

99-353 SolidWorks and Laser Cutting

Instructor:
Susan Finger
Dave Touretzky

TAs:
Chelsea Chen
Penelope Ackerman

1.0 Units / 4 days (Micro course)

<http://courses.ideate.cmu.edu>

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.

Assignments

- During each class meeting, you will generate a SolidWorks file to cut on the laser cutter. You will send the file and a picture of your part to:
laser-micro@ideate.cmu.edu
- You get to keep the parts
- The final assignment is a part of your own choosing

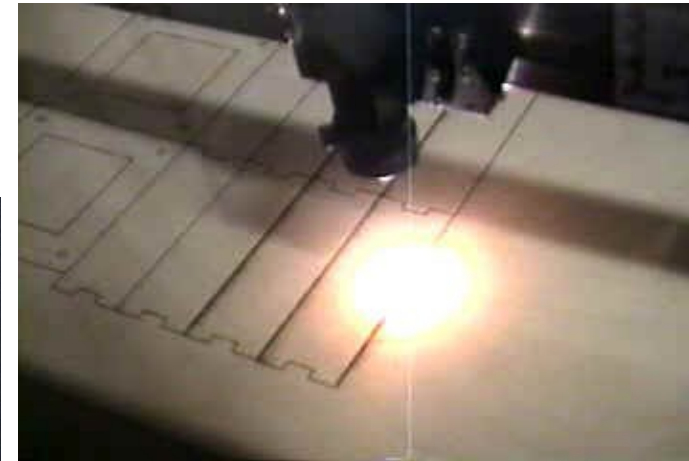
Rapid Prototyping Fabrication Technologies

- 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

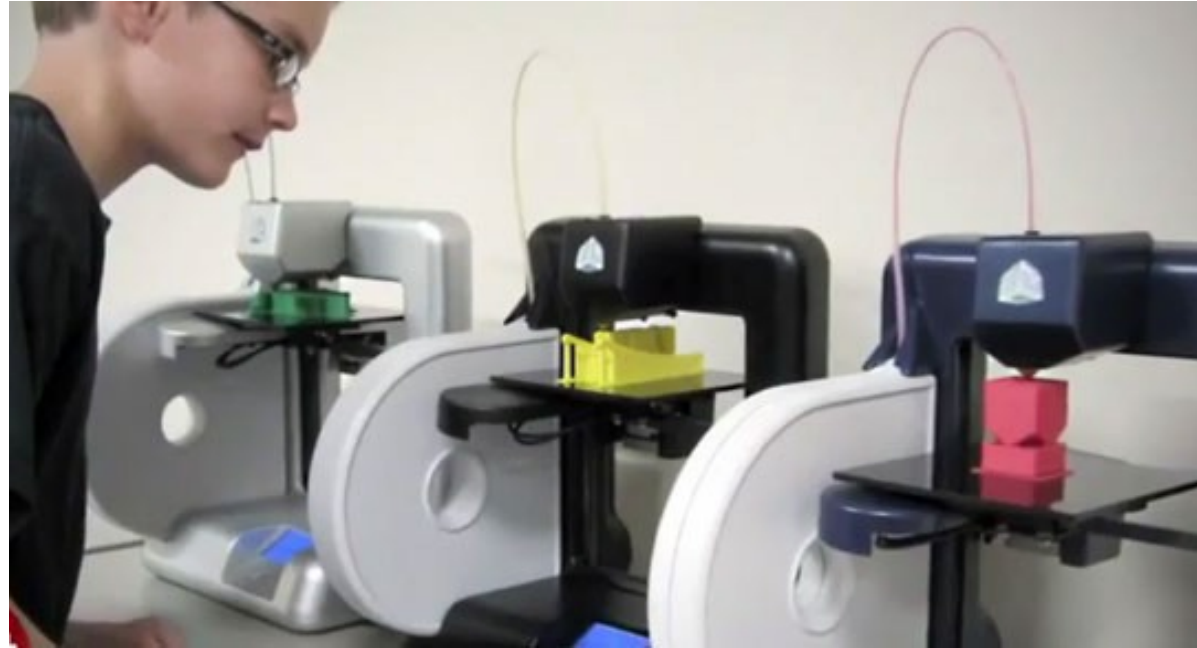
- ❓ Fast
- ❓ Precise
- ❓ Cheap
- ❓ Wide choice of materials

