MorphOSC- A Toolkit for Building Sound Control GUIs with Preset Interpolation

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Summary

• **MorphOSC** is a new toolkit for building graphical user interfaces for the control of sound using morphing between parameter presets.

• Processing class library:
  – Cross-platform: desktop and Android.
  – Open-source.

• Improved interaction:
  – Intuitive configuration of parameter spaces.
  – Layering metaphor for parameter subsets.
Presentation Outline

1. Project origins, background, goals.

2. Similar work: software controllers.


4. Discussion and future work.
Origins and Motivation

“Tailoring Multitouch Interfaces for Musical Control”

• Graphical User Interface.
• Sensor input.
• Interaction design.
Background: Interactive Music System

- Three basic stages linked by a communications protocol.
- Processing stage *maps* the controller inputs to the parameters of output.
- Mapping imparts character to an IMS (Drummond, 2009).
Simple Mapping

- Mapping may be a simple one-to-one arrangement.
  - Hardware synthesiser: a single control widget (e.g. slider) will control a single sound parameter.
  - But! A violin doesn’t have a SOLITARY pitch control.
Complex Mappings

• Type: one-to-many, many-to-one, many-to-many.

• Trade-off between initial ease-of-use and potential for expressive play/long term engagement.

• Subjective tests: users prefer complex mappings to simple ones, once learned (Hunt 2000).

Violin pitch = (w_{\text{large}} \times \text{finger position}) + (w_{\text{small}} \times \text{bow pressure})
CrossMapper on Android (O’Sullivan & Boland, 2012)
Interpolated Parameter Spaces

• Parameter space of output (e.g. timbre) is often greater than the available controls, necessitating a few-to-many mapping.

• A 2-D controller, for example, can control a high-dimensionality parameter space.
  – Anchor points represent ‘snapshots’ of parameters.
  – Can interpolate between anchors for output.
  – Sacrifices individual control of parameters for intuitiveness/usability.
  – Suited to 2-D screen space.
Example Interpolation Method

• Shepard's Method uses simple inverse distance weighting to interpolate between values of a set of ordered parameters (Shepard, 1968).

\[ p_i = \frac{\sum_{n=0}^{k} p_{ni} d_{n}^{-1}}{\sum_{n=0}^{k} d_{n}^{-1}} \]
Project Goals

• ‘Intuitive’ graphical interface offering dynamic configuration of complex two-to-many mappings.

• Open Sound Control formatted messaging over networks.

• Cross-platform, open-source code with portability to touch screens.
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Similar Work: OSC Interfaces

andOSC app for Android

TouchOSC app
Similar Work: MnM

- IRCAM: MnM mapping toolbox.
  - Part of FTM external objects.
  - Requires Cycling’74 Max environment.
  - Limited to Max GUI elements.

**Example Max patch using two-to-many mappings.** The output parameter space is learned for a position of the X-Y controller. Moving it interpolates between the learned mappings.
Similar Work: *MetaSurface*

- AudioMulch MetaSurface.
  - Provides a control space for mappings using interpolation between snapshots.
  - OSC/MIDI output, control of softsynth parameters.
  - Commercial software bundle.
  - Sub-menus to include parameters in interpolation.
Similar Work: Environments

Cycling’ 74 Max 5 nodes object

Preset Interpolator for Supercollider (Marier, 2012)
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Processing Development Environment

“Processing is an open source programming language and environment for people who want to create images, animations, and interactions.”
ControlP5 and OscP5 Dependencies

• Libraries for Processing by Andreas Schlegel: www.sojamo.de

• Use these to keep code-base small, rapid development.

• Currently removing dependency on OscP5, ControlP5 is a long-term goal.
Class Structure

- **MorphOSC**: Base class, manages interaction space.
- **Parser**: Parses subset of widget fields.
- **MorphLayer**: Interactive GUI element. Container for (i), (ii), (iii).
  - (i) **MorphAnchor**: Holds a set of parameter values.
  - (ii) **MorphPoint**: An interpolation point.
  - (iii) **MorphParameter**: Parameter value parsed from widget.
- **OSCAgent**: Formats outgoing messages.

*Install by including JAR file in Processing path.*
import net.liamosullivan.morphosc.*;
import controlP5.*;
MorphOSC m;
ControlP5 cp5;
Slider s1, s2;

void setup() {
  size(400, 400);
  background(0);
  cp5 = new ControlP5(this);
  m = new MorphOSC(this);
  s1 = cp5.addSlider("Slider1").setWidth(100).setHeight(40);
  s1.setPosition(50,40);
  s2 = cp5.addSlider("Slider2").setWidth(100).setHeight(40);
  s2.setPosition(50,100);
  m.addController(s1);
  m.getControllerInfo();
  m.addMorphLayer(width*0.75, height*0.75);
}

da void draw() {
}
Demonstration
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Discussion

• Contributions:
  – ‘Intuitive’ graphical interface and interaction.
  – Dynamic, complex mapping in real time.
  – Cross-platform toolkit for Processing.

• ‘Barely beta’ version: basic features, buggy as hell.
Immediate Future Work

• Attach to software development cycle: finalise feature set and move to full beta.
  – Save and recall scenes, options (xml).
  – Specification of OSC formatting.
  – Android GUI.

• Inclusion of gesture recording/ playback.
Future Work

• Is the layering metaphor effective?
  – Can it be exploited in other ways?

• Do visualisations make the interface more useable?

Visualisation of textural sounds (Grill, 2012)
Perceptual Anchors

• Graphical anchors used to represent the high-level aspects of the associated sounds.

An example relationship between the shape of a virtual controller (left) and output sound spectrum (right) for prototype audiovisual system (O’Sullivan & Boland, 2011).
Overlong Bibliography Slide


Software Resources

www.processing.org

ftm.ircam.fr/index.php/MnM

www.audiomulch.com/help/metasurface.htm

http://hexler.net/software/touchosc
Get It!

https://github.com/LiamOSullivan (Source)

www.mee.tcd.ie/~lmosulli/projects.html

Email: lmosulli@tcd.ie

Thanks!