

**BCNET Conference 2011**

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# Open Orchestra: A High-Fidelity Immersive Music Simulator

**John Roston, McGill**

**Mark Zuberbuhler, UBC**



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# Open Orchestra Project



## Objectives

- Provide a music student practicing alone the realistic experience of playing in an orchestra or singing in an opera.
- Provide an electronic music stand version of the score and custom audio controls.
- Allow the student to record himself or herself for later review by an instructor who may be at a remote location.
- Allow the student and instructor to communicate asynchronously with oral and written comments linked to points in the score.



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# Open Orchestra Project



## Overview

- HD recording of jazz band, orchestra and opera
- All files stored on servers at McGill
- Student workstations deployed across Canada
- Individual workspace for each instructor and student
- CANARIE network used to deliver video and audio in real time



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# Open Orchestra Project



## Lead Institution

McGill, Schulich School of Music,  
Centre for Inter-disciplinary Research in Music,  
Media and Technology (CIRMMT)

## McGill Team Leaders

- Video & Project Coordinator – John Roston
- Audio – Wieslaw Woszczyk
- Software & Networking – Jeremy Cooperstock



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# Open Orchestra Project



## Partner Institutions & Team Leaders

- UBC, Centre for Teaching, Learning and Technology – Mark Zuberbuhler  
(Lead institution for opera recording)
- Banff Centre – Theresa Leonard
- Humber College, School of Creative & Performing Arts – Steve Bellamy
- National Arts Centre Orchestra – Maurizio Ortolani
- National Youth Orchestra – Barbara Smith



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# Open Orchestra Project



## Technical Support & Funding

- Canarie Inc.

## Collaborating Corporations

- Panasonic Inc.
- Melnik Resources Ltd.



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# Open Orchestra Project



## Student Workstation

- Panoramic HD video
- Three 32" monitors
- Monitor on each side angled at 45 degrees
- Touchscreen music stand displays electronic score and system controls



# Open Orchestra Project



## Student Workstation

- Surround audio via headphones
- Overhead mic for audio recording
- Webcam for video recording





# Open Orchestra Project



## Student Workstation

- Electric lift for standing and sitting positions
- Monitors, touchscreen and computer move together.
- Workstation custom built by Melnik Resources in Ontario



# Open Orchestra Project



## Student Workstation

- Touchscreen music stand shows the electronic score at left.
- System controls at right allow student to turn audio tracks on and off and adjust levels.

The screenshot displays the 'Open Orchestra' software interface. On the left, a musical score for 'Straight Ahead' by Count Basie is shown, with various instrument parts like Trumpet 1, Trombone, Saxophone, and Bass. On the right, a control panel allows students to adjust the volume of each instrument track using sliders and to mute or unmute tracks. The interface is titled 'Open Orchestra' and 'Straight Ahead by Count Basie'.

# Open Orchestra Project



## Student Workstation

- Student selects his or her instrument.
- Student sees and hears what would be seen and heard at that position in the orchestra.
- Student can also choose to see and hear at conductor's position.



# Open Orchestra Project



## Video & Audio Transmission

- Target HD video is three simultaneous streams of 720p60 H.264 AVC @ 25 Mbps each
- Flash file format
- Playback not yet stable @ 25 Mbps so have been using "triple stitched" stream @ 15 Mbps
- 128 kbps audio mixed at the server and transmitted separately
- Video & audio synchronized at client end
- Currently using Wowza to stream video and gstreamer for audio



