Modeling

CS116B

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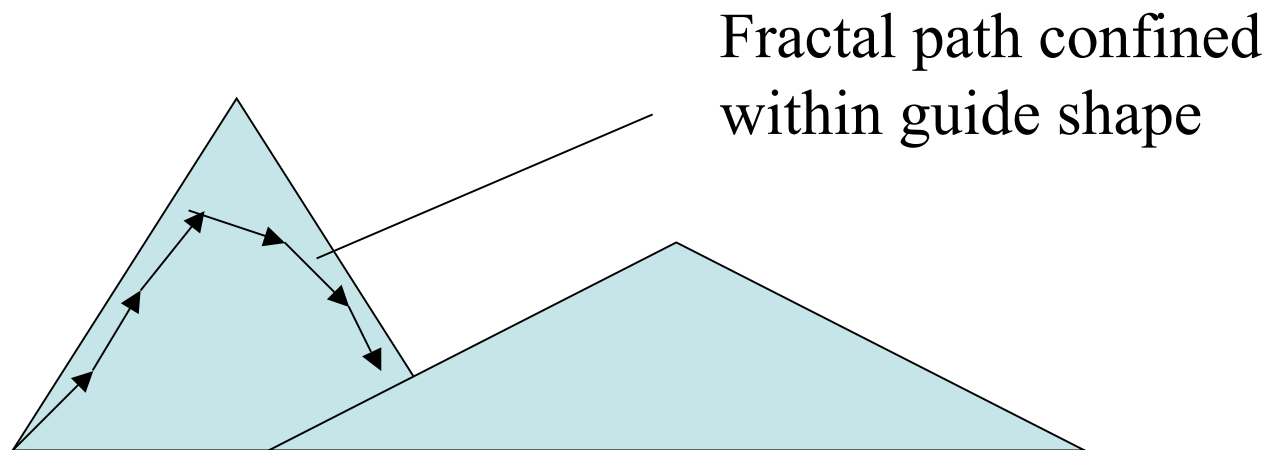
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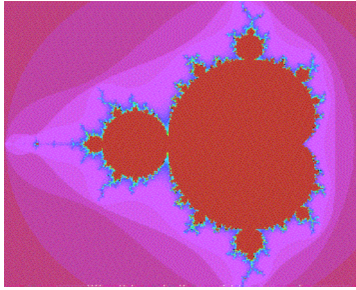
Outline

- Terrain Topography
- Self Squaring Fractals
- Self Inverse Fractals
- Shape Grammars

Terrain Topography

- One way to control the placement of peaks and valleys in a fractal-terrain is to constrain the midpoint displacement method with control surfaces.

Fractal path confined within guide shape

Self Squaring Fractals

- Another way to make fractals is to start with some quadratic function. For example, $f(z)=a*z(1-z)$ or $g(z)=a*z(1+z)$. To check if a point z_0 is in the fractal, one checks if sequence of iterations of the function beginning with z_0 converges to zero. Color points by how fast converges/diverges.

- Mandelbrot set takes $f(z) = z*z+z$. Compute sequence $z_0=z$, $z_1= z_0 * z_0 + z_0$, $z_2 = z_1 * z_1 + z_1$.

- Notice $z*z$, $|z*z| > |z|$ where $|z| >1$ and $|z*z| <|z|$ when $|z| < 0$ and equal when $|z|=1$. So would expect some values where converges.
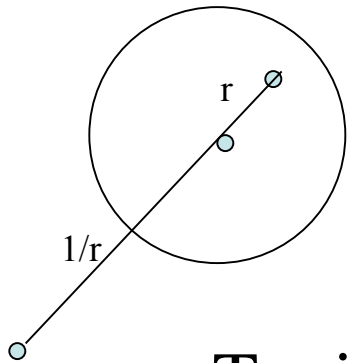
Self Inverse Fractals

- To invert a point through a circle: take the distance of the point to center of circle. Invert this number multiply it by the radius of the circle and plot a point on this same line through the center of the circle at this distance.

- This operation maps circles to circle.

- To get a fractal, can pick different reference circles and do repeated inversions through these circles.
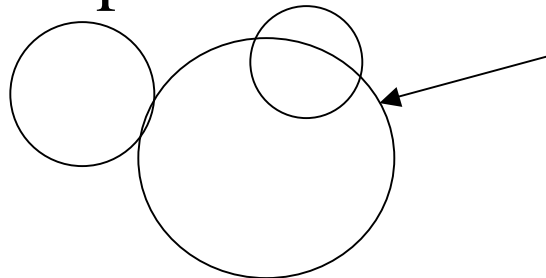
For example, could use these three circles as reference circles

Shape Grammars

- Shape grammars are sets of production rules that are to be applied to an initial object to add layers of detail. This detain is supposed to be harmonious with the shape of the original object.

This rule illustrates a triangle going to one of two possible patterns
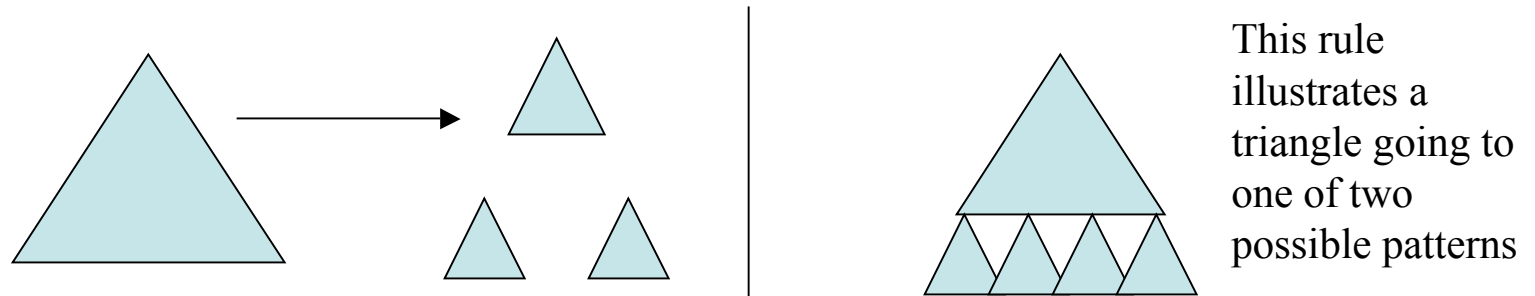
- Example, might start with a cylinder modeling a lamp shade and use this technique to generate a pattern of triangles on it.