

RAPID PROTOTYPING

Week 2 “The Chaos Begins”



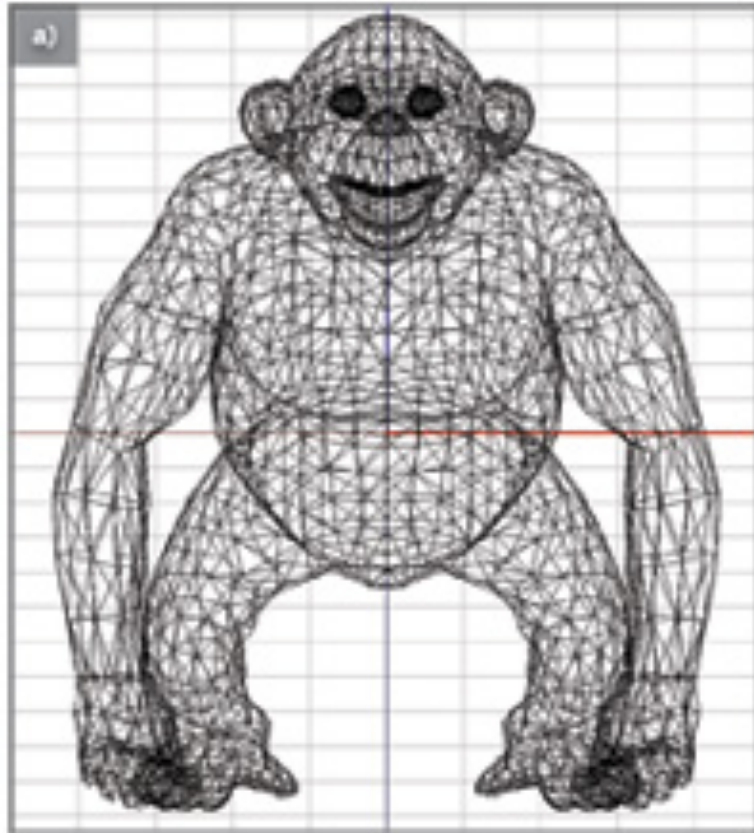
PLANNED AGENDA

1. 3D printing overview
2. Using 3D printers, software and hardware
3. The class project hardware
4. Finishing the designs for the class project
5. 2D with Tinkercad and Cricut
6. Online 3D designs / Print services
7. Demonstration of a prototyping project

