Angular Interpolation - Working Notes

> These are my personal notes when I was working through a problem. They haven't been edited for understanding. However, the formulas are all useful.

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1. At $\theta = 90^\circ = \frac{\pi}{2}$ → r = 2;
2. At $\theta = 180^\circ = \pi$ → r = 1;
3. At $\theta = 0$ → r = 1;
4. At $\theta = 270^\circ = \frac{3\pi}{2}$ → r = 2;

$r = (|sin(\theta)| * 2) + (|cos(\theta)| * 1)$

If we say that $r_1 = 1$ and $r_2 = 2$ then…

$$r = |sin(\theta)r_2| + |cos(\theta)r_1|$$

- Note that the r2 and r1 can either be inside or outside the absolute value without changing the result.

Ok, so what if $\theta = 45^\circ = \frac{\pi}{4}$? That's x = 0.707, y = 0.707, huh I see.

…

Here are a few formula, we're plugging in theta = 45 degrees.

$$r = (1 - sin(\theta))r_1 + sin(\theta)_r 2 = 0.203 r_1 + 0.707 r_2 = 0.203 + 1.414 = 1.617$$

This is wrong, as the goal at 45 degrees should be equal values of r_1 and r_2.

$$r = |sin(\theta)r_2| + |cos(\theta)r_1| = 1.414 + 0.707 = 2.121$$

This is wrong, as it goes *over* r_2 which should be the maximum value of r.

$$r = r_1 \frac{\sin(\theta)}{\sin(\theta)+\cos(\theta)} + r_2 \frac{\cos(\theta)}{\cos(\theta)+\sin(\theta)} = r_1 0.5 + r_2 0.5 = 1.5$$

This feels far more correct as 45* equates to a ratio of 1/2 r_1 and 1/2 r_2. So I will consider this to be angular interpolation, which makes sense given sin and cos are complementary functions, and so they should be calculated as a fraction of their whole to normalize them.

ANGULAR INTERPOLATION IS GREAT!

Let’s test it at extrema?

Given the following shorthand,

$$sin'(\theta) = \frac{\sin(\theta)}{\sin(\theta)+\cos(\theta)}$$
$$cos'(\theta) = \frac{\cos(\theta)}{\sin(\theta)+\cos(\theta)}$$

$$given\ \theta = [45^\circ, 0^\circ, 90^\circ]$$
$$\sin'(\theta) = [0.5, 0, 1]$$
$$\cos'(\theta) = [0.5, 1, 0]$$

$$given\ \theta = [30^\circ, 60^\circ]$$
$$\sin'(\theta) = [0.36602, 0.63397]$$
$$\cos'(\theta) = [0.63397, 0.36602]$$

Ok, so those are interesting. You’d think since 60 is 2x 30, and together they equate to 1, that it would be the classic 0.333 and 0.666, but instead it’s just shy of that behavior at 0.633 and 0.366.
