

In need of Fractional Brownian Noise (FBM) vs Perlin Noise clarification

Asked 9 years, 5 months ago Modified 3 months ago Viewed 15k times



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I'm researching the various types of noise for terrain generation and I'm a little confused regarding when noise becomes perlin noise and when perlin noise becomes fbm. I'm hoping somebody could clarify anywhere that I'm going wrong. I currently assume the following

Noise: Contains a both amplitude and frequency which dictates the final value in conjunction with some form of interpolation such as linear, cosine or cubic.

Perlin Noise: A sum of octave noise functions(each successive function contains twice the frequency). From what I've read so far the amplitude always seems to be presented as a consistent reduction. For example, Noise1 contains A of 1, Noise2 contains A of 0.5, Noise3 contains A of 0.25 meaning that here amplitude halves each time. Must this it always be consistent like this?

FBM: The sum of multiple perlin Noise functions where each Perlin Noise function MUST contain only octaves with decreasing amplitudes.

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edited Jun 8, 2013 at 12:32

asked Jun 8, 2013 at 12:26



[user2211776](#)

229 1 2 11

another trick that looks great but kind of blurs the definitional boundaries is iq's analytical derivative jig:
iquilezles.org/www/articles/morenoise/morenoise.htm – user755921 Jul 12, 2014 at 16:56

2 Answers

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Perlin Noise is actually a method to calculate what you call Noise. It is a form of coherent noise computed as the interpolated normalized gradients of a pseudo-random underlying function (or pseudo-randomly generated gradients). The frequency controls the "sampling" distance of the gradients, so the higher the frequency, the smaller the sampling distance, and more gradients per unit of space. Amplitude controls the max and min values of the noise function.

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 Noise is a general term. Perlin Noise is only a type of coherent noise. But there is many different types with different characteristics.

[Fractional Brownian motion](#) is, in fact, what you call Perlin Noise. It is a combination of multiple steps of Perlin Noise (or another similar noise function), each with a different frequency and amplitude. In the context of procedural generation, the variation in frequency from a step to the next is called lacunarity. The variation in amplitude from a step to the next is called gain.

Look at [this](#). This project on terrain generation gives a very good description of what fBm is and how it is computed.

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edited Jul 24 at 9:44





spamove
211 1 9

answered Jun 8, 2013 at 13:31



Mario Guerra
406 4 3

- 1 You can also find good information about noise in general here: scratchapixel.com/lessons/3d-advanced-lessons/noise-part-1 – user18490 Jun 11, 2013 at 15:57 
- 3 Hugo Elias' page is confused, what he speaks about is called value noise, not Perlin noise. They are different approach and quality. Practically speaking value noise is a cheap alternative of Perlin noise. en.wikipedia.org/wiki/Value_noise – plasmacel Mar 21, 2014 at 20:39 
- 1 [Perlin Noise FAQ Mirror](#) – Bryce Guinta Dec 31, 2015 at 4:26



perlin noise uses slopes to create round bubbly looking correlations for a more natural look.

0



the octaves method combined noise at various scales to generate more complex forms. apparently, this technique is the thing that is called "fractal brownian motion". ive never heard this before but i did some research and this is what im getting.



you can use octaves with any kind of noise and scale them however you want in both frequency and amplitude. the halving thing is done for mathematical reasons to remove certain artifacts from the results.

but this octaves thing is a technique independent to perlin noise. they work well together, so they are used together.

white noise octaves aka white noise fBm is called value noise. it has a tendency to reveal the underlying grid, so perlin noise is often used instead.

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answered May 24, 2019 at 21:30



Bad Radish
71 2

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