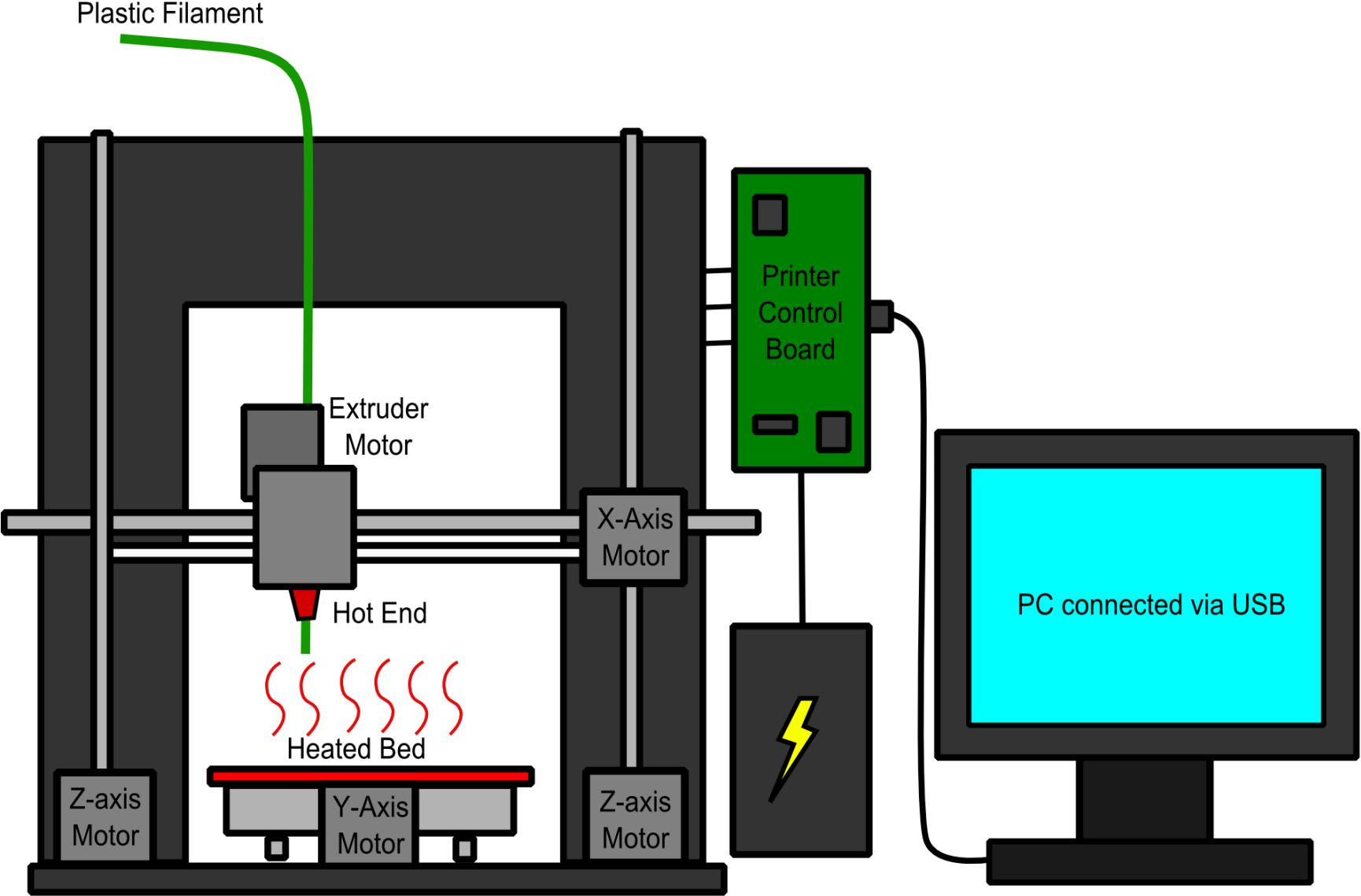


1. OVERVIEW OF 3D PRINTING

