A Reactive Environment for Network Music Performance

CIRMMT Student Award Presentation

Dalia El-Shimy
Ph.D. Candidate
Supervisor: Prof. Jeremy Cooperstock

McGill University, Shared Reality Lab

September 5, 2012

CIRMMT Centre for Interdisciplinary Research in Music Media and Technology

McGill Centre for Intelligent Machines

Overview

Overview

Overview

Overview

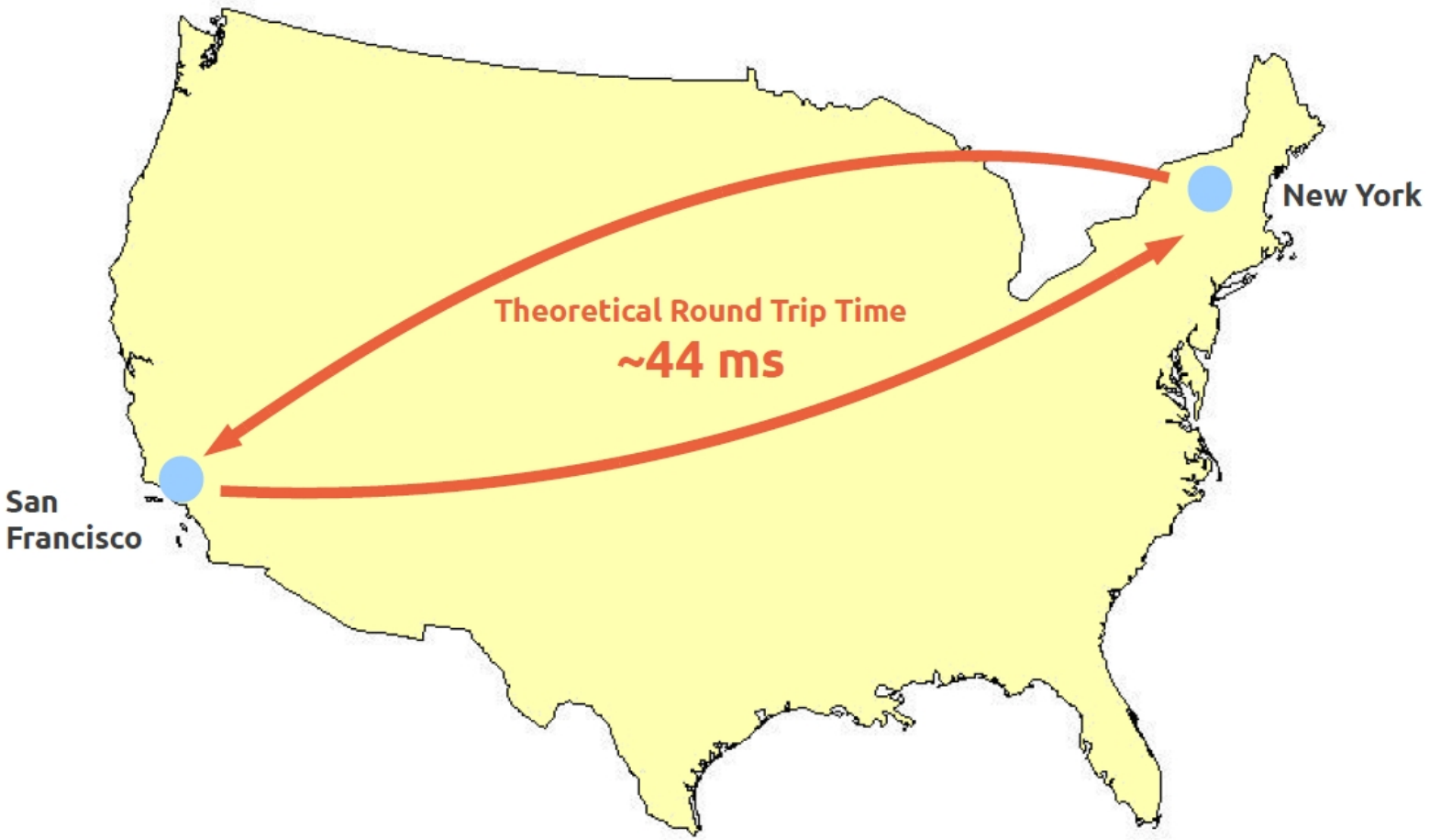
Overview

Network Music Performance (NMP)

