99-353 SolidWorks and Laser Cutting

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1.0 Units / 4 days (Micro course)

http://www.cs.cmu.edu/afs/cs/academic/class/99353-f16

Goals For This Course

At the conclusion of this course, you will know:

1. How to design objects using SolidWorks.
2. How to safely operate a laser cutter.
3. How to work with a variety of materials (wood, acrylic, paper, cardboard).
4. How to incorporate mechanical elements into your design (screws, nuts, standoffs, etc.)

Communication

- The syllabus and all assignments are posted on the course web page.
- We will use **Piazza** for announcements, question answering, and discussions.
- If you have questions about an assignment, SolidWorks, etc., **use Piazza** instead of email.
  - Other students may have the same question.
  - Fellow students may be able to answer your question more quickly than the instructor or TA.

Hand-Ins

- Each assignment specifies what to hand in and when it is due.

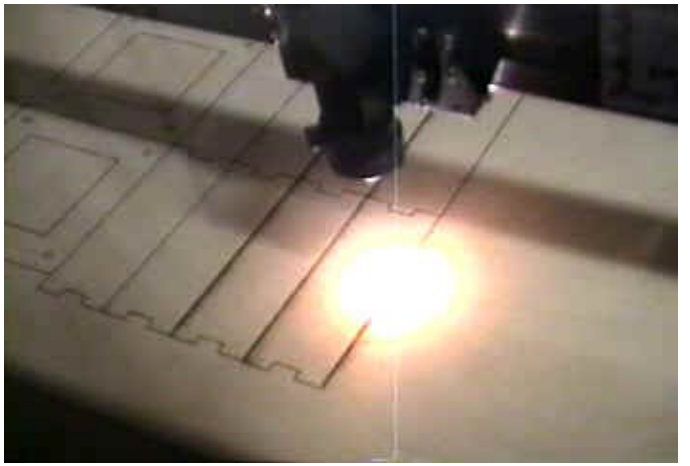
- We will use **AutoLab** to:
  - Accept hand-ins
  - Provide feedback on assignments
  - Record grades

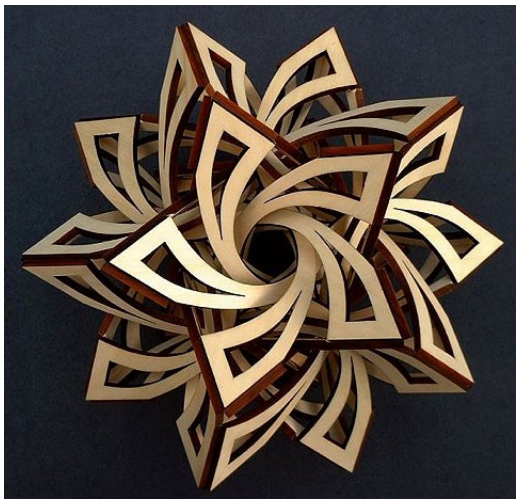
Rapid Prototyping Fabrication Technologies

- Computer-controlled
- Requires little skill to operate the machinery
- Generally safe to use
- May have limitations as to materials or production capacity.
- But may also offer new capabilities not previously available.