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# Open Orchestra Project



## Camera Rig

Front:  
Cameras



Back:  
Monitors



# Open Orchestra Project



## Camera Rig

- Electric lift mechanism for sitting and standing positions

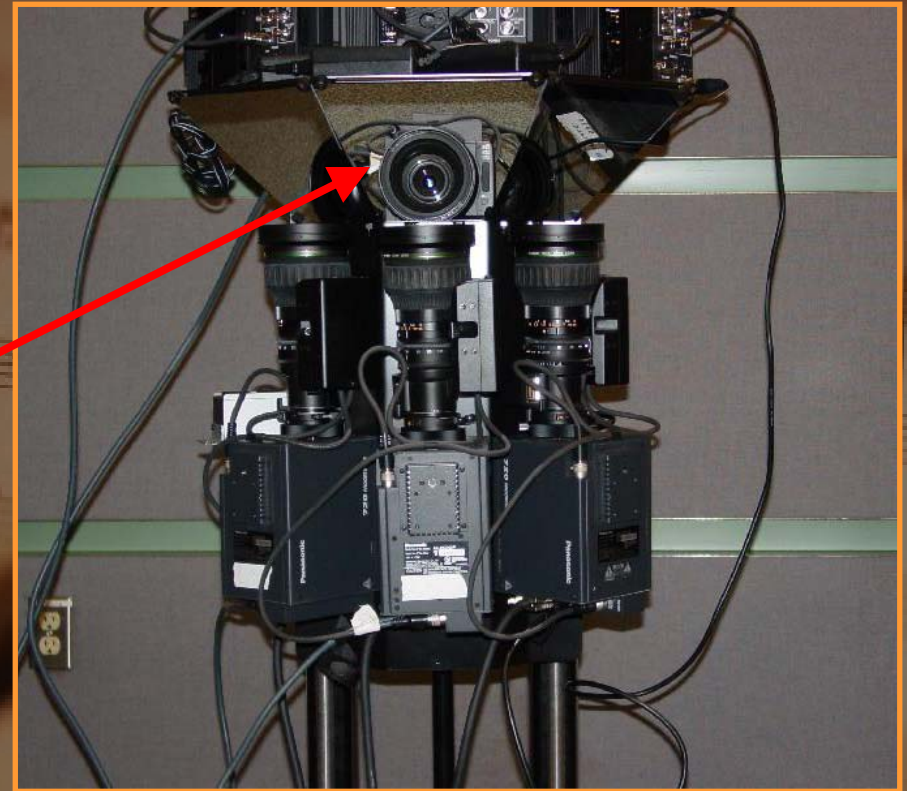


# Open Orchestra Project



## Camera Rig

- 3 Panasonic broadcast 720p60 cameras
- Mounted vertically looking into 45 degree angle front surface mirrors



# Open Orchestra Project



## Camera Rig

- Camera rig replaces trumpet player





# Open Orchestra Project



## Camera Rig

- Panoramic video display has 2 vertical blind spots between monitors where the monitor bezels meet.
- Cameras are aligned to allow for these blind spots.

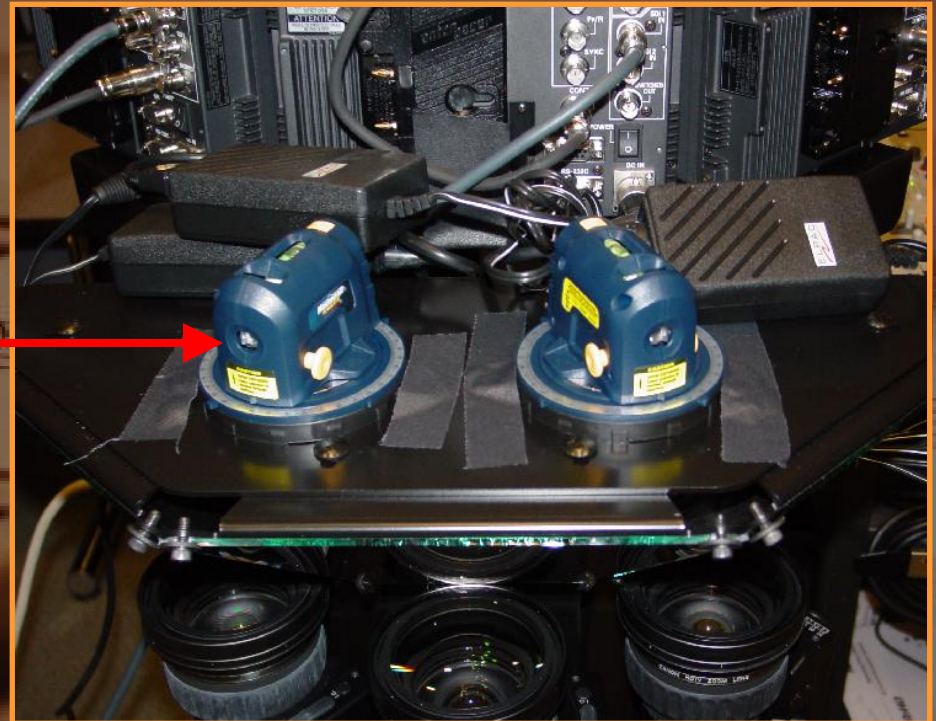


# Open Orchestra Project



## Camera Rig

- To facilitate moving musicians out of these blind spots, laser beam transmitters are mounted on the camera rig to transmit a vertical line in the blind spot.



