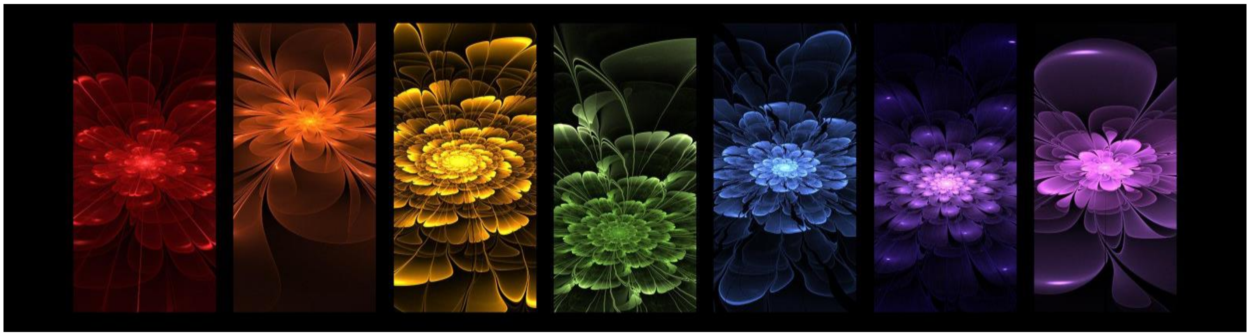
Fractals



Fractals are a never ending pattern that repeats itself to infinity.
This is called "Self-Similarity."
Fractals are highly complex, sometimes infinitely complicated
this means you can zoom in and find the same shapes forever.
Fractals are although very easy to make.
A fractal is made by repeating a simple pattern over and over again.

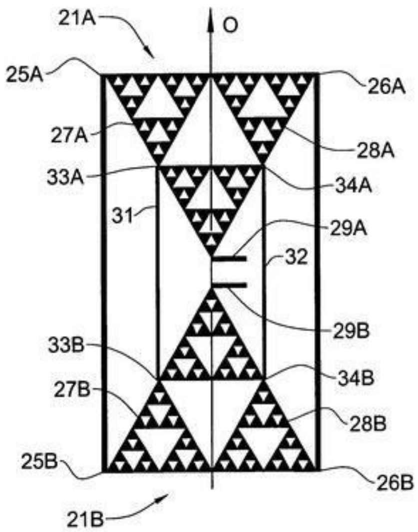
Where are fractals seen in nature?

Fractals are found all over nature, ranging from small to large. We often find the same patterns again and again, from the tiny branching of our blood vessels and neurons to the branching of trees, lightning bolts, and river networks. Although size does not matter, these patterns are all formed by repeating a simple branching process.
A fractal is a picture that tells the story of the process that created it.

Oak tree, formed by a sprout branching, and then each of the branches branching again, etc.
Scale = 30 m = 3*101 m.

History

In 1975, mathematician Benoit Mandelbrot coined the term "fractal" in the first published paper on fractal geometry. Despite some resistance from the mathematical community, it was soon discovered that fractal geometry is unparalleled at measuring and modeling the world of natural phenomena.

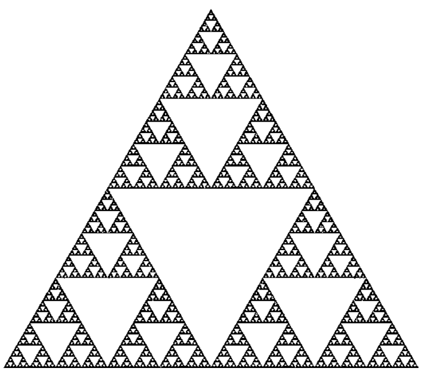


How is a fractal calculated?

Here is a very simplified explanation of how a fractal is actually generated.

Each point on the screen is assigned a pair of values, such as (1, 2), giving its horizontal and vertical position. This pair of numbers is fed into an equation and the resulting pair of numbers, such as (7.235, 4.001) is fed back into the same equation. This process is repeated many times.

How does this create an image? The answer is that the size of the final value, after say 200 iterations, is used to select a color for the dot at that point on the screen. This process is repeated for every point on the screen.



Fractals in real world applications

Although Fractals can be highly complicated, fractals do have a lot of uses in real life applications. First, we start with art. The image created by a fractal is complex yet striking, and has intrigued artists for a long time already. In fact, fractal art is considered to be true art. Artists such as Jackson Pollock and Max Ernst, has used fractal patterns to create seemingly chaotic yet defined forms. Even in African art and architecture fractal shapes and images are prevalent. In addition, some artists are inspired by fractal images when creating their own art forms. Not only that: fractal images are actually being used nowadays to create special effects. Utilized in shows such as Star Trek and Star Wars, fractals are used to create landscapes that are otherwise impossible with conventional technology. On a related note, fractals are also used in creating some computer graphics.

Fractal patterns can also be found in commercially available antennas, produced for applications such as cell phones and Wi-Fi systems by companies such as Fractenna in the US and Fractus in Europe. The self-similar structure of fractal antennas gives them the ability to receive and transmit over a range of frequencies, allowing powerful antennas to be made more compact.

__Sources__

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