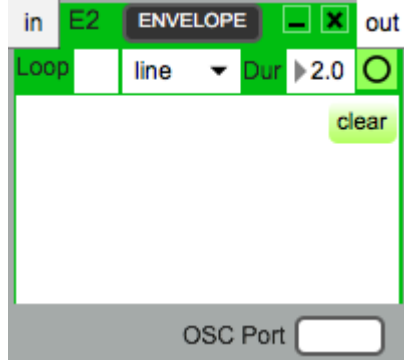


# Soundcool's Envelope Module Specification

September 24, 2019

## User interface

Following is the user interface for an envelope module in Soundcool:



- **Drop points:** User can drop points on the canvas by clicking. After two points are dropped, there will be lines connecting each pair of two x-adjacent points. That is, in terms of x coordinate, each pair of neighboring points.
- **Drag points:** User can drag points. This will result in the connecting line also change.
- (Optional) **Delete points:** If possible we will implement the delete point feature, since there is none in soundcool 3.1
- **Clear canvas.**
- **Change duration:** duration indicates the time interval that the envelope on the canvas get applied to. In seconds, enter an integer greater than 1.
- **Loop:** selecting loop will result in the envelope applied consecutively.
- The button next to duration: click to apply or bypass the current envelope.

# Web Audio Implementation

## Terminology

canvas = the window where user specifies the envelope curve

y-value = Y coordinate on canvas (amplitude multiplier). Range: [0,1].

x-value = X coordinate on canvas (discrete sample index)

An envelope specification requires a JavaScript(JS) Object with following fields: 1) `startSampleId` 2) `endSampleId` 3) `sustainAmp` 4) `arr`. Since envelope can be looped and could be of arbitrary shape, the only way to achieve this in Web Audio is to use a Audio Buffer Source Node (ABSN). The idea is to represent user specified envelope as discrete samples in a `Float32Array`. Here is the definition of the parameters:

**`startSampleId: (integer)1 number`**

x-value where user specified curve starts

**`endSampleId: (integer)1 number`**

x-value where user specified curve ends

**`sustainAmp: (float)1 number`**

y-value where user specified curve ends

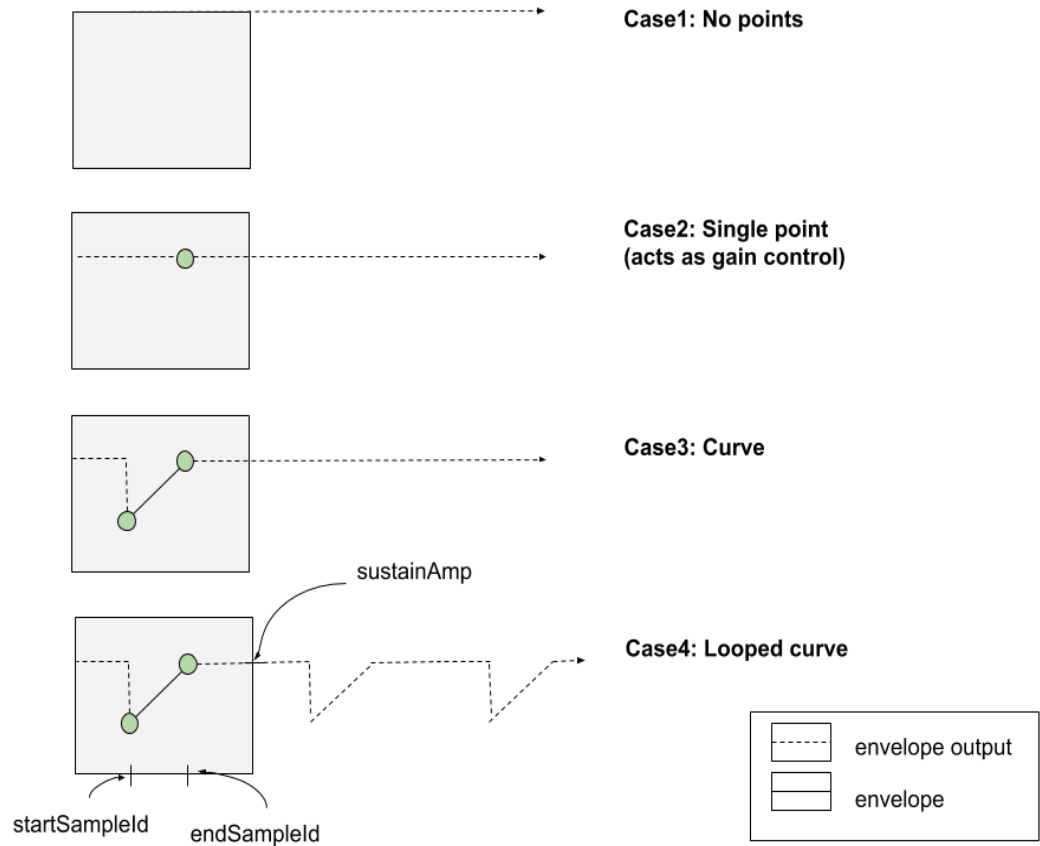
**`arr: Float32Array`**

user specified curve stored as `Float32Array` of sample rate length (assume 44100). Note that for the samples that do not have user specified y-value, default it to 0.

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<sup>1</sup>type number in JS refers to both `int` and `float`. Prefix indicate whether to cast to nearest integer.

The figure below shows all valid envelopes and their respective outcomes. Parameters of the envelope curve are annotated as well for brevity.



## Methods

### **set duration:number**

*duration* (in seconds) can be set by tweaking *playbackRate* audio param of ABSN.

$$\text{playbackRate} = 1 / \text{duration} \quad (1)$$

### **set loop:boolean**

*loop* setter wraps ABSN's *loop* audio param.