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## Audio Recording

- Multi-track system
- Musician replaced by camera does not play.
- This musician records post-sync track later in sound studio.
- Student can use this track to hear how he or she should sound.
- Student can play duet.

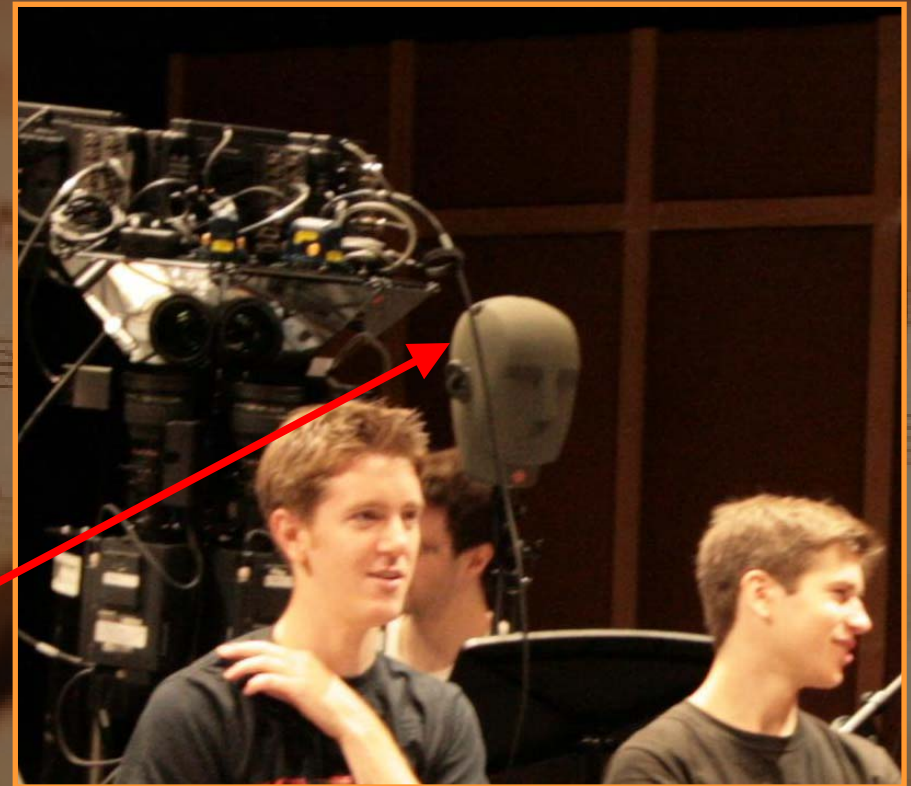


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## Audio Recording

- Student can hear how orchestra sounds at musician's position or conductor's position.
- Reference audio recorded at musician's position using dummy head.



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## Opera Recording

- Phase 1: static opera singers at music stands
- Camera rig replaces singer



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## Opera Recording

- Phase 2: moving opera singers on stage
- Camera rig must move as singer would move.



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## Opera Recording

- Where the camera replaces one member of a couple moving together, a handle is used to keep the singer in position beside the camera.



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## Tasks Remaining

- Solve Flash video player issues.
- Continue testing at 5 partner institutions.
- Improve system in response to feedback.
- Develop single screen home version.



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# Open Orchestra Project



## More Information

- Web Site:  
[http://canarie.mcgill.ca/project\\_nep2\\_index.html](http://canarie.mcgill.ca/project_nep2_index.html)
- Blog:  
<http://openorchestra.cim.mcgill.ca>
- [john.roston@mcgill.ca](mailto:john.roston@mcgill.ca)
- [mark.zuberbuhler@ubc.ca](mailto:mark.zuberbuhler@ubc.ca)



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