Procedural Modeling

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Procedural Modeling

• Apply algorithms for producing objects and scenes
• The rules may either be embedded into the algorithm, configurable by parameters, or externally provided
Procedural Modeling

- Fractals
- Terrains
- Image-synthesis
  - Perlin Noise
  - Clouds
- Plants
- Cities
- And procedures in general...
Fractals

- Consider a simple line fractal
- Split a line segment, randomize the height of the midpoint by some number in the \([-r, r]\) range
- Repeat and randomize by \([-r/2, r/2]\)
- Continue until a desired number of steps, randomizing by half as much each step
Fractals and Terrains

- A similar process can be applied to squares in the xz plane
  - At each step, an xz square is subdivided into 4 squares, and the y component of each new point is randomized
  - By repeating this process recursively, we can generate a mountain landscape
Terrains

• A similar process can be applied to squares in the xz plane
  – At each step, an xz square is subdivided into 4 squares, and the y component of each new point is randomized
  – By repeating this process recursively, we can generate a mountain landscape
Image Synthesis

• Procedurally generate an image (pixels)
Perlin Noise

• Procedurally generate noise
  – http://js1k.com/demo/543
Plant Modeling

• The Algorithmic Beauty of Plants
City Modeling

• Procedural Modeling of Cities