Widget Modulation

A Novel Extension for Modular Design in Faust

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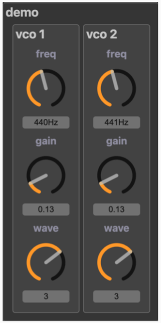
EMERAUDE (INRIA/INSA/GRAME)

Introduction



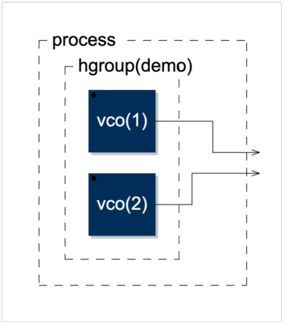


Figure 1: two VCOs

Example

```
mo = library("modular.lib");
process = hgroup("demo", mo.vco(1), mo.vco(2));
```

Question?

[illegible]

The answer . . .

Not without editing the code (or using Widget Modulation)

Widget Modulation

- New extension to Faust programming language
- Inspired by modular synthesizers
- Enables “voltage control” style modulation
- Allows parameter modulation without code modification
- Enhances code reuse and customization

Example

```
mo = library("modular.lib");
process = hgroup("demo", mo.vco(1)*200
                        : ["freq":+ -> mo.vco(2)])
                       <: _,_;
```

Reshaping the UI of `dm.freeverb_demo` (1/4).

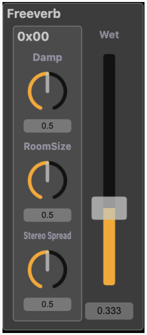


Figure 2: Freeverb, full UI

Example 1: full UI

```
import("stdfaust.lib");
process = ba.pulsen(1, 10000)
        : pm.djembe(60, 0.3, 0.4, 1)
       <: dm.freeverb_demo;
```

Reshaping the UI of `dm.freeverb_demo` (2/4).

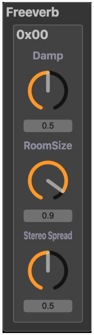


Figure 3: Freeverb, Wet slider removed

Example 2: full UI

```
import("stdfaust.lib");
process = ba.pulsen(1, 10000)
        : pm.djembe(60, 0.3, 0.4, 1)
       <: ["Wet":0.2 -> dm.freeverb_demo];
```

Reshaping the UI of `dm.freeverb_demo` (3/4).

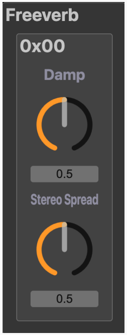


Figure 4: Freeverb, RoomSize also removed

Example 2: full UI

```
import("stdfaust.lib");
process = ba.pulsen(1, 10000)
        : pm.djembe(60, 0.3, 0.4, 1)
       <: ["Wet":0.2, "RoomSize":0.9 -> dm.freeverb_demo];
```

Reshaping the UI of `dm.freeverb_demo` (4/4).

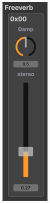


Figure 5: Freeverb, Stereo Spread replaced

Example 2: full UI

```
import("stdfaust.lib");
st = vslider("stereo", 0.5, 0, 1, 0.01);
process = ba.pulsen(1, 10000)
        : pm.djembe(60, 0.3, 0.4, 1)
       <: ["Wet":0.2, "RoomSize":0.9,
           "Stereo Spread":st -> dm.freeverb_demo];
```

Widget Modulation: Basic Syntax

Syntax diagram:

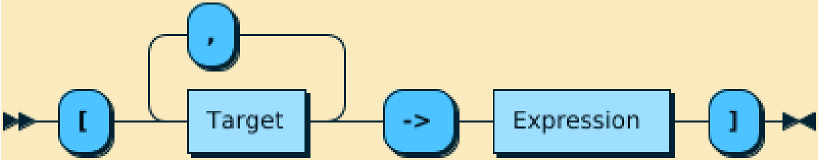


Figure 6: Widget Modulation

Widget Modulation: Target Syntax

Syntax diagram:

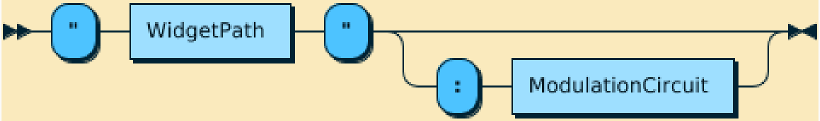


Figure 7: Target

Widget Modulation: Widget Path

Syntax diagram:

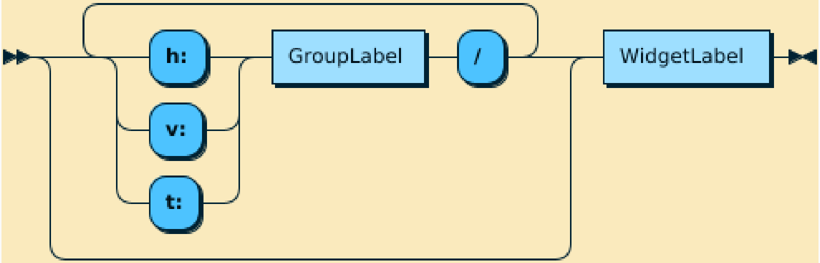


Figure 8: Widget Path

Modulation Circuit

Binary Circuit (2→1)

- Creates an additional input
- Example: `"Wet":+`

Unary Circuit (1→1)

- Transforms the widget value, no additional input
- Example: `"Wet":*(lfo(10, 0.5))`

Constant Circuit (0→1)

- Replaces the widget
- Example: `"Wet":0.75`
- Example: `"Wet":hslider("foo", 0.5, 0, 1, 0.1)`

Example of (2→1) modulation circuit

Description

- We assume the modulation signal m is an audio signal.
- When m is 0, the current slider value is used.
- When m is $+1$, the maximum value of the slider is used.
- When m is -1, the minimum value of the slider is used.

Implementation

```
mod(s, m) = s + (h - s) * max(0, m) + (s - l) * min(0, m)
    with {
        l = lowest(s);
        h = highest(s);
    };
```

Conclusion

Benefits

- Widget Modulation Enhances code reusability.
- It enables post-development customization.
- It doesn't require source access.
- It introduces no performance overhead.

Impact

- Enables the creation of new, rich UI libraries.
- Lays the groundwork for a potential *modular synthesizer* library.