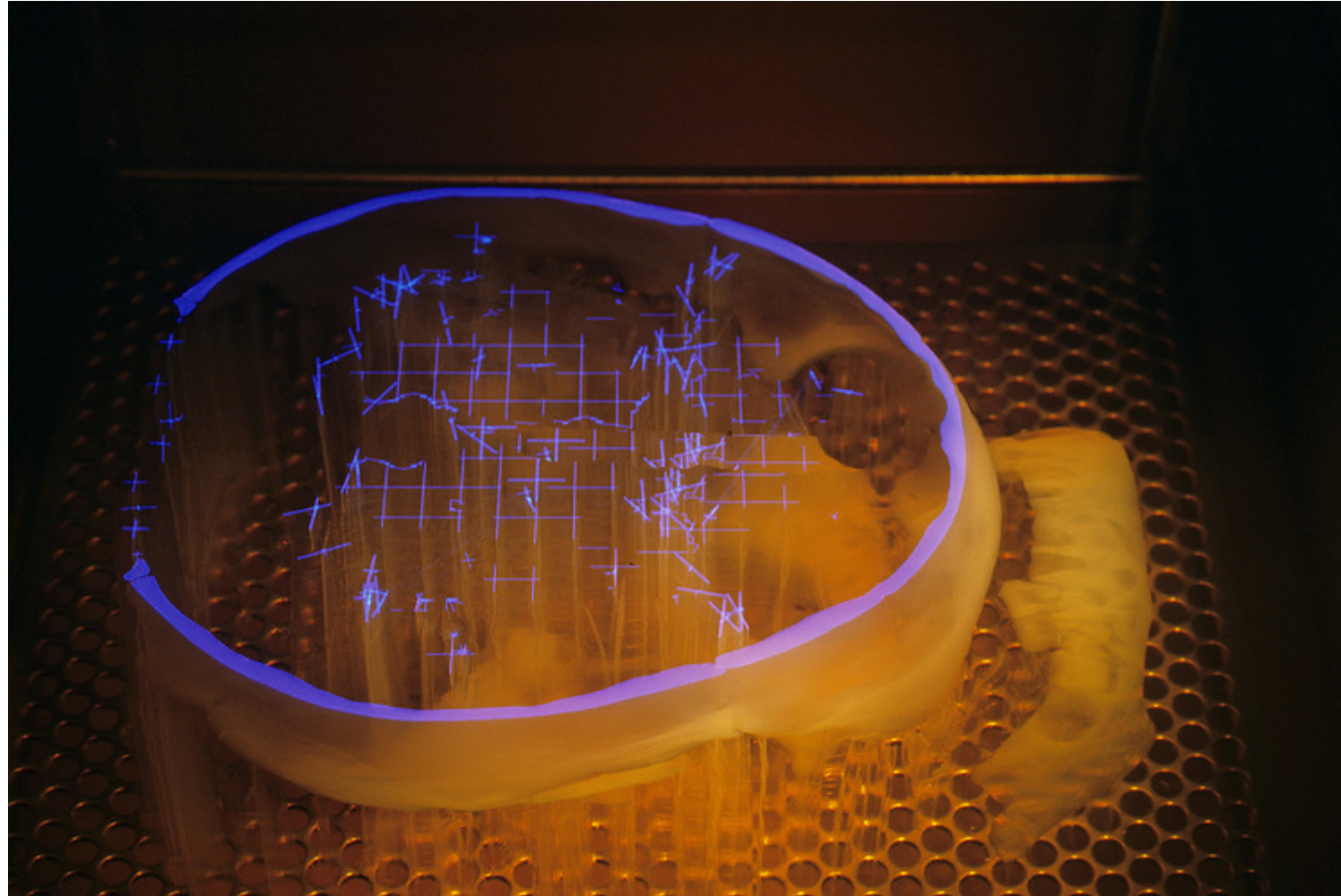
HOW DO THESE THINGS WORK?



