The Helen Carswell Chair in
Community Engaged Research in the Arts

Final Report - 2023

A Community Music Approach to Collaborative Sonic Spaces in WebXR

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What is this research about?

The purpose of this project is to introduce extended reality (XR) practices for music group improvisation to a selected group of students from Community Music Schools of Toronto (CMST), and to collaborate on a multiplayer virtual reality (VR) prototype with the students as co-creators. Our project allows for participatory, collaborative, and co-creative interactions that are vital to developing skills in music creation and learning music concepts. Our main intention is to increase digital literacy and accessibility of emerging media and music for youth aged 10-17 years old in Canada, and add virtual reality to the music curriculum at the Community Music Schools of Toronto.

More concretely, our participatory research-creation project was conducted with The Senior Jam Class at CMST in the spring term 2023. The class was composed of five students from 13 to 15 years-olds, whose main focus was to learn to jam together. The class itself was headed by Allison Cameron, who is a professional composer, performer and improvising musician in Toronto. She has a long standing career in improvising and performing on electronic keyboards, ukulele, banjo, piano, mini amplifiers, radios, crackle boxes, cassette tapes, miscellaneous objects and toys. It was crucial for us that we integrate the VR project as much as possible within these improvising practices and the class curriculum in discussions with Ms Cameron, who also participated in our workshops together with her teaching assistant Jevoy Jennings. Thanks to their welcoming approach, we were able to create a safe and collaborative space while also being able to share knowledge and different music practices among ourselves.

We considered inclusivity and accessibility through the practice of co-creation with the students (including them in all of the project phases - from ideation to prototyping). We provided them with an environment for creating music that differs from traditional musical instrument performance and leverages their skills in listening, improvisation, empathy, and imagination, all core principles of collaborative group music making.

Final Report - 2023

What did the researchers do?

From March to June 2023, we had seven workshops with the Senior Jam Class at CMST where we first introduced the children to interactive immersive music-based media (online platforms and VR pieces). This initial research phase was followed by a couple of ideation workshops. In order to combine virtual reality and music making, embodiment and movement was a crucial aspect of the ideation stage. Therefore, we adopted Soundpainting exercises to encourage the students to experiment with physical gestures, conducting as well as playing with different objects outside the realm of musical instruments. We then had them come up with action-sound couplings – pairings of a given gesture to control a given sound – a concept from embodied music cognition. We then realized these couplings as instruments using the MetaSound plugin in the VR Unreal game mode. In the final phase, students came up with different visual real-world objects these action-sound couplings could be paired with. This triage-like architecture provided a user design structure of the world with four interactive audio-visual assets, which include: a gesture, a sound and a 3D model, and which can be further used and modified.

During these sessions, we have

- experimented with interactive music online apps
- introduced the students to existing music-based VR pieces
- conducted improvising and ideation exercises facilitated with Soundpainting live composing sign language: http://www.soundpainting.com/soundpainting/
- the sound-to-gesture ideas were visually transferred to the white board and further documented for to be reviewed and selected to be realized in VR
- some of the gesture-sound coupling were selected to be created in the VR session
    - constraints: Mapping the gestures and sounds via using of the controlled (grabbing function through the controllers to trigger a sound action)
- the visual assets and movements (mapping of the movement visually to sound) were ideated and discussed collaboratively with the students
- after the ideation phase, the prototyping stage followed - the prototype was tested by the students during three sessions and there was a focused discussion on students feedbacks and potential user design issues
- we developed two prototypes
    - a Meta Quest 2 single-player Beta-prototype with five different interactive visual and sonic assets
    - a working multi-player prototype with three sonic assets with object-placeholders

- both prototypes were presented on the CMST - PEACH recital day on June 16th, 2023 at Music department of York University and tested by the students

What did the researchers find?

