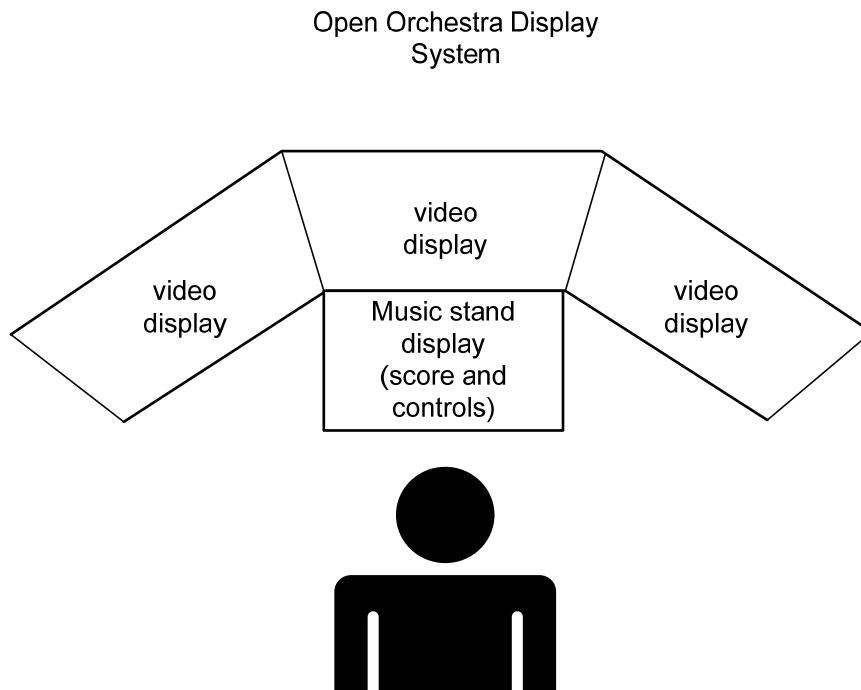


Network-Enabled Platforms (NEP-2) Program Progress Report – Feb 28, 2010.

Project NEP54: Open Orchestra Appendix 3: Initial Video and Audio Acquisition Plan

Video Acquisition Plan

The student will see the conductor and relevant part of the orchestra on a panoramic display as would the selected musician or vocalist and will hear the orchestra with that performance removed. The student will also have a music stand display of the musical score and system controls. As described in the original SOW, the panoramic display was to consist of three 24" monitors. This has now been increased to at least 32" monitors to increase the immersive effect of the system.

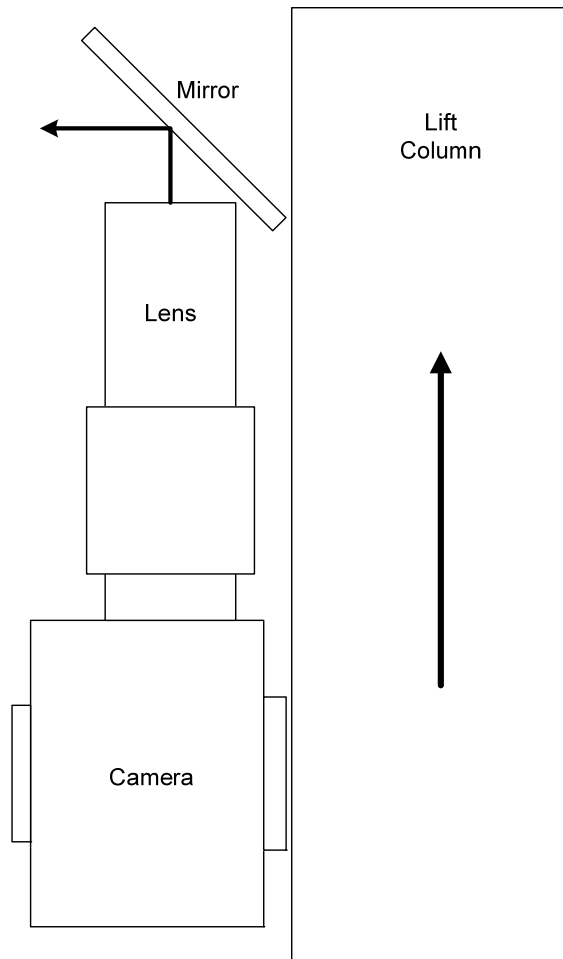


The problem with acquiring three simultaneous video streams for display in this manner is that all three cameras must be co-located where the student would be to give the correct visual perspective on each screen. This is a major challenge given the size of the high definition broadcast cameras and their lenses and the need to see objects that are very close to the student.

Camera Rig Design

The answer is to point the cameras vertically toward the ceiling into a front surface mirror mounted at a 45 degree angle to allow all three cameras to see what they should see if they were all co-located where the student's head would be. The cameras are mounted on a central lift column which is placed where the student would be.