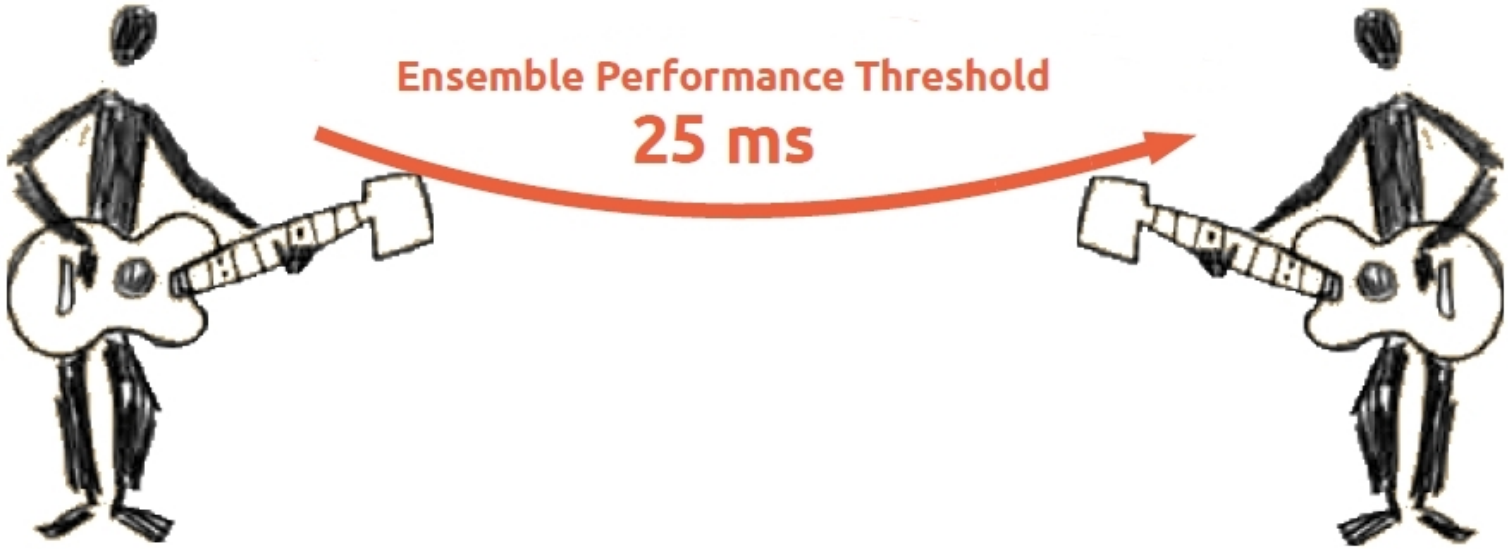
Distributed Performance made possible by recent advances in high-speed network

Network Music Performance (NMP)

Distributed Performance made possible by recent advances in high-speed network



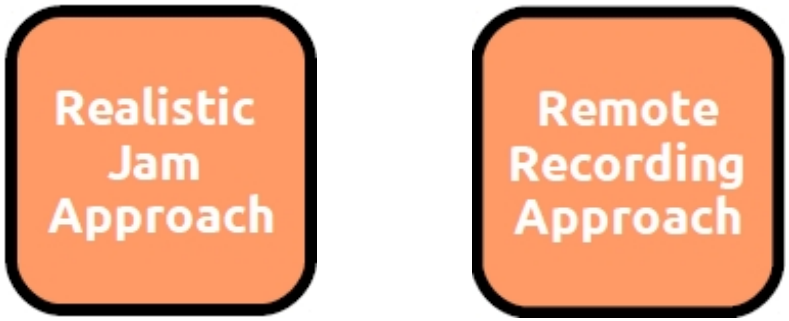
Network Music Performance (NMP)



Approaches for Dealing with Latency

Approaches for Dealing with Latency

Approaches for Dealing with Latency



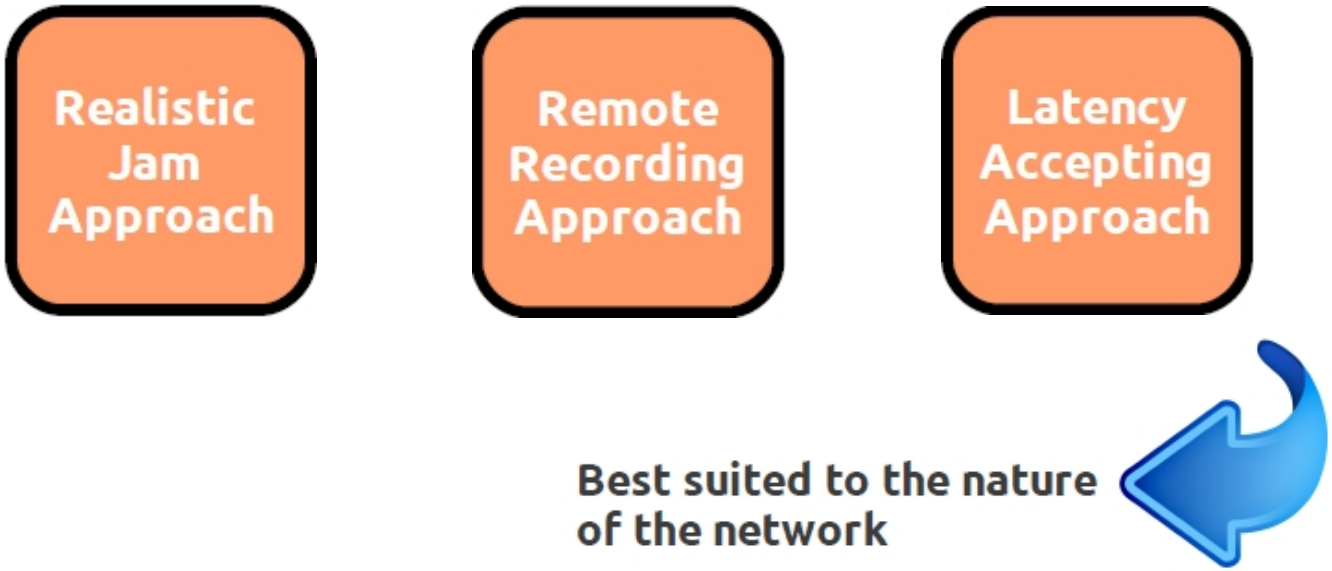
Approaches for Dealing with Latency

Characteristics of the Network

According to Tanaka:

"Music exists in space, in acoustical contexts, in the environment that it is played in. If music is made on networks, the network infrastructure becomes the space the music occupies. The time characteristic of that infrastructure defines the musical quality of that medium. Network transmission latency thus becomes the acoustic of the network, to be respected and exploited just as one does when composing for specific physical spaces" [Tanaka, 2006]

