Mixing

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Getting a Mixing Parameter

// create a value of 0. or 1. from the value of x wrt edge:
float t = step( float edge, float x );

// create a value in the range 0. to 1. from the value of x wrt edge0 and edge1:
float t = smoothstep( float edge0, float edge1, float x );

Using that Mixing Parameter to Blend Two Quantities

// use the returned value from step() or smoothstep() to blend value0 to value1:
T out = mix( T value0, T value1, float t );

where T can be just about any type: float, vec2, vec3, vec4, ...

out = (1.-t) * value0 + t * value1

One would expect 0.0 ≤ t ≤ 1.0, but that doesn’t have to be true. After all, these are just numbers.

For a fun exercise with this, go back and change the morphing slider to go beyond 0.0-1.0.

As we will see later, there are really good uses for going beyond the range 0.0-1.0.

“SmoothPulse” in a Fragment Shader

in float vX, vY;
in vec3 vColor;
in float vLightIntensity;
uniform float uA;
uniform float uP;
uniform float uTol;
const vec3 WHITE = vec3( 1., 1., 1. );

void main() {
    float f = fract( uA*vX );
    float t = smoothstep( 0.5-uP-uTol, 0.5-uP+uTol, f )  - smoothstep( 0.5+uP-uTol, 0.5+uP+uTol, f );
    vec3 rgb = vLightIntensity * mix( WHITE, vColor, t );
    gl_FragColor = vec3( rgb, 1. );
}
Fun With One

Moral: There are many ways to turn \([0.0, 1.0]\) into \([0.0, 1.0]\).

Sidebar: Why Do These Two Curves Match So Closely?

The Taylor Series expansion of \(y = \sin\left(\frac{\pi}{2} x\right)\) around \(x = 0.5\) is:

\[
y = \left(\frac{1}{2} \cdot \frac{\pi}{4} \cdot \frac{\pi}{4}\right) + \left(\frac{\pi}{2} \cdot \frac{\pi}{16} \cdot x\right) + \left(\frac{\pi}{8} \cdot \frac{\pi}{8} \cdot x\right) - \left(\frac{\pi}{12} \cdot \frac{\pi}{12} \cdot x\right)
\]

which is pretty close to: \(y = 3x^2 - 2x^3\).

Cubic vs. Quintic

Both go from 0.0 to 1.0.
Both have initial and final slopes of 0.
The quintic has initial and final curvatures of 0.