Side View of Camera, Lens, Mirror and Lift Column
(camera mount, monitor platform and column legs removed)

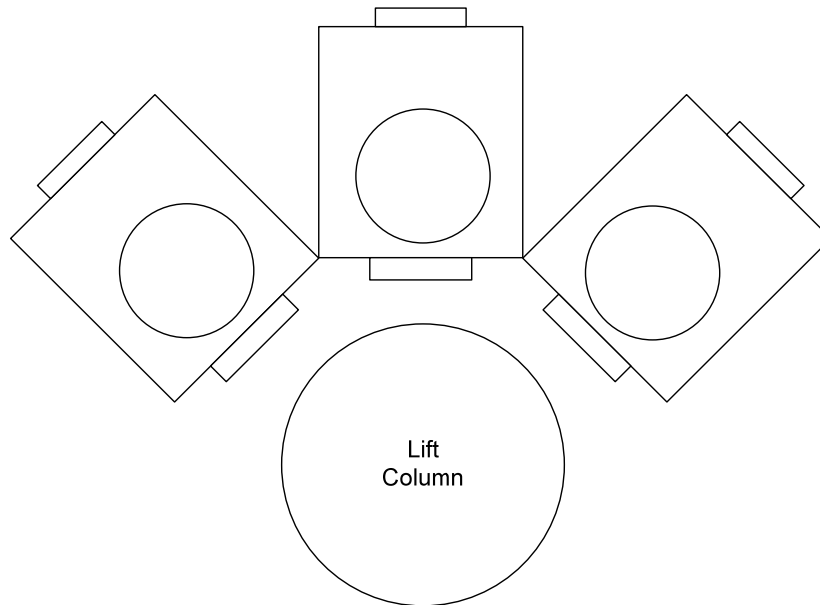


The camera lift column can be raised and lowered depending on whether the student would normally be sitting or standing to play a particular instrument. Similarly the workstation used by the student to view the panoramic video will be able to be raised and lowered to the correct position.

Three cameras will be mounted vertically on the lift column so that they are touching one another and pointing into three mirrors that are positioned to see

what the student would normally see. The student's head would normally be in the same position as the lift column just behind the mirrors.

Overhead View of Cameras and Lift Column
(lenses, mirrors, camera mount, monitor platform and
column legs removed)



The lift column will be mounted on legs with casters for easy movement to different positions without the need to re-align the cameras.

Simultaneous Video Recording

The plan is to video record the jazz band and classical orchestra performances from six different positions representing six different instruments. Since there will only be one master audio recording consisting of numerous tracks for the different instruments, the video recorded at each position must be in sync with that master audio recording. This is done by audio recording only the orchestra's first performance. When the cameras are moved to a different position for the next video recording, the first audio recording is played back and the musicians play in sync with it. To minimize the number of times this must be done, the plan is to use two camera rigs using a total of six cameras. This will allow panoramic video recording for two different instruments simultaneously.

The camera rigs are being designed and built by McGill's Department of Electrical and Computer Engineering. This has enabled the project to obtain two rigs for the price of one from an external supplier that was included in the original budget.

Although the CIRMMT research centre at McGill has six high definition broadcast cameras, it only had three high definition digital video recorders. The use of two camera rigs requires six such recorders. Arrangements were made to trade two other videotape recorders no longer being used by CIRMMT for an additional three high definition digital video recorders with only the cost of shipping being charged to the project.

Audio Acquisition Plan

There will be one master recording with each player recorded in a close perspective. Each player's perspective and direction (pan) will be adjusted at playback to suit the situation. To simplify the task, we will probably have three audio perspectives (close, mid, far), and more panning directions that will be matched to the video image. During the recording of each individual or section part, the musicians will have to play EXACTLY what has been recorded first as a full orchestra. We will also use many microphones on the original recording of full orchestra to give each player a clear guiding sound to play along with. We may limit the number of parts, for example do some violins but not all (they play the same part), or do sections at once, rather than individual players. The score selection will be critical. The original recording will have to be spotless, in tune and in time (not easy to do for student musicians, so the score should be not too difficult). Alternatively, we will need to hire some professional musicians, mostly symphony players and university teachers, to provide exceptional guide for critical solo parts.

Audio Acquisition Method in Brief

1. There is one master recording of everyone, used as guide for re-recording of parts.
2. Audio is re-recorded in sections, with and without single players or chairs (pairs), and featured solo and chairs (pairs of players) are recorded separately for sound isolation.
3. Video is recorded initially from one or two angles.
4. Additional video angles are recorded by lip sync'd while listening to the reference.
5. All scenarios are recorded as stereo group stems (with or without a given instrument).
6. The software player looks for the correct files and plays them from a remote server to the user's workstation.

7. The workstation provides means for choosing the stems to listen to, to adjust the balance between them, and to move them to a desired panning location or to be fixed to the one represented in the video image.

8. Reverberation and ambience are added in post-production process to create correct auditory perspectives (sense of relative distance and size between groups of instruments).

9. In pre-production, decisions must be made and mapped out about which instruments and which sections will make up each stereo stem (section or group).

10. In pre-production, decisions must be made about the music to be recorded and the camera positions.