Approaches for Dealing with Latency

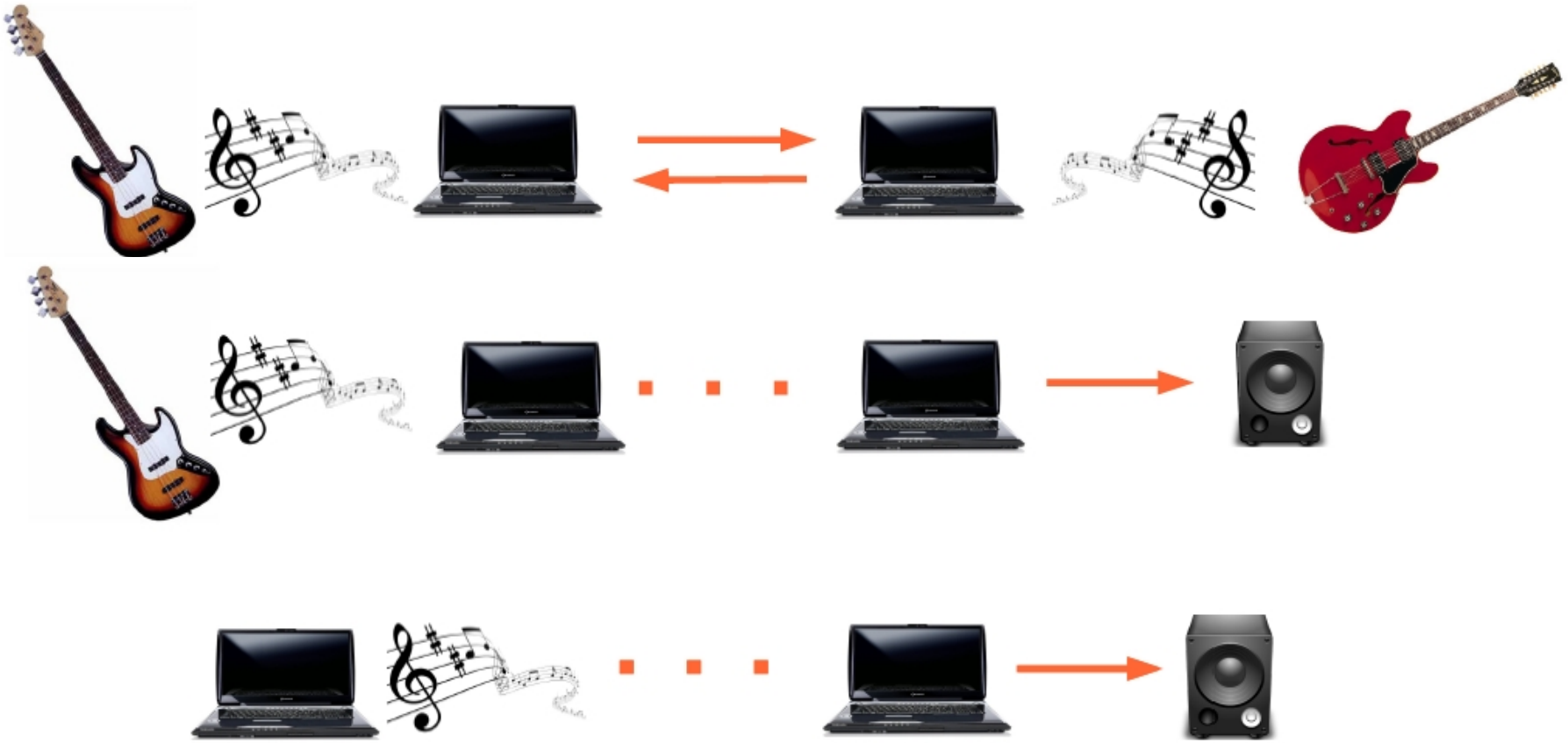


Motivation

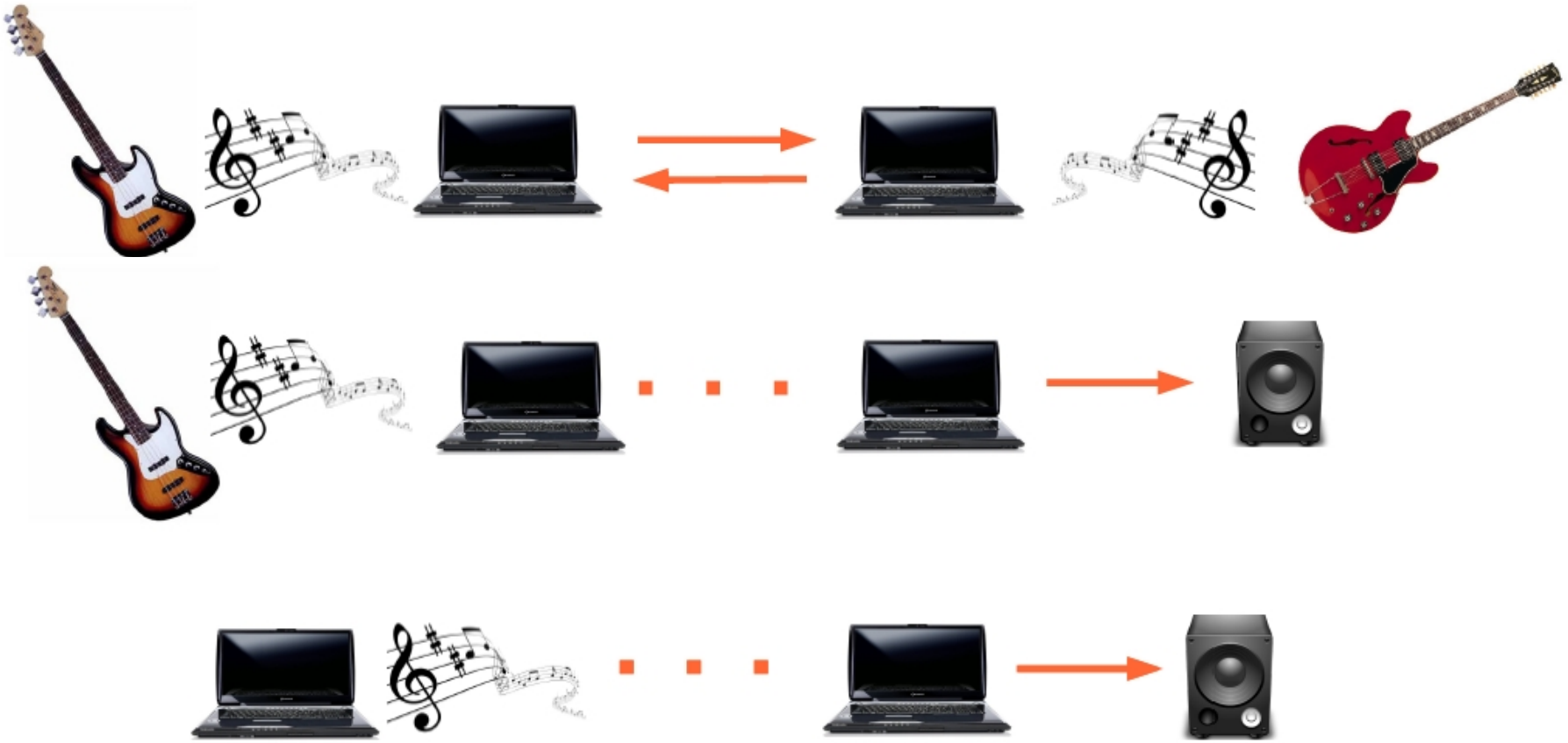
The Big Question

Why not capitalize on the fact that, by definition, the network brings computing technology to the performance