- Students had previous experience with web-based music apps such as Chrome Music Lab as well as virtual reality games
- students were new to improvisation techniques and co-creation practices
- Building VR prototype for musicking requires a real-life implementation platform, in which ideating can be done through mapping and coupling of sound and gesture. This is specifically more important when the design approach tends to be a non-skeuomorphic design
    - The researchers came with the idea of utilizing Soundpainting as an ideating method since it entails sound-gesture mapping and coupling. In addition, it provided an inclusive and accessible context for musicking, improvisation and sound-gesture brainstorming disregarding the students' proficiency with musical instruments. It provided freedom for musical imaginations and possibilities.
- the researchers have further explored and identified an interdisciplinary tension and exchange between sound design practices in music-based contexts, user design practices in immersive media as well educational design approaches and within the research-creation process addressed these questions focusing on three participatory roles and their different aims of the project: researchers, co-creators, other users
    - How can we proportionate these different approaches, so that all three groups reach their aims? And what are the "wants" and "needs" for each participatory role?
- some students are interested in multiplayer musicking in VR and some prefer single-player musicking
- due to the participation of one student in a wheelchair, we tested how VR could provide a platform for accessible design for users with physical disabilities although more development is needed to implement these changes in VR templates
- VR (and more broadly XR) provide a context for musical imaginations and learning outside of the physical boundaries and limitations, and to our experience with the Senior Jam class it didn't feel 'unreal' or hard-to-engage
- students were curious and their musical engagement seemed to be engaging and meaningful

- there is a great demand for multiplayer platforms for musical engagements, especially in regards to current and hand-tracking possibilities, as well as VR platforms that are created specifically for programming sound and music

How can you use this research?

Not only did we develop two working prototypes in Meta Quest 2, we have also created a new open-source architecture for interactive sound design in virtual reality in the Unreal game engine. The code and our documentation are accessible under the Creative Commons license on GitHub for other developers, designers, music teachers and students to build their own interactive and immersive environments. Moreover, all three of us - the principal investigators - are planning to use the open-source code in our future work. We provide the documentation of the whole co-creative process in the web-based interactive tool Miro Board. Our findings are being circulated through the GitHub and Unreal communities, our personal websites, the CMST website, different newsletters at York University as well as on social media channels. And last but not least, we are planning to participate in different conferences and festivals focusing on interactive sound design, music education and immersive environments (i.e. FIVARS Toronto, SIGGRAPH, ISEA, Cinekid Festival Amsterdam and others).

Single-player prototype GitHub link: https://github.com/michaelpalumbo/jamxr
Multi-player prototype GitHub link: https://github.com/michaelpalumbo/jamxr_multi
Miro board link: https://miro.com/app/board/uXjVMIXWBno=/?share_link_id=193873096807
Video-Capture from SCMS Recital: https://vimeo.com/848836621?share=copy

About the researchers

Aida Khorsandi

Aida worked in different organizations and settings as a music educator since she graduated from Piano performance from University of Arts in Tehran, Iran in 2006. She studied and conducted research in the field of music cognition and perception at the University of Jyväskylä, Finland, and further pursued her interest in music technology at University of Toronto. In her doctoral studies at York University, Aida's research intersects between instrument design, interactivity, physical and sonic gestures and haptic engagements in sound making, and accessibility.

Michael Palumbo is a musician, teacher, and programmer. A PhD candidate in Digital Media at

York, he is researching electroacoustic music improvisation in online, multiplayer virtual reality. He teaches sound and video art at York, creative coding with javascript at OCAD, and private lessons in coding and music. He performs as a soloist and in ensembles, and runs the Exit Points concert series and record label. https://linktr.ee/michaelpalumbo

Michaela Pňaček(ova) is an award-winning XR artist, PhD candidate and ELIA scholar at Cinema and Media Arts at York University. She focuses on human-machine co-creation in emerging media. Graduate assistant at Immersive Storytelling Lab (York University), and the B2AI Project (National Institute of Health). She was commissioned to create XR works supported by Mozilla and Reeperbahn Music Festival. Her piece Symphony of Noise VR received: FIVARS Award 2020, VRNow 2021 Best VR Entertainment Nomination, IDFA and MIT R&D Selection, 2019 Best XR Installations List by Forbes.

Keywords

virtual reality, music improvisation, co-creation, user-centred design, participatory youth workshops, digital media, soundpainting

About the Helen Carswell Chair

The Helen Carswell Chair in Community-Engaged Research in the Arts is a partnership between York University's School of Arts, Media, Performance and Design and Community Music Schools of Toronto. This partnership is dedicated to community cultural development in the underserved neighbourhoods of Toronto. We facilitate and conduct rigorous academic research which explores the benefits of community music programs and the links between music and learning. The goal of our work is to significantly benefit children from high-risk neighbourhoods and to fortify community music programs globally through publications and knowledge mobilization. We especially seek to engage and help drive new knowledge and practice to community-based groups serving children in the Jane and Finch community.