Parametric Design
Jim Whitehead
What is parametric design?

- An approach to the design of 3D (and 2D) objects where one or more aspects of the object are the output of a computational process.

- Key elements of these processes include:
  - Explicit modeling of constraints
    - Ex: the length of the roof is the same as the length of the house
  - Use of systems of equations to determine shape properties
    - Ex: use of a continuous curve equation to define the exterior of a building

Mafoombey
Martti Kalliala
Esa Ruskeepaa, 2005
Social framing of parametric design

- Parametric design has emerged primarily within building architecture
  - Strong inspiration from airplane designers, who were among the first to use computer aided techniques to design object shapes (wings)
  - However, used now by designers and artists in a wide range of fields
    - Fabric design, household object design, artists, etc.
  - Not well known or employed by other branches of generative methods

myThread Pavilion
Jenny Sabin
2012
www.coolhunting.com/design/nike-mythread-pavilion.php
Techniques for parametric design

- Parametric design tends to be performed in two ways
  - Fully custom solutions
    - Software systems created for a specific design task
  - Visual dataflow languages
    - A visual language for creating and manipulating shapes via flows of data
    - Examples: Grasshopper, Generative Components

- Tradeoffs
  - Custom
    - Pro: wide expressive range, high scale ceiling
    - Con: expensive, time consuming, doesn’t integrate well with existing pipelines
  - Visual dataflow
    - Pro: fast to start, easy to manipulate, good for rapid prototyping and exploration
    - Con: narrower expressive range, complex programs hard to understand and maintain, computation can be slower
Here are links to parametric design that employs a fully custom approach:

- **Bathsheba** – procedural jewelry
- **MLK Jr. Park Stone Vault** – example of procedural vaulted ceiling generation
Parametric Design projects

- Some projects in the style of generative design
- Technicolor Bloom
  - http://www.technicolorbloom.com/project.html
- myThread Pavilion
  - http://jennysabin.com/?p=684
  - https://www.youtube.com/watch?v=JW683T3Pku0&feature=youtu.be
- Digital Origami
History Links

- **www.parametricdesign.net**
  - Blog about parametric design, has academic focus (many workshop reports)

- **History**
    - The Control of Shape: Origins of Parametric Design in Architecture in Xenakis, Gehry and Grimshaw
      - Rodrigo Garcia Alvarado, Jaime Jofre Munoz
  - [http://www.aiacc.org/2012/06/25/parametric-design-a-brief-history/](http://www.aiacc.org/2012/06/25/parametric-design-a-brief-history/)