setting, and use this to the musicians' advantage by giving them control over certain dynamics of the performance?

Existing Systems



Existing Systems



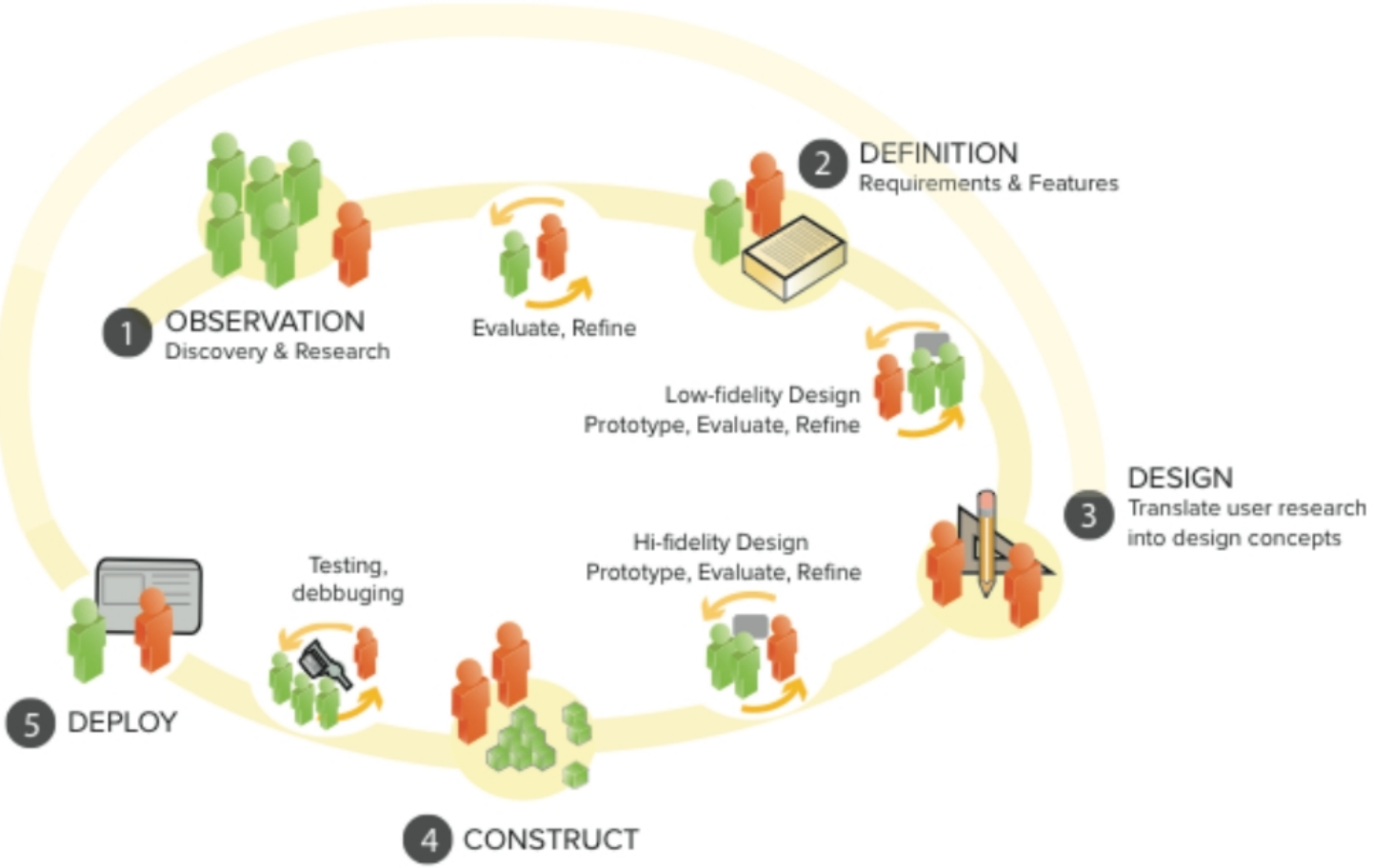
How can the user interact with a system **while** playing an instrument?

