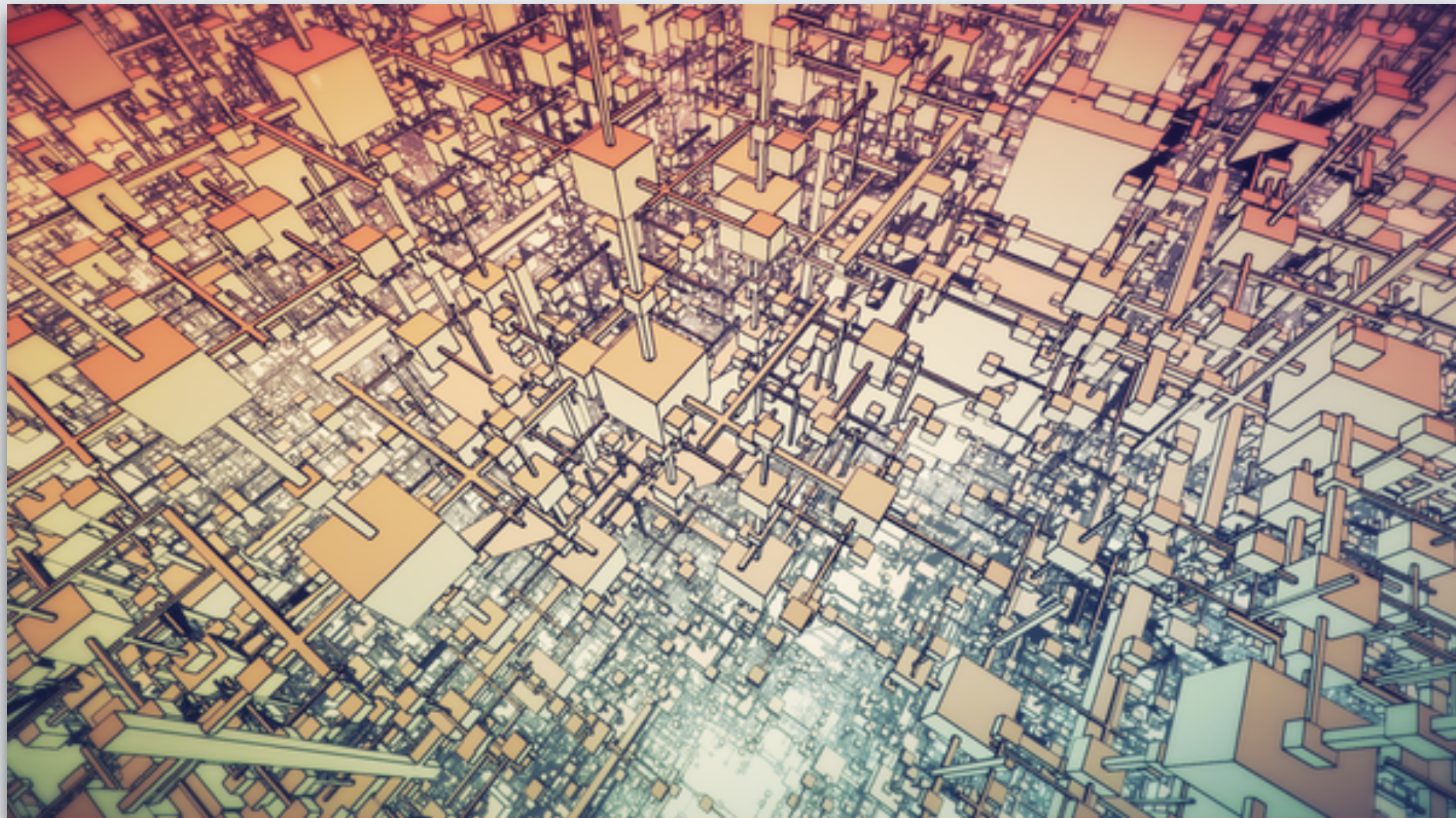


PROCEDURAL GRAPHICS

“how to paint with math”



(source)