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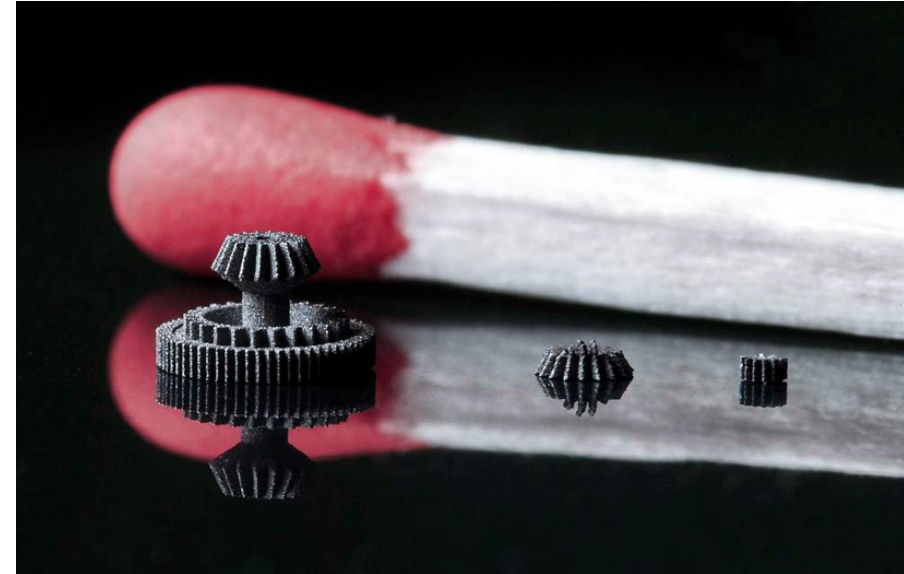
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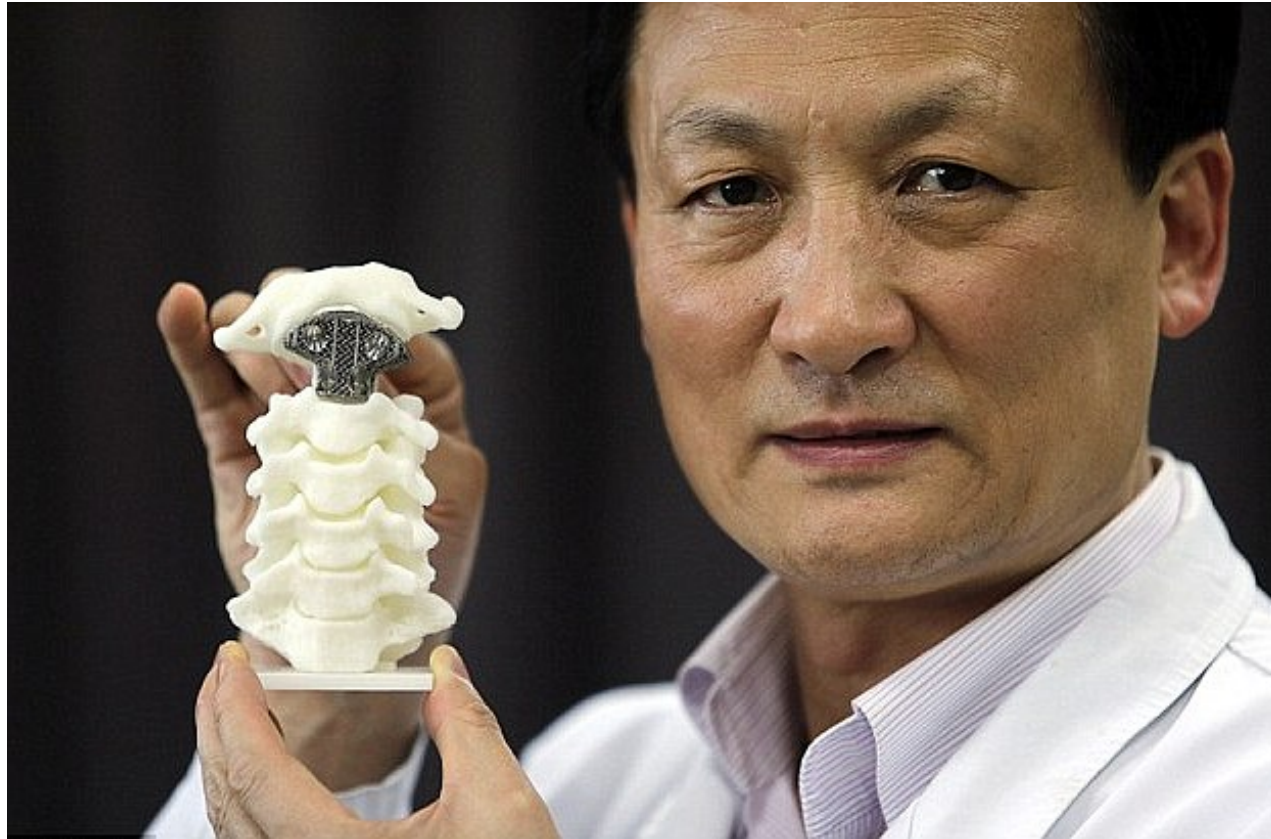
WHAT ARE PEOPLE SO AFRAID OF?