Reactive Environments

A Reactive Environment should...

- "reduce the cognitive load of the user by allowing the system to make context-sensitive reactions in response to the users conscious actions" [Cooperstock, 1995]
- "do its job well enough that the occupants are usually not aware of its presence" [Elrod, 1993]

User-Centered Design (UCD)



Our Proposed System

We want to:

- Design a system for NMP that allows musicians to interact with their instruments and their computer-controlled environment simultaneously
- Increase the level of interaction between the distributed musicians
- Apply a user-centered methodology throghout the process

Research Goals

- Create a system that is enjoyable and easy-to-use for musicians
- Examine the merits of UCD when applied to Music Technology
- Draw lessons for interface designers from the HCI community who work with challenging target users

Research Goals

- Create a system that is enjoyable and easy-to-use for musicians
- Examine the merits of UCD when applied to Music Technology
- Draw lessons for interface designers from the HCI community who work with challenging target users

Research Goals

- Create a system that is enjoyable and easy-to-use for musicians
- Examine the merits of UCD when applied to Music Technology
- Draw lessons for interface designers from the HCI community who work with challenging target users

Research Goals

- Create a system that is enjoyable and easy-to-use for musicians
- Examine the merits of UCD when applied to Music Technology
- Draw lessons for interface designers from the HCI community who work with challenging target users

Understanding the User

- User Observation: Uncovers the *what* and *how* of performance
- User Interviews: Uncover the *why* of performance
- Personas

Understanding the User

- User Observation: Uncovers the *what* and *how* of performance
- User Interviews: Uncover the *why* of performance
- Personas

Understanding the User

- User Observation: Uncovers the *what* and *how* of performance
- User Interviews: Uncover the *why* of performance
- Personas

Understanding the User

- User Observation: Uncovers the *what* and *how* of performance
- User Interviews: Uncover the *why* of performance
- Personas

Understanding the User

- User Observation: Uncovers the *what* and *how* of performance
- User Interviews: Uncover the *why* of performance
- Personas

System Functionality

A Reactive Environment for NMP that features the following functionalities:

1. Dynamic Volume Mixing (DVM)
2. Enhanced Stereo Panning (ESP)
3. Time Permitting: Joint Attention Filtering (JFA)

System Functionality

A Reactive Environment for NMP that features the following functionalities:

1. Dynamic Volume Mixing (DVM)
2. Enhanced Stereo Panning (ESP)
3. Time Permitting: Joint Attention Filtering (JFA)

System Functionality

A Reactive Environment for NMP that features the following functionalities:

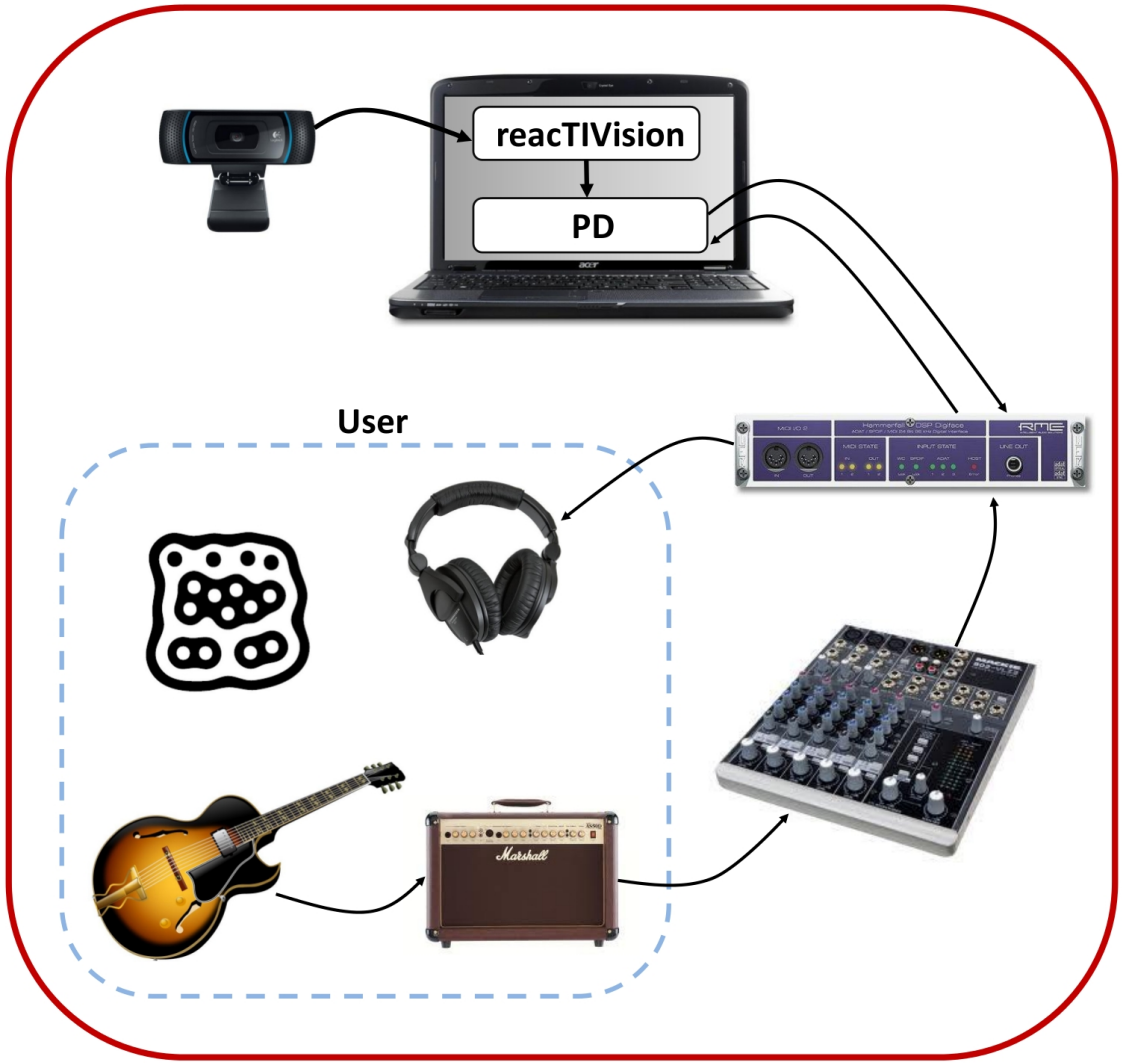
1. Dynamic Volume Mixing (DVM)
2. Enhanced Stereo Panning (ESP)
3. Time Permitting: Joint Attention Filtering (JFA)

