**Wireless Orchestra**

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### Motivation
- The Wireless Orchestra simulation environment using National Instruments hardware and software over a wireless channel.
- The hardware and software are available to the general public, Wireless Orchestra can be an open source project.
- The product can be used as a practice device for conductors, schools, and live performers.
- Microsoft Kinect and Keyboard inputs provide interactive control of the system.
- NI-USRP's transmit and receive data as is and is very customizable for the designer and the users.
- The orchestra's position can be customized due to the wireless nature of the system.

### Data Flow

Transmitter using the USRP & Kinect

1. Kinect Sensor
2. Kinect Commands
3. Data Stream
4. USRP Transmitter

Receiver using the USRP

1. USRP Receiver
2. Extract Command from Bit Stream
3. Decider
4. Audio Output

- Kinect Commands implemented as state machines
- Keyboard commands implemented as alternative
- Capable of transmitting commands to individual computers or broadcasting to all
- Select a computer with Kinect by performing a command in its direction
- Play different songs, control volume, equalize songs, or play notes individually

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### Directing via Kinect and Keyboard

- **Mode:** Right Hand, Left Hand
- **Computer 1:** 0000011, 10110100, 10011011
- **Computer 2:** 00000000

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### Transmitting via USRP or Wifi

- LabView uses a USRP radio to transmit/receive commands generated from a kinect and a keyboard.
- Transmitter assigns preamble bit sequence to generated command and modulates it using QPSK modulation. The created signal is then transmitted over wireless channel at 915MHz.
- Received signal is synchronized using the preamble and demodulated at receiver USRP.
- Resultant demodulated information is then passed to extractor and decider block.
- A wifi version of the system was also implemented, and is significantly cheaper

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### My-DAQ Equalizer

- Implementation of sound equalization using myDAQs. Resampling, filtering, D/A and A/D conversion are all features of the myDaq
  - Volume
  - Base
  - Midtone
  - Treble

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### Future Work

- Introduce more Kinect gestures to expand library of commands.
- Use the National Instruments myDAQ hardware for data processing:  
  - Tempo Control  
  - Frequency Shifting  
  - Frequency Filtering
- Implementation of repetition coding and Error detection