The Performance Simulator: Building software robustness and scenario diversification for improved user-friendliness

Overview

The performance simulator has been an on-going project of the Music Performance and Body Lab (MPBL) led by Prof. Isabelle Cossette, the principal applicant of this CIRMMT Agile Seed funding award. Before applying for this award, a basic performance simulation software had been developed and used in some experiments. Some glitches had been observed when using this software in the real-world scenarios and the user interface was observed to be a little complicated by the performance science researchers who conducted these experiments. For the initial trials, one music audition scenario had been developed by recording and processing videos of actors appearing as a jury for the audition.

Objectives

The CIRMMT Agile Seed funding was requested for three main purposes:

1. To improve the interface of the previous application used for the performance simulator trials.
2. To expand the library of scenarios for the performance simulator trials.
3. Purchasing devices with biosensors to acquire physiological signals and performing preliminary studies on music performance anxiety with this equipment.

Achievements

Significant milestones were achieved with respect to the first goal. The interface of the performance simulator application was fully redesigned to make it easier for the performance science researchers to conduct the interactive performance simulator experiments. Also, with the new interface, it is now possible to create pre-programmed simulator scenarios with fixed durations for unsupervised trials.

Regarding the goal of expanding the library of scenarios, the team decided to prioritize the music audition scenario and solve this challenge first, considering the availability of time and funding before expanding to other scenarios. Nevertheless, some effort was spent on editing and formatting a second audition scenario with different actors and environment.

A literature review of various biosensors and bio-signals was conducted to identify the most suitable devices that could be used while performing the music performance simulator trials. Considering its effectiveness, and the broader budget and time constraints, it was decided to purchase the Shimmmer3 + GSR kit that would allow the measurement of critical stress markers like the Electro-Dermal Activity (EDA) and

photoplethysmography (PPG). To complement the EDA and PPG, it was decided to use the Tobii Pro Glasses 3 available with CIRMMT for measuring the eye-gaze data. While eye-gaze has been identified as an important stress marker by some studies, the eye-gaze data would also help the researchers know whether the participants were focusing at the jury on the screen or not. To record all the data streams from the biosensors with accurate time-synchronization, it was decided to use the lab-streaming layer (LSL) protocol. Compatibility and ready availability of the free software to LSL data streams from Shimmer3 and the Tobii Glasses was also an important criterion to choose this hardware.

Some preliminary experiments have been conducted with the Shimmer3 and Tobii Glasses, primarily to determine the setup required for conducting trials with the participants and to test the usability of the captured data for estimating the emotional state (e.g. anxiety) of the participants.

There were some unforeseen challenges in the data collection from the different biosensors. The main issues we faced are related to the simultaneous compatibility of the data-capturing software for the biosensors on Linux, Windows and MacOS. As a way to bypass these issues, we made use of two computers, one for running the experiment and another for capturing the sensors data, while achieving the temporal synchronization between the different systems using LSL. While this technique works, it is a challenge for a single person conducting the trial to perform the full setup. Efforts are underway to streamline this process and make it as automated as possible.

Next Steps

Considering the wide scope and opportunity that this research presents, the team plans to apply for a SSHRC grant in February 2025 and other opportunities for an extended duration to continue this research.

The next steps also include the ethics application for a pilot-study in winter 2025 and building additional scenarios for the simulator. To help on these, students from management are currently enrolled in an internship on this project.

Utilization of budget:

- $1768 was spent on purchases: Shimmer3 GSR+ unit as well as additional connectors for the performance simulator.
- $2593 was used for the salary of the RA working on the development of the interface.