Laser cutter / Water jet

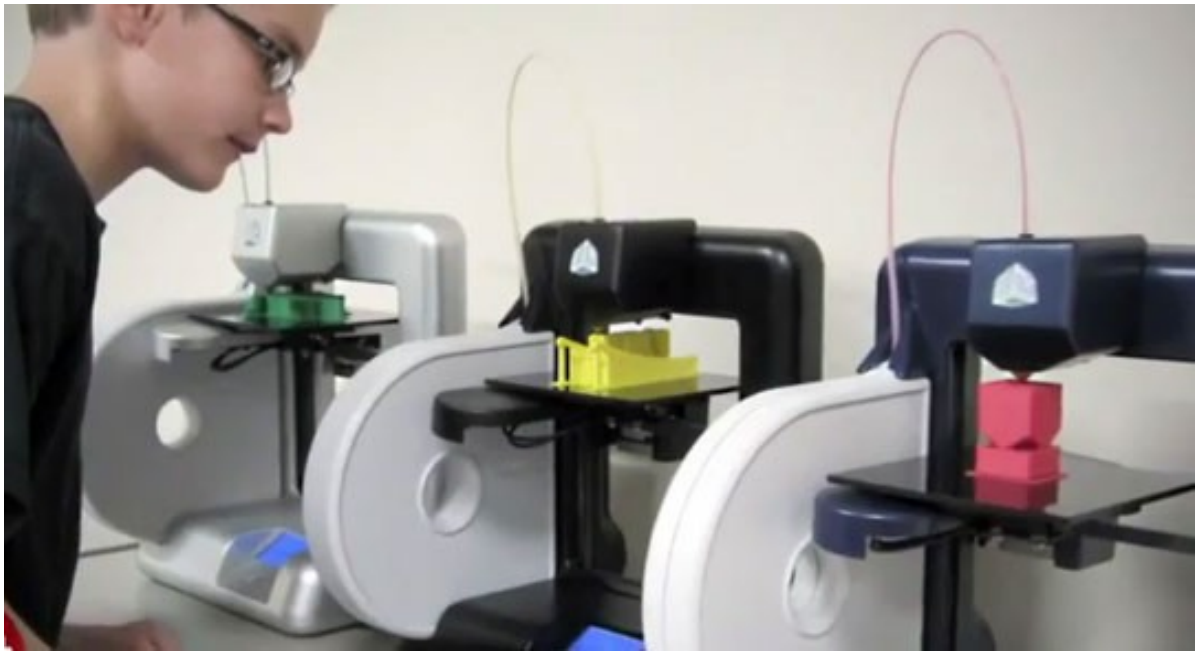
- ✓ Fast
- ✓ Precise
- ✓ Cheap
- ✓ Wide choice of materials
- X Parts are only 2D (but assemblies can be 3D) →





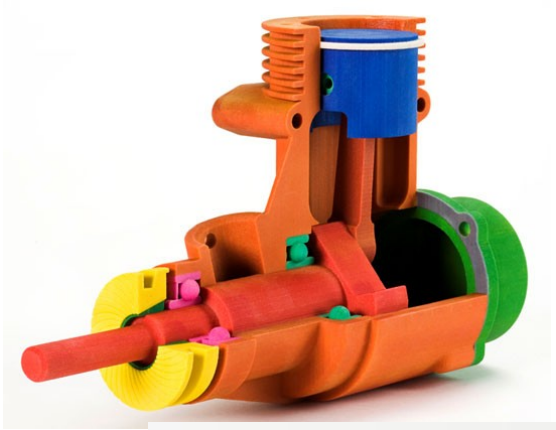
Cheap 3D Printing

- X Slow
- X Less precise
- X More expensive
- X Limited materials
- X Support material may be required
- ✓ Complex 3D structures!



High End 3D Printing

- ✓ Precise
- ✓ Multicolor
- ✓ Complex materials
- X Slow
- X Expensive



What Is Maker Culture?