✗ Parts are only 2D (but assemblies → can be 3D)



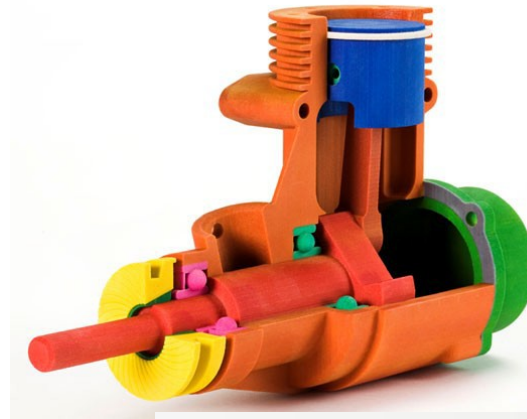
Cheap 3D Printing

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



High End 3D Printing

- ✓ Precise
- ✓ Multicolor
- ✓ Complex materials
- ✗ Slow
- ✗ 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

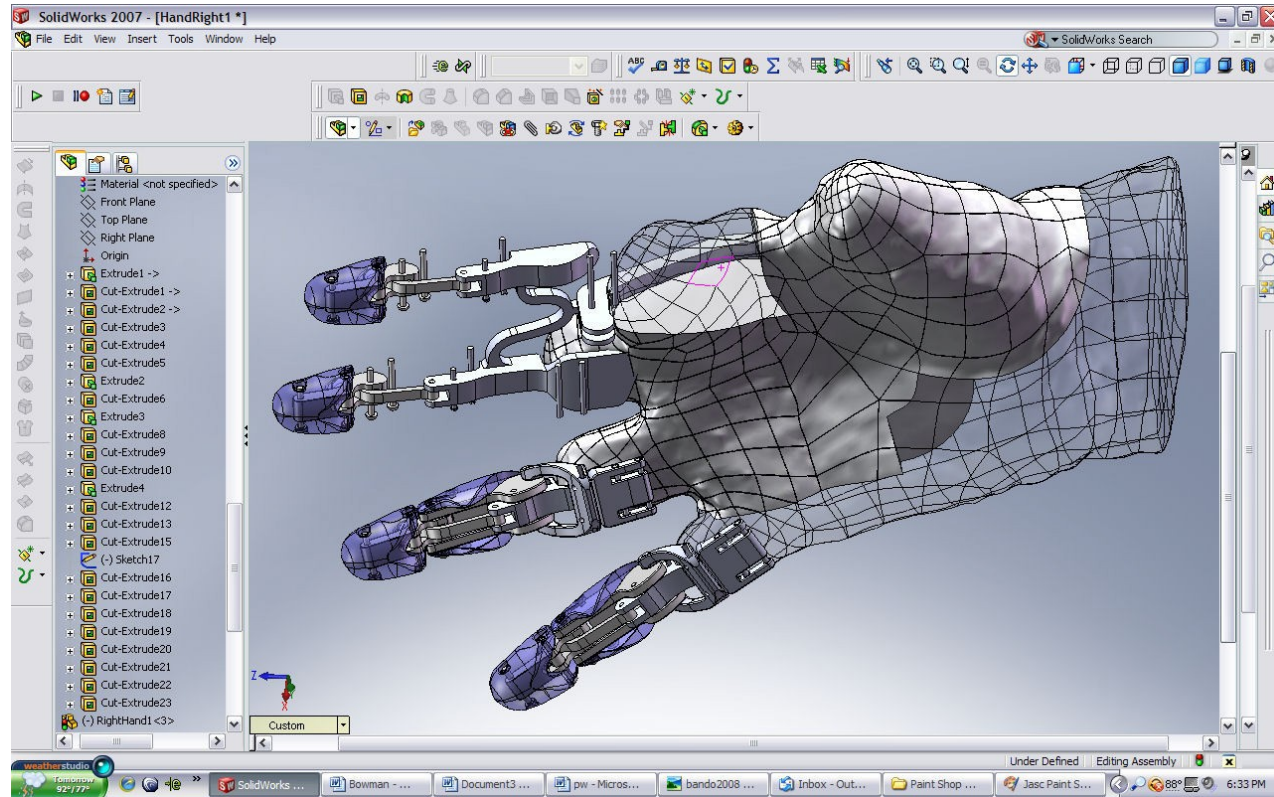
Maker Culture Around Us

- 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)