University of Pennsylvania - CIS 700 Procedural Graphics
Rachel Hwang

STRUCTURE IS EVERYWHERE



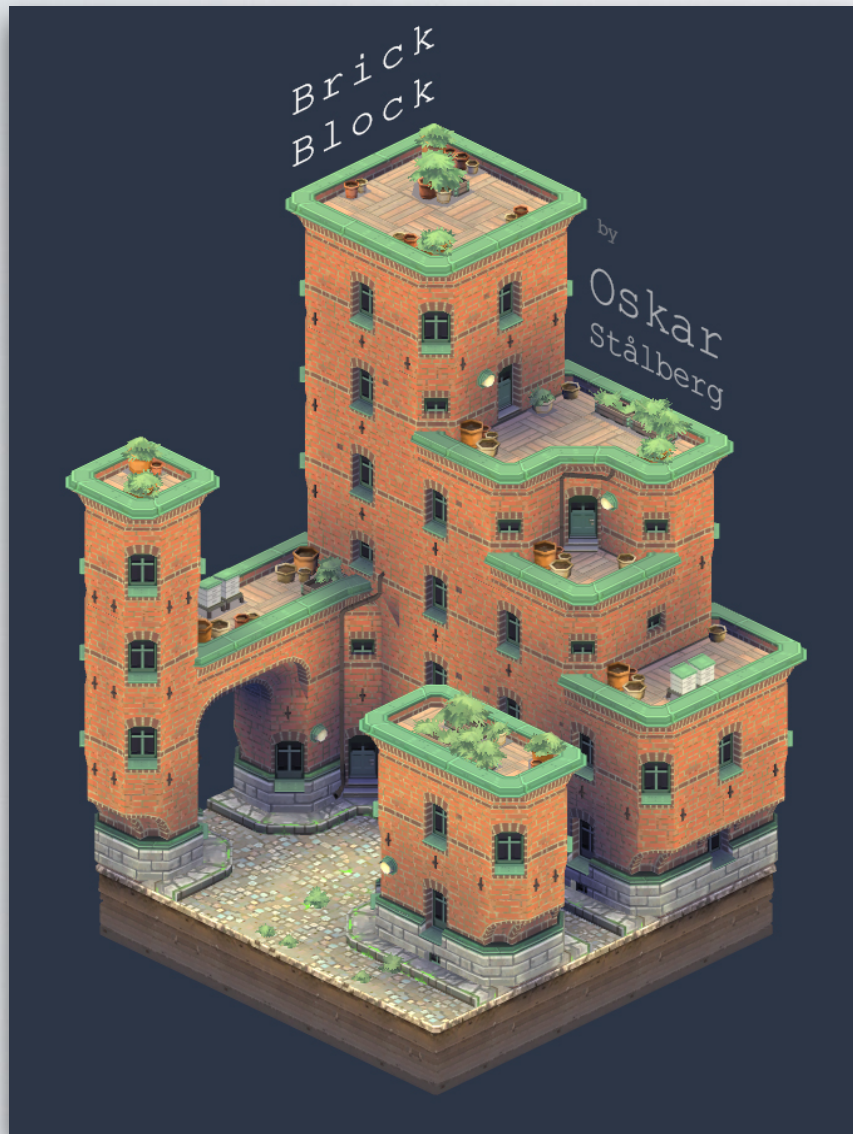
WHAT IS PROCEDURALISM?

- Finding a “recipe” to describe and synthesize content
- Creation via algorithms, not manual specification
- Slippery definition in computational work



Light it Up — Method Studios ([source](#))

