Reactive Environment for Network Music Performance

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Overview

For a number of years, musicians in different locations have been able to perform with one another over a network as though present on the same stage. However, rather than attempt to re-create an environment for Network Music Performance (NMP) that mimics co-present performance as closely as possible, we propose focusing on providing musicians with novel controls that can help increase the level of interaction between them. To this end, we have developed a reactive environment for distributed performance that provides participants with dynamic, real-time control over several aspects of their performance, enabling them to change volume levels and experience exaggerated stereo panning. In addition, our reactive environment reinforces a feeling of a "shared space" between musicians. It differs most notably from standard ventures into the design of novel musical interfaces and installations in its reliance on user-centric methodologies borrowed from the field of Human-Computer Interaction (HCI). Not only does this research enable us to closely examine the communicative aspects of performance, but it also allows us to explore new interpretations of the network as a performance space.

Understanding the User

User Observations

- Sheds lights on the *what* and *how* of performance
- "Fly-on-the-wall" approach
- Observed 15 different musicians in 5 bands
- We noted differences in interactions between musicians based on their familiarity with one another
- We also found that volume adjustments mid-session was often cumbersome for musicians

Non-Leading Interviews

- Sheds lights on the *why* behind performance

Step 1: Interviews

- Conducted with 5 male and 1 female musicians, ages 18 to 42

Step 2: Content Analysis

- Grounded Theory (GT) approach
- Determined top 4 motivations for musicians:

Enjoyment
Self-Expression
Creative Engagement
Interaction with Others

Step 3: Validation

- Online survey asked musicians to rank different motivations by importance
- Completed by 15 male and 6 female musicians, ages 18 to 42
- Confirmed top 4 motivations listed above

Design and Implementation

- Design specifications are informed by our understanding of the user
- System should be driven by interpersonal interactions between musicians
- System should allow musicians to balance their own mix interactively
- This led us to define the two principal features of our system:

Dynamic Volume Mixing (DVM)

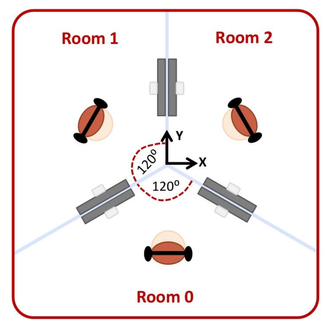
As a musician moves towards the monitor displaying a remote participant, both can experience each other's instruments as gradually increasing in volume.

Enhanced Stereo Panning (ESP)

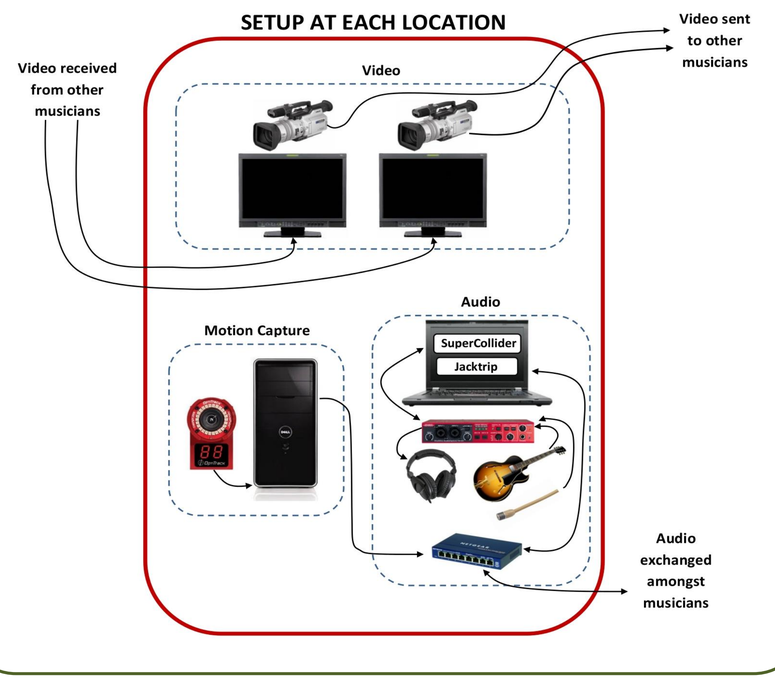
As a musician turns his head about, he can experience a stereo panning effect based on his orientation relative to the video monitors displaying the remote participants within his local space.

Shared Space

- System features designed to give musicians a sense of "shared space"
- The goal is to increase the level of interaction between participants, which typically is diminished in distributed scenarios



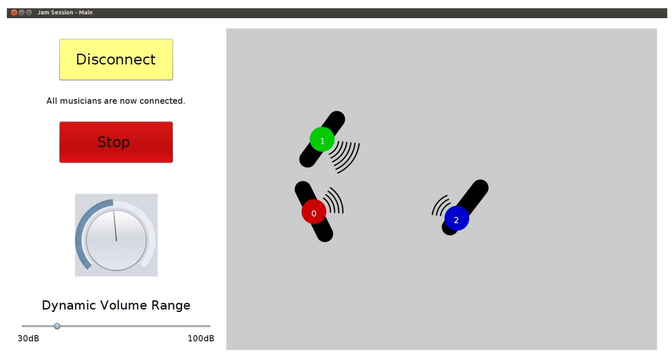
Current Prototype



Prototype iteratively modified based on results of user testing

User Testing

Formal Experiment: Video vs. Animations



- Each musician has access to a Graphical User Interface displayed on a computer monitor
- Musicians are represented as "avatars" illustrating their positions, orientations, volumes and stereo panning levels
- Experiment aims to study the benefits of graphical representations vs. traditional video streams

Artist Residency: Composing with DVM and ESP

- Composer has been invited to a month-long artist residency
- He will write a piece exploring new sonic possibilities with the system's two main features, Dynamic Volume Mixing and Enhanced Stereo Panning
- Our goal is to study the benefits of the features over long-term exposure, and refine them according to the composer's feedback

References

- D. El-Shimy and J.R. Cooperstock. "Reactive Environment for Network Music Performance." In New Interfaces for Musical Expression (NIME), Seoul and Daejeon, South Korea. May 2013 *(to appear)*.
- D. El-Shimy, T. Hermann J.R. Cooperstock. "A reactive environment for dynamic volume control." In New Interfaces for Musical Expression (NIME), Ann Arbor, MI, USA. May 2012.
- J. D. Gould and C. Lewis. Designing for Usability: Key Principles and What Designers Think. Communications of the ACM, 28:300–311, March 1985.