



How pi makes a looping animation

When animating procedural textures, the wave texture provides us with the quickest way to animate that pattern in a loop, but it isn't very obvious how it does that.

Let's break it down in simple terms.

Wave Texture Node:

- In Blender, the Wave Texture node generates a repeating pattern that resembles waves, bands, or rings.
- You can adjust various parameters to control the appearance of this texture.

Seamless Looping:

- When creating animations, we often want them to loop seamlessly without any visible jumps or interruptions.
- Achieving this seamless loop with the Wave Texture node involves understanding a few key concepts.

The Role of Pi (π):

- Pi (π) is a mathematical constant approximately equal to 3.14159.
- It's related to the periodicity of trigonometric functions like sine and cosine.

Sine Waves and Periodicity:

- The sine function repeats itself in a 2π interval. This means that its values repeat every full circle (360 degrees or 2π radians).
- When you set the scale or frequency of the Wave Texture node, you're essentially adjusting how many waves fit within a given space.

Perfect Looping with Pi:

- To achieve a seamless loop, we need the texture to repeat exactly at the end of the animation cycle.
- The magic number for this is $\pi/5$ (approximately 0.628).
- When you set the scale to $\pi/5$, the texture will complete exactly one wave within the 0 to 1 coordinate range.

Multiples of $\pi/5$:

- For even smoother loops, you can use multiples of $\pi/5$ (e.g., $2\pi/5$, $3\pi/5$, etc.).
- These values ensure that the texture seamlessly wraps around without any visible seams.

Putting It All Together:

- When you set the scale to $\pi/5$ or its multiples, the texture coordinates map neatly to the texture's repeating pattern.
- As the animation progresses, the texture smoothly transitions from one cycle to the next, creating a seamless loop.
- Remember, this is a simplified explanation, but I hope it helps demystify how π plays a crucial role in achieving those perfect loops!

Practical application

On a plane, apply this node setup.

Bring your timeline to frame 0, In the Phase Offset start at zero and add a keyframe. Then go to the end of your timeline (I would add 120 frames). Then in the Phase Offset type in " $6*\pi$ " and insert another keyframe. Now watch how the loop goes on and on! If you want to speed up or slow down the animation you can use a smaller even number or add more keyframes.