System Functionality

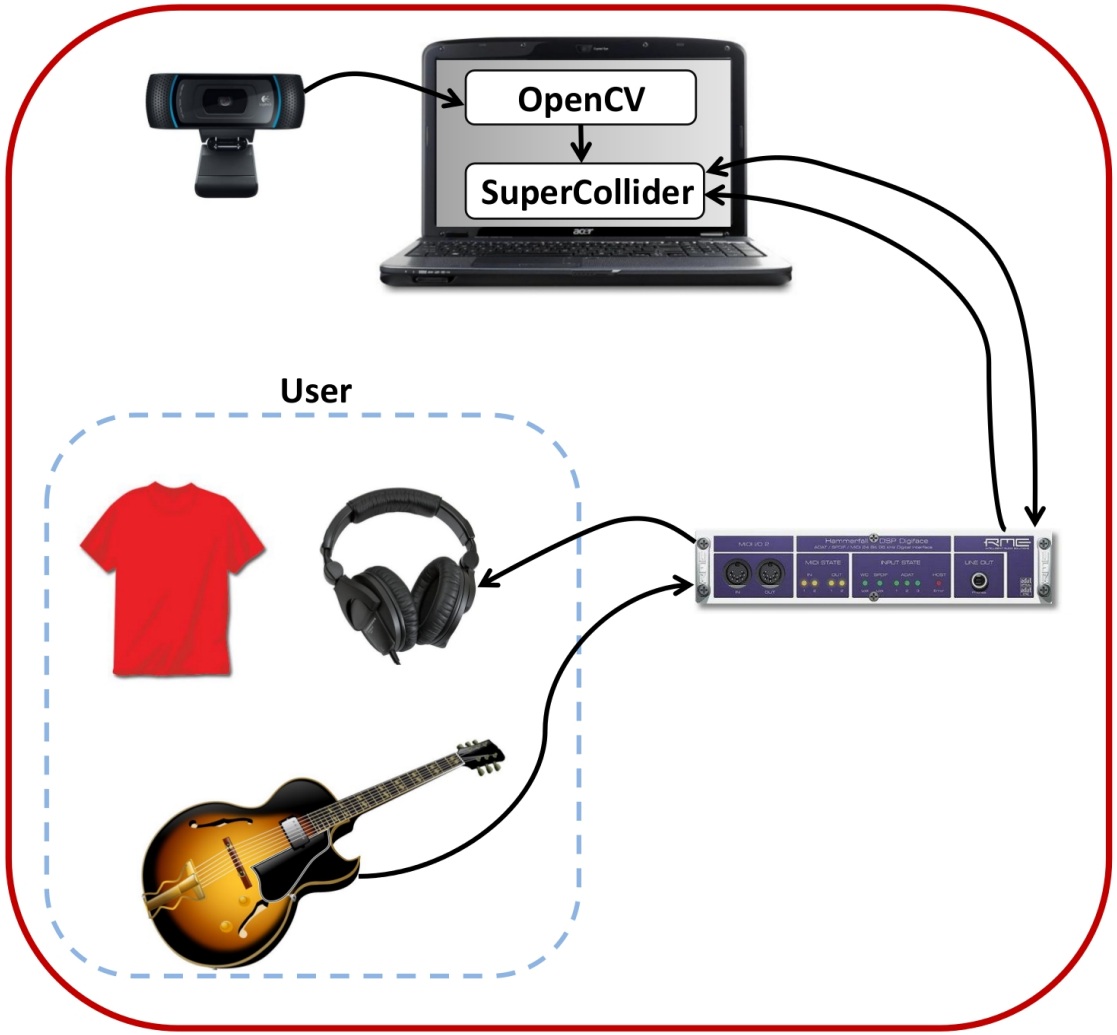
A Reactive Environment for NMP that features the following functionalities:

1. Dynamic Volume Mixing (DVM)
2. Enhanced Stereo Panning (ESP)
3. Time Permitting: Joint Attention Filtering (JFA)

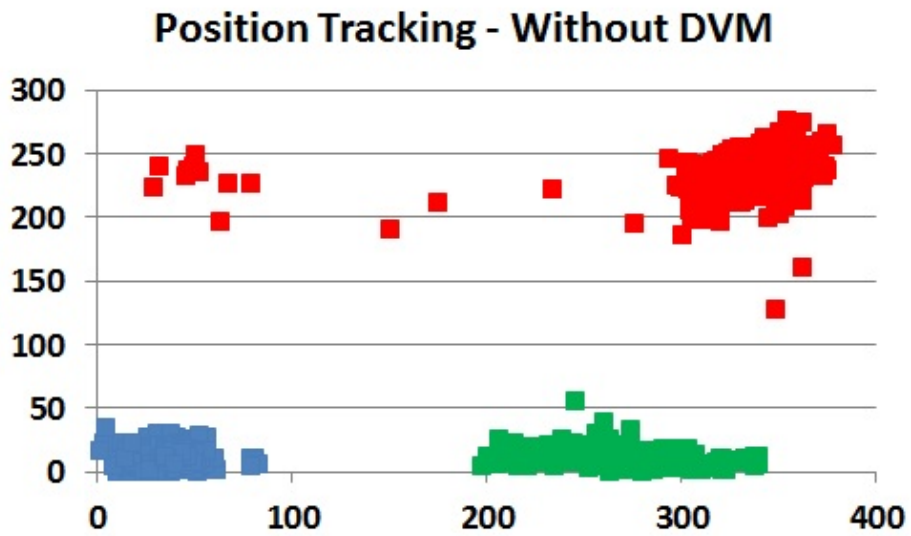
First Prototype

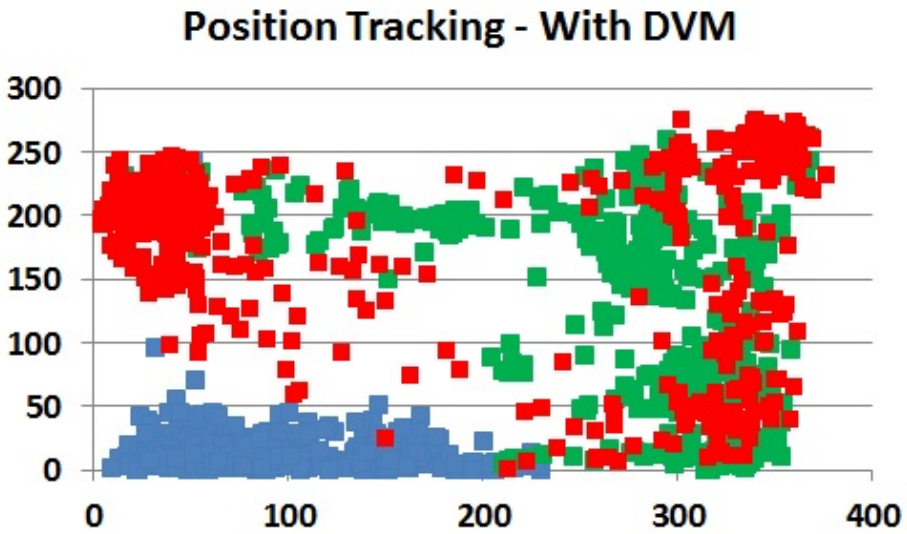


Second Prototype

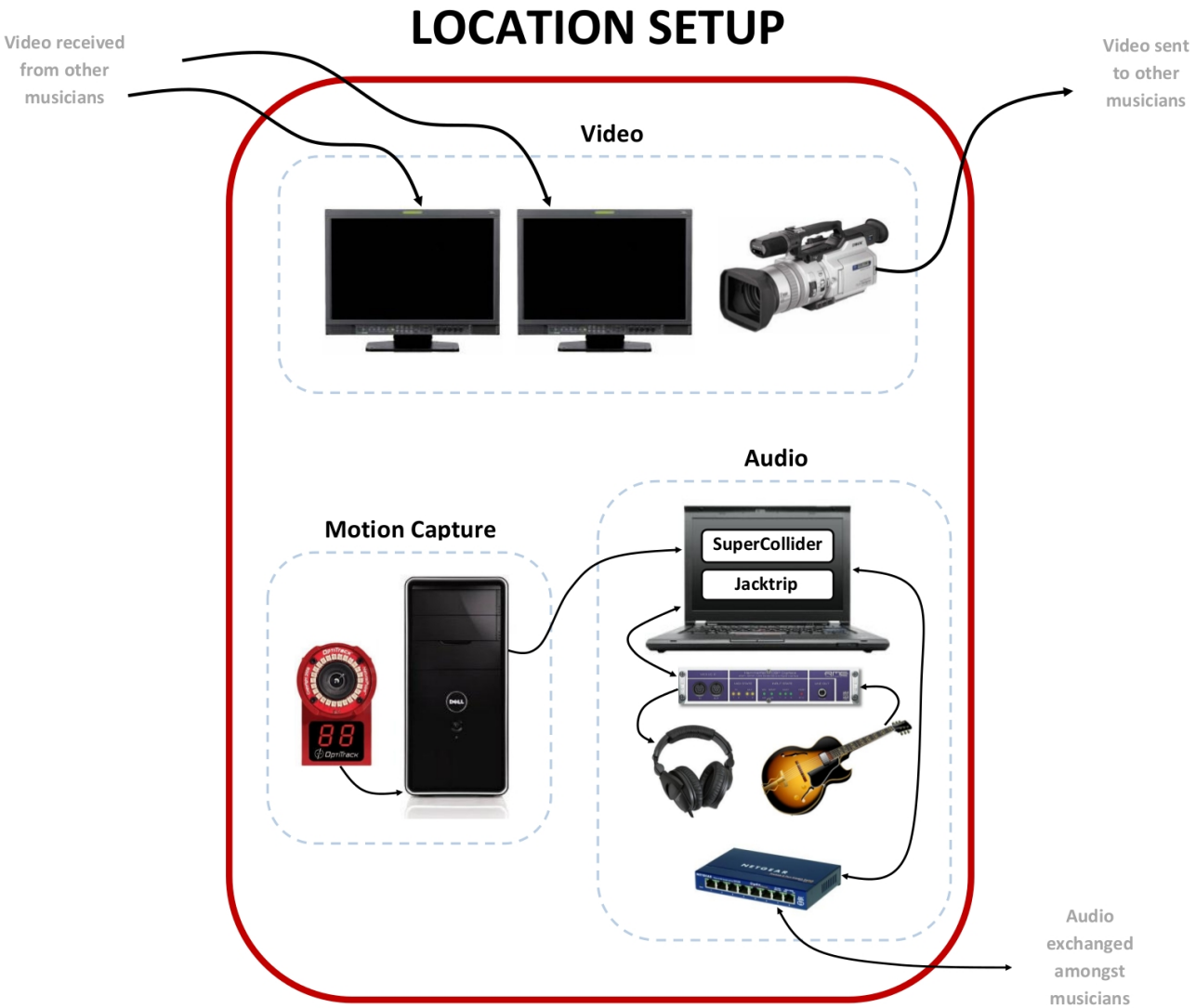


Results - Position Tracking





Alpha System



Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Enhanced Stereo Panning