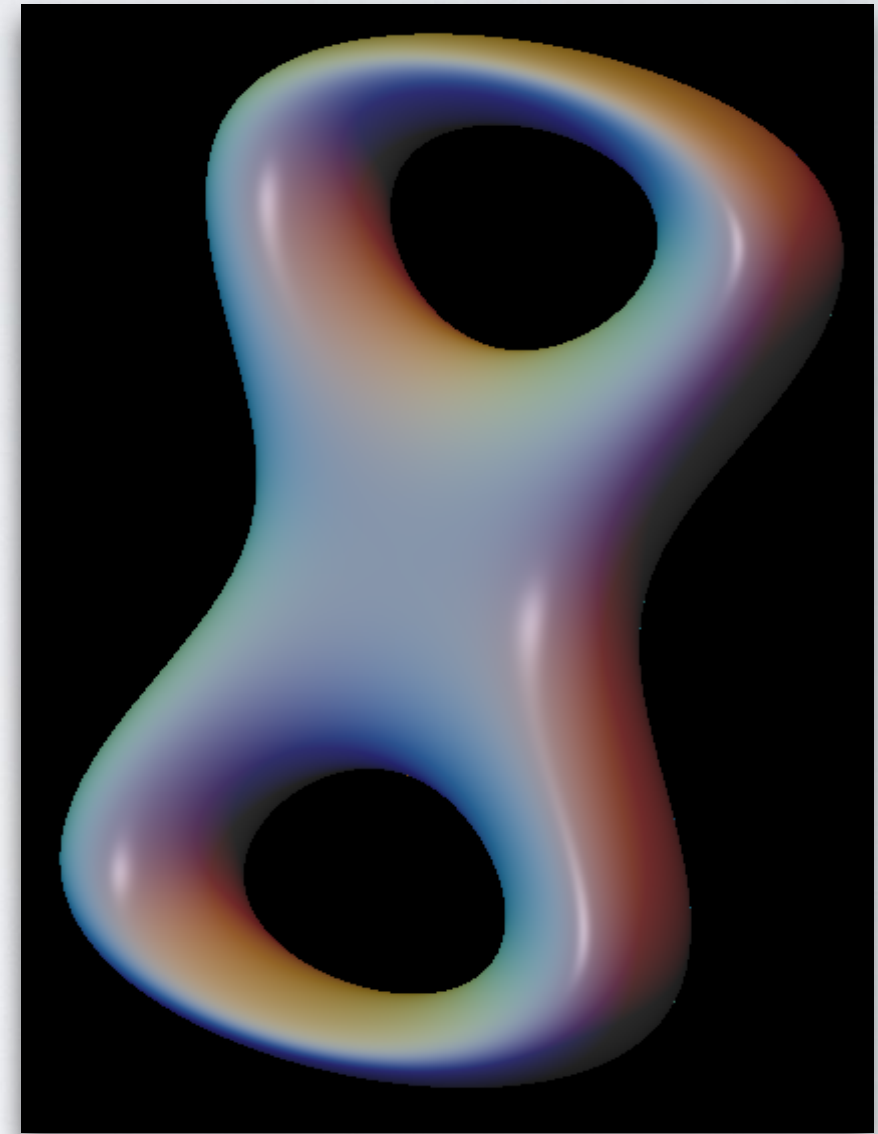
TYPES OF PROCEDURES



Oskar Stalberg ([source](#))

EXPLICIT

Directly generate points of a shape



virtual math museum ([source](#))

IMPLICIT

Answer queries about a specific points

PROS

- Extremely compact
 - Textures: kilobytes vs megabytes
- No fixed resolution/size
 - Continuous functions can be sampled at any frequency, applied to any size domain
- Can be parameterized.
 - Specify a whole class of related models/textures
 - Go infinite!

CONS

- Implementation Time
 - No bugs in images!
- Difficult to control
 - Surprising results can be a pro or a con
- Evaluation Time
 - Classic time vs. space tradeoff.
- Potential Aliasing issues

FOR INSTANCE...



Monolith - ASD | Assembly 2015 ([source](#))

COURSE GOALS

- Learn a toolkit of helpful procedural techniques
 - Understand the underlying theory
 - Develop intuitions about how to apply and parameterize
- Get familiar with new mediums/technology for procedural artwork
 - three.js / javascript
 - Houdini
- Start/continue developing a portfolio of visually and technically impressive work
- Practice approaching relatively unstructured, open-ended problems

COURSE STRUCTURE

- Website: <https://cis700-procedural-graphics.github.io/>
- Once a week: 50% lecture, 50% related in-class exercises
- 100% project based
 - 50% hw
 - 30% final project
 - 20% in class assignments (submissions open till midnight)
- Grading criteria
 - Conceptual mastery
 - Engineering effort / code organization
 - Visual output / creative application

SCHEDULE

- Week 1: Noise
- Week 2: Toolbox methods
- Week 3: L-Systems
- Week 4: L-Systems Extended
- Week 5: Color
- Week 6: Implicit Surfaces
- Week 7: Intro to Dynamics
- Week 8: Procedural Textures
- Week 9: Intro to Crowd Sim
- Week 10: Artificial Life
- Week 11: Intro to ShaderToy
- Week 12: Special Topics
- Week 13: Special Topics
- Week 14: Final Project