Guiding and Grading Mathematical Art

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Course Details

- Queens College
  - Urban Commuter Campus
  - Diverse Student Population
- Math with Mathematica
  - First course in computing
  - Varied math, programming levels
  - Satisfies writing requirement

Teaching Philosophy

- Give students the tools to succeed
  - Stand-alone tutorials
  - Comprehension Questions
  - How to: Documentation Center
  - One-on-one help
- Make learning active
  - Goal oriented: Projects
  - Inspires creativity
  - Each gains unique knowledge

Projects

1. Tutorial for a math class (4 weeks)
   - Learn specialized commands
   - Basic Mathematica concepts
   - Instills collaborative spirit
2. Piece of Mathematical Art (4 + 1.5 weeks)
3. Design an Interactive Interface (5 weeks)

Mathematical Art Project

- Goals
  - 3D Printing Process
  - 3D Design in Mathematica
  - Creativity in Mathematics
  - Interdisciplinarity
- Deliverables
  - Artwork
  - Mathematica notebook
  - Four-page writeup

Guiding: Framework

- Mathematical basis
- Techniques: 3D modeling, functional
- Artistic considerations taken into account
  - Visit by Matt Greco, QC Art Department
- Commensurate with math, programming levels
- Critiqued, refined, revised multiple times
- Timeline to stay on track

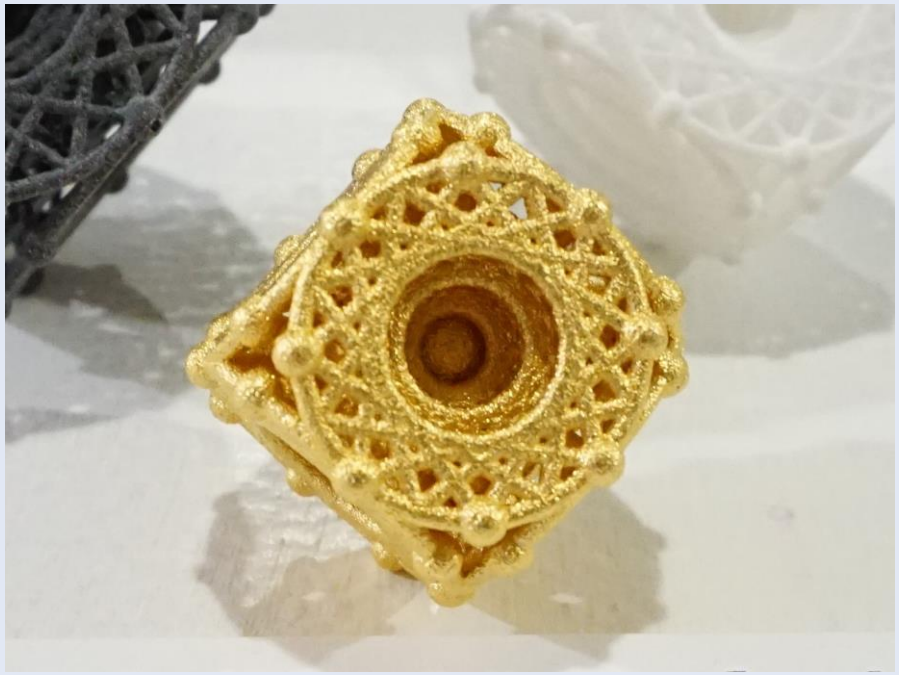
Guiding: Tutorials

- 2D Graphics (reminder of 2D coords)
- 3D Graphics (thinking in 3D coords)
- 3D Design (making printable, ↝STL)
- MeshRegions (more advanced capabilities)

Minimal Working Examples

- 4 weeks to prototype, 1 week for revision

How to grade this?



Different answers for different people!

Grading Scheme

Artwork (30%)

- Intrigue
- Mathiness
- Computational Techniques

Writeup (45%)

- Artistic Qualities
- Math, Programming Discussion
- Revision Process

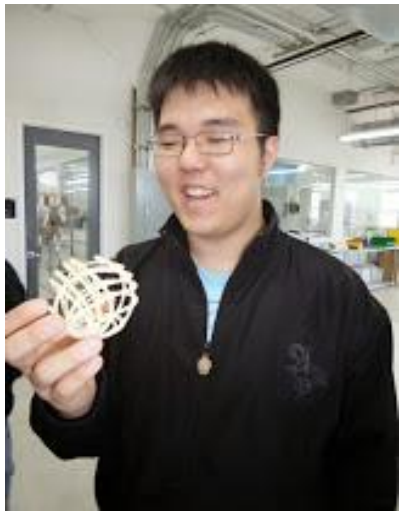
Organization (25%)

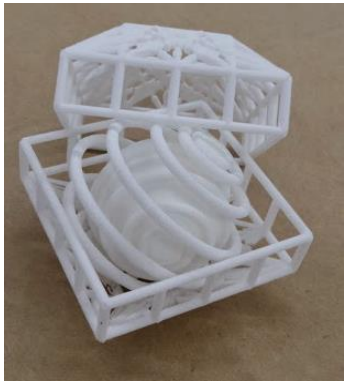
- Timeliness
- Name and Description
- Worksheet Organization
- Writeup Style

Grading (is also Guiding)

- Transparency
- Give weight to what I value.
  - Skill Development
  - Intentionality
  - Creative Process
  - Revision Process
  - Thoughtfulness
  - Aesthetics
  - Student responsibility

Success!





Trip to Shapeways
April 29, 2015

Student Comments

- **"This project allowed me to let my imagination soar while still learning about math concepts and modeling."**
- **"The art project was challenging but still managed to be fun … extremely satisfied when the object came to life."**
- **"I learned how to think in three dimensions."**
- **"Having a physical copy of the project was one of the greatest things ever."**
- **"I like the creative freedom that we given to complete this project."**
- **"The trip was very informative and was also very fun to attend. Thanks again Professor."**

Difficulties

- 3D Design in Mathematica is finicky
- 3D Printing is finicky
  - Printability
  - Build in lots of time!

Future

- Standards-based Grading Scheme
- More tutorials about three-dimensional mathematics

Thank YOU!

- Shapeways and Lauren Slowik!
- My students, who amaze and inspire EVERY TIME!

qc.edu/~chanusa

> Courses
Course Materials

> Research > 3D Design
3D Design in Mathematica

> Research > Talks
Slides Available

> Portfolio
Mathematical Art Gallery

hanusadesign.com
Mathematical Jewelry