Integration of surround sound into *Processing*

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:: Presentation Overview ::

• Frequently-used Terminology
• Motivation
• Project Objectives
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:: Frequently-used Terminology ::

- Processing
- Supercollider (SC3)
- Synthesiser Definitions
- Open Sound Control (OSC)
- Stereoscopic Images/Objects
- Viewport
- Perspective projections
:: Processing Example ::

Click on applet to gain focus, then move the cursor to make the grass sway.
Made with Processing.
:: Supercollider & Synth Def Example ::
:: Viewport & perspective

Example ::
:: Stereoscopic Example ::
:: Motivation ::

- Fully utilise WEDGE Theatre's dual screen capabilities and 8-speaker array in providing higher levels of realism.

- Lay the foundational groundwork for low-cost virtual reality systems such as the WEDGE to be used in unconventional areas i.e. Audio Synthesis.
:: Objectives ::

- Develop a *Processing* application that uses both screens of the WEDGE.

- Enable *Processing* to display its output to a borderless window environment.

- Develop an application that displays a stereoscopic image across both screens of the WEDGE.
:: Objectives II ::

- Enable *Processing (on Windows)* to send Open Sound Control (OSC) messages to *Supercollider (on Mac)* over a Local Area Network.

- Define appropriate *Synthesiser Definitions (SynthDefs)* to generate the appropriate sound effects.

- Allow users to interactively adjust (within *Processing*) the frequency of the audio effects produced by *Supercollider*. 
Objectives III

- Provide users with a means of generating audio effects through the movement of objects within Processing.
Why use Processing?

- Used by artists, designers and architects to generate images, animation and sound.

- Has an extensive range of libraries that include video, sound, computer vision, Graphical User Interfaces... even 3D Fog!
Why use Processing? (cont'd)

- One of the main programming environments used to render objects onto the WEDGE.

- User interactivity.

- Capable of exporting completed programs into executable applications and/or applets.
:: Technologies Employed ::
Why use OSC and SC3?

• *OpenSound Control* is a communication protocol for computers, sound synthesizers, and is optimized for use with modern networking technology.

• *OSC* allows for messages to be 'bundled' and sent as a whole.
Why use OSC and SC3? (cont'd)

• *Processing* has a dedicated library for *OSC* functionality.

• *SC3* is a mainstream audio synthesis software capable of accepting *OSC* messages.

• *SC3* runs a local server that actively listens on a specific port for inbound *OSC* messages.
:: Implementation ::

Dual Screen & Dual Stereoscopic

- Extends Processing display window to twice its normal width (due to the use of dual screens)
- Partitions the extended window into a left and a right partition
- Each partition is handled by a viewport.
- Viewports are responsible for drawing their respective stereoscopic images.
:: Implementation ::

**Dual Screen & Dual Stereoscopic (cont'd)**

- Each viewport draws the object that is responsible for twice – once for the left eye, once again for the right eye.
- Objects are rendered a total of 4 times. (twice on left viewport, twice on right viewport)
- Use of perspective projection assume user is viewing from the center of the screen.
:: Implementation ::

SC3 and Processing Integration

- Import of *Processing*'s OSC library (termed oscP5).
- Defines an IP address and port number (Port 57110) to which message packets are sent to.
- Concatenates messages with the appropriate data (/s_new,/n_set, etc)
:: Implementation ::

SC3 and Processing Integration

- Graphical buttons and sliders will regulate the message sending.
- Two distinct modes (ball mode and slider mode) for the application in Processing.
- Two types of synth definitions to produce the appropriate audio effects when OSC messages are received.
Implementation

SC3 and Processing Integration

- Problem encountered – OSC messages weren't being received by SC3.
- Processing is only able to send OSC messages to machines located on the same LAN as the source machine.
OSC test application

- Primary purpose – determine if OSC messages are being sent from the source to destination machine in a correct manner.
- Requires two instances of Processing to be running simultaneously – one receiving, the other sending.
- Prints out message details for diagnostic purposes.
:: Future Work I ::

- Implementing the current dual-screen stereoscopic images as a frustum projection rather than a perspective projection.
Future Work II:

- Perspective projections assume that a user is always at the centre of the screen. (left and right distance are always the same)

- User is likely to be moving around when viewing objects in the WEDGE.

- Frustum projections in combination with the head-tracker peripheral device will enable a more realistic rendering of stereoscopic objects.
:: Future Work III ::

- Enhance the existing implementation of the integration between Supercollider and Processing through the use of a 3-D object instead of the current 2-D object.
:: Conclusion ::

• Framework for communication between Processing and Supercollider has been established.

• Processing can be responsible for the rendering of stereoscopic objects while sending OSC messages to Supercollider to enable it to synthesize audio.
:: Questions and Answers ::