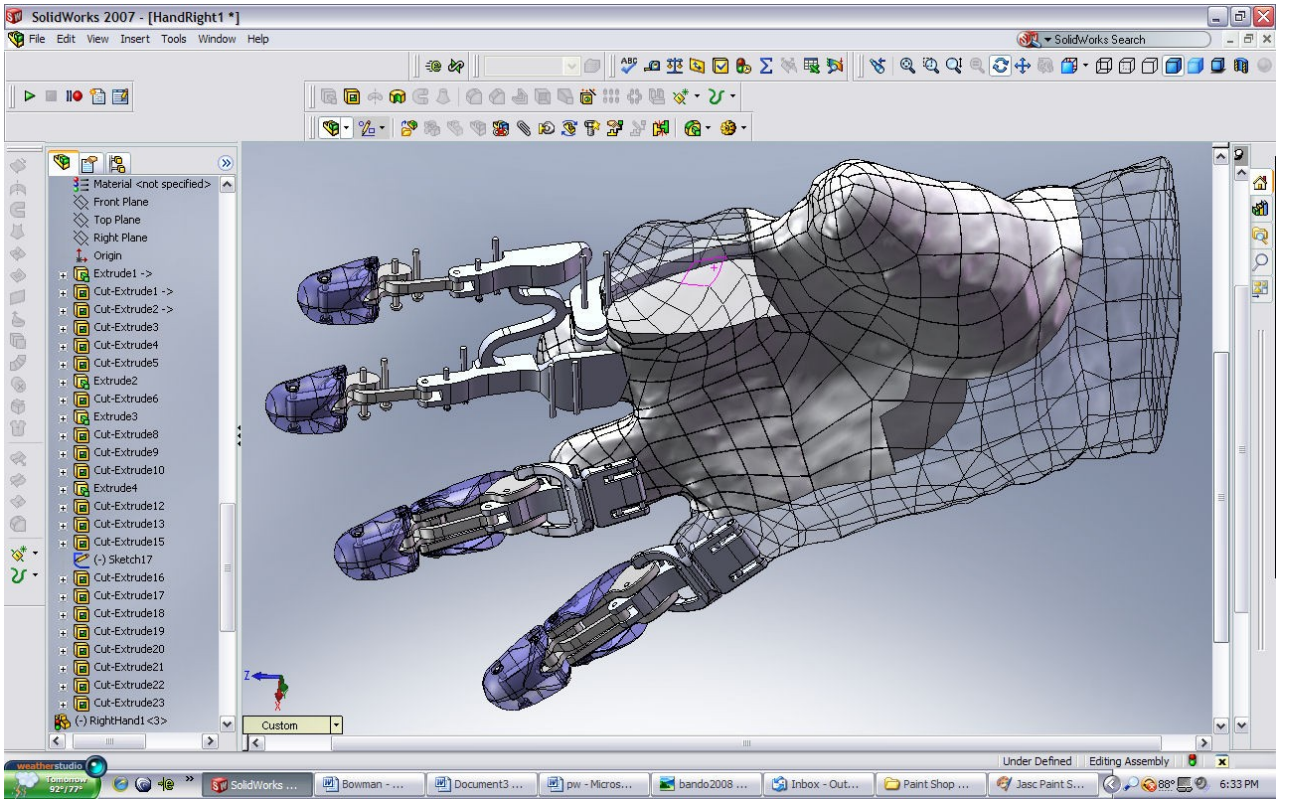
- “Do it yourself” meets high technology and open source movements.
- The high tech part:
  - CAD software
  - Laser cutters, 3D printing, Arduinos, etc.
- Why is this good?
  - Rapid prototyping: hold your ideas in your hand!
  - Extreme customization / personalization
  - New modes of artistic expression

Maker Culture Around Us

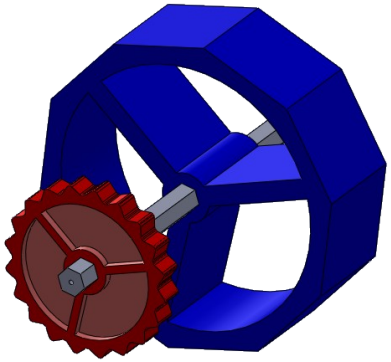
- Make Magazine
  - Makezine.com
- Hacker spaces; TechShop
- LaserSaur: open source laser cutter
- Reprap and open source 3D printers
- Thingiverse & similar sites: marketplaces for 3D models (many are free)

CAD Tools

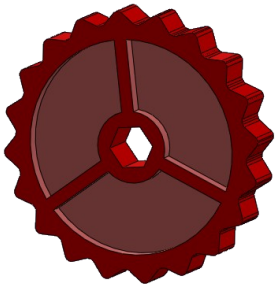
- The big two:
  - AutoCad from AutoDesk
  - SolidWorks from Dassault Systemes
- Alibre/Invent
- Sketchup
- Blender
- CorelDraw, Inkscape, Rhino
- Sketch It Make It (developed at CMU)
- Many more...



