microphones and speakers. The feedback loop is enhanced by digital processing and amplified, while the resulting amplitude levels are mapped onto processing of the live video projection of the performance. Spatial distortion was chosen after demoing several video processing techniques in one of the workshops, and complemented the theme of reconfiguration of one's identity, as the image is fragmented and then allowed to reform whole. Figure 1 shows an example of the reactive video controlled by a performance on the feedback membrane.

Figure 1. Members of In:fluence and Gagego! ensembles performing with the plate membrane



4. CONCLUSION

The collaborative development process between the authors and participants allowed each member of the In:fluence Ensemble to explore an embodied practice tailored to their own abilities and interests. Each custom instrument made use of sensors to leverage a dimension of expressive control available to the individual performer. The collaborative development process was a necessary step to offer real agency to performers whose inclusivity needs vary significantly. Using sensor-based custom instruments, we were able to create performance situations and environments in which participation was accessible to each individual.

5. ETHICAL STANDARDS

All workshops were conducted in accordance with ShareMusic's best practice guidelines.

6. REFERENCES

- [1] M. Merleau-Ponty. *Phenomenology Of Perception*. London : New York :Routledge & K. Paul; Humanities Press, 1974, 795-825.
- [2] M. Grierson and C. Kiefer. *NoiseBear: A Wireless Malleable Instrument Designed In Participation with Disabled Children*. In *Proceedings of New Interfaces For Musical Expression*. Daejeon, Korea, Republic of, 2013.
- [3] <http://www.clarenceadoo.co.uk/headspace.html>, last accessed 24 January 2020.

7. Appendix

More information can be found on the ShareMusic website via the following link: <http://sharemusic.se/sverige/mondgewachse/>