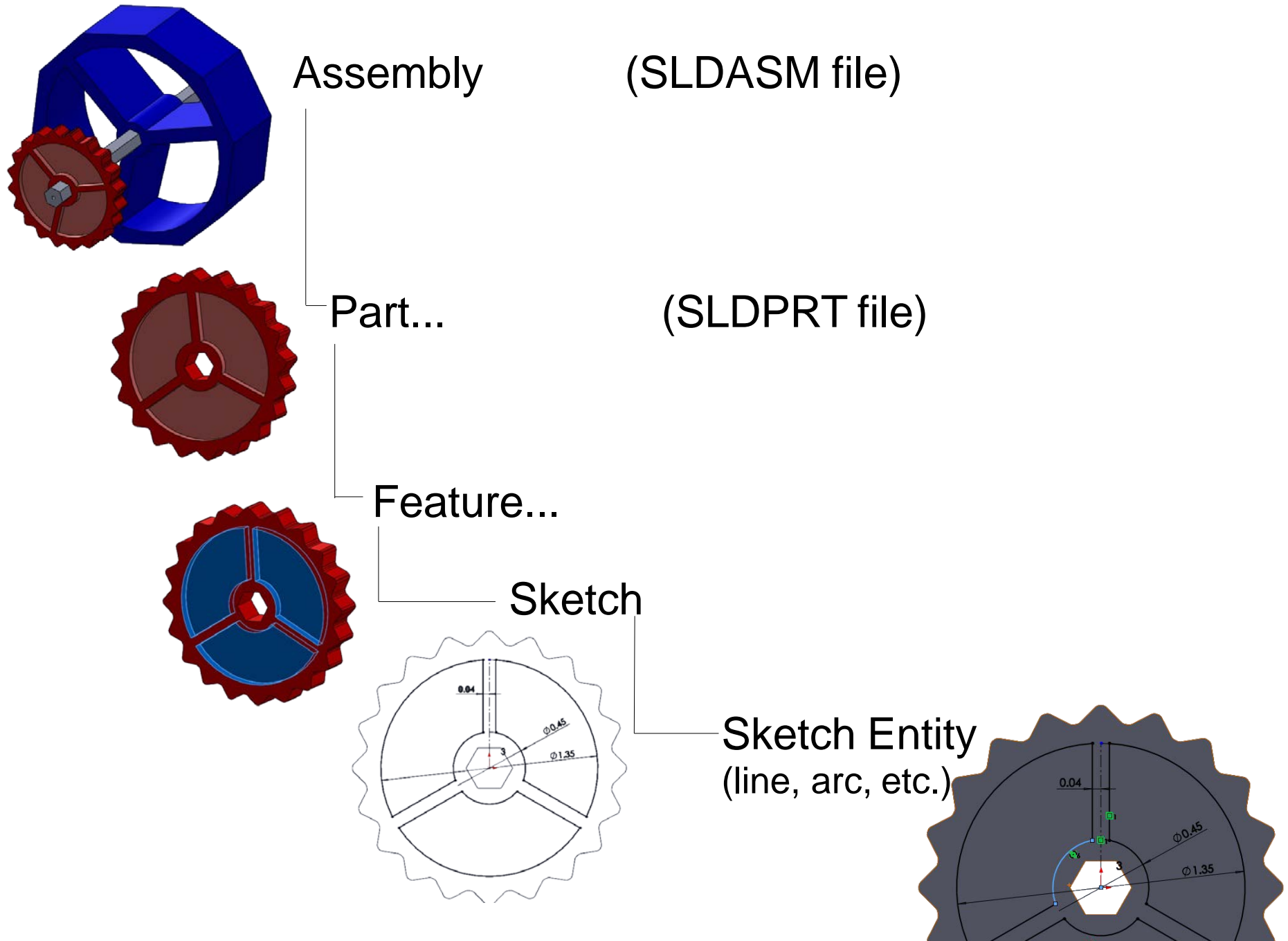


CAD Tools

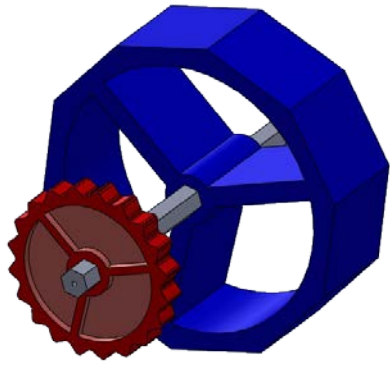
- The big two:
 - AutoCad from Autodesk
 - SolidWorks from Dassault Systemes
- Alibre/Invent
- Sketchup
- Blender
- CorelDraw, Inkscape, Rhino
- Sketch It Make It (developed at CMU)
- Many more...



A Quick Look at SolidWorks

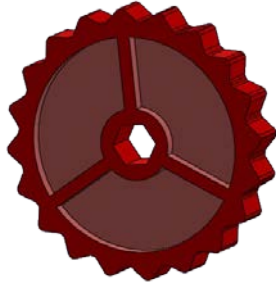


A Little More Detail



Assembly (SLDASM file)

- Mates
- Reference Geometry
- Subassembly...



Part... (SLDPRT file)