Enhanced Stereo Panning

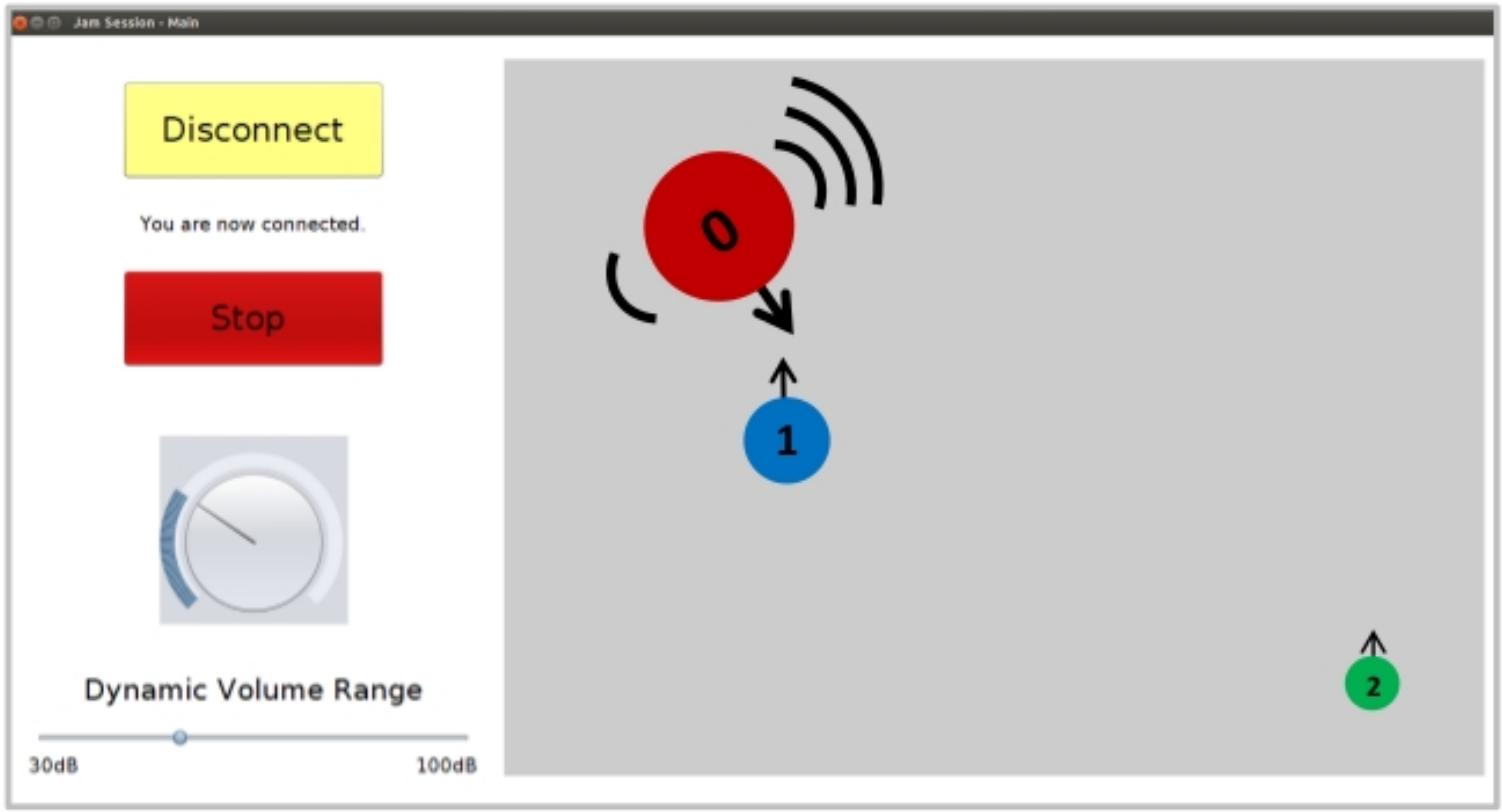
Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Visual Information



Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Future Work

- Enhanced Stereo Panning
- Visual Information
- Evaluation Techniques
- Formal User Experiments
- Final System...?

Thank you!

Discussion