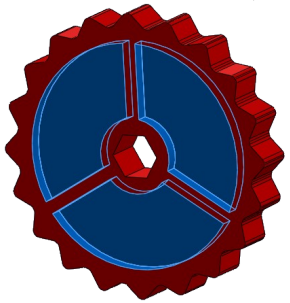
A Quick Look at SolidWorks



Assembly (SLDASM file)

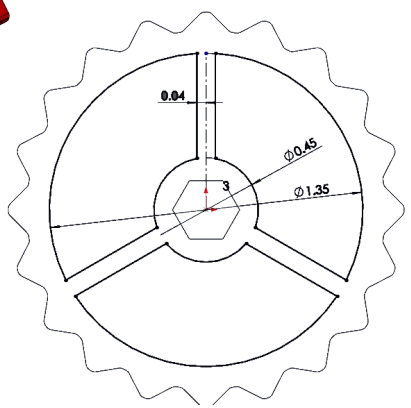


Part... (SLDPRT file)

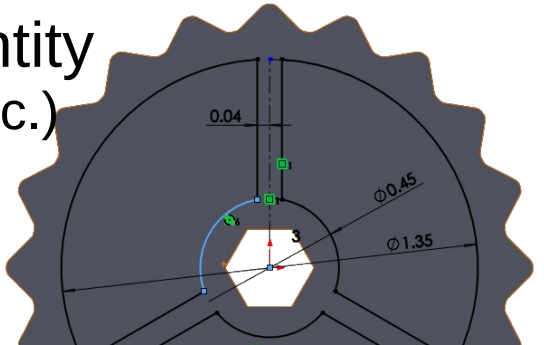


Feature...

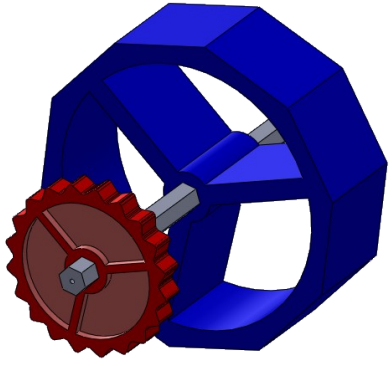
Sketch



Sketch Entity
(line, arc, etc.)

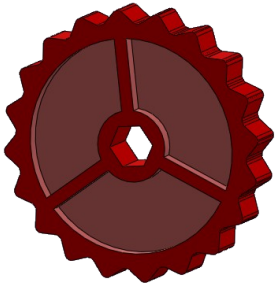


A Little More Detail



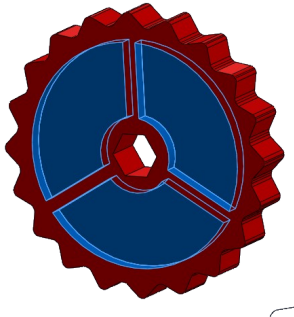
Assembly (SLDASM file)

- Mates
- Reference Geometry
- Subassembly...

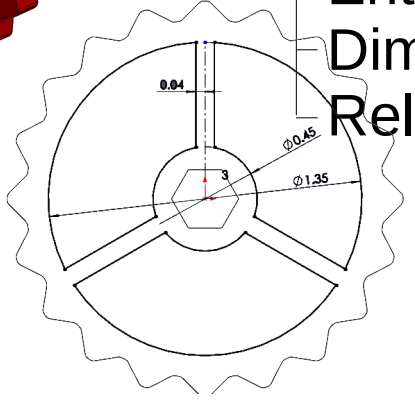


Part... (SLDPRT file)

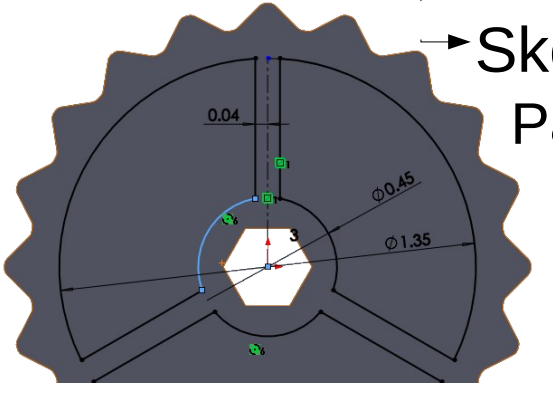
- Reference Geometry
- Feature...



- Sketch
  - Entities
  - Dimensions
  - Relations



→ Sketch Entity Parameters...



How To Learn SolidWorks

1. We'll teach you, starting now. The scripts are linked from the class syllabus.

2. SolidWorks has good built-in tutorials; click on the little “house” icon (Resources) on the right side of the screen, and select Tutorials (mortar board icon).

3. Lynda.com offers excellent quality video tutorials; see the link from our course home page.

4. Thousands of random YouTube videos, including specialized topics such as how to make involute gears.