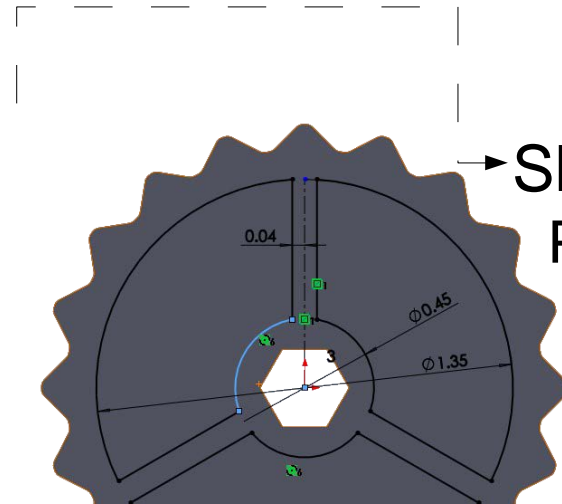
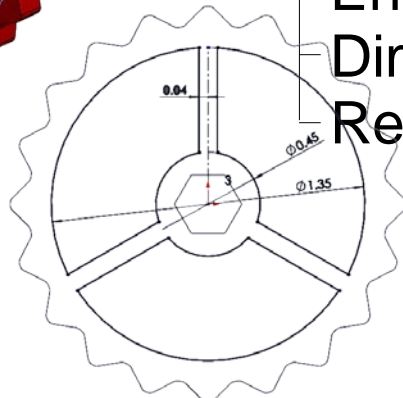
Reference Geometry

Feature...



Sketch

- Entities
- Dimensions
- Relations



Sketch Entity Parameters...

How To Learn SolidWorks

1. We'll teach you, starting now. The tutorials 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. Be sure to login through the CMU portal.
4. Thousands of random YouTube videos, including specialized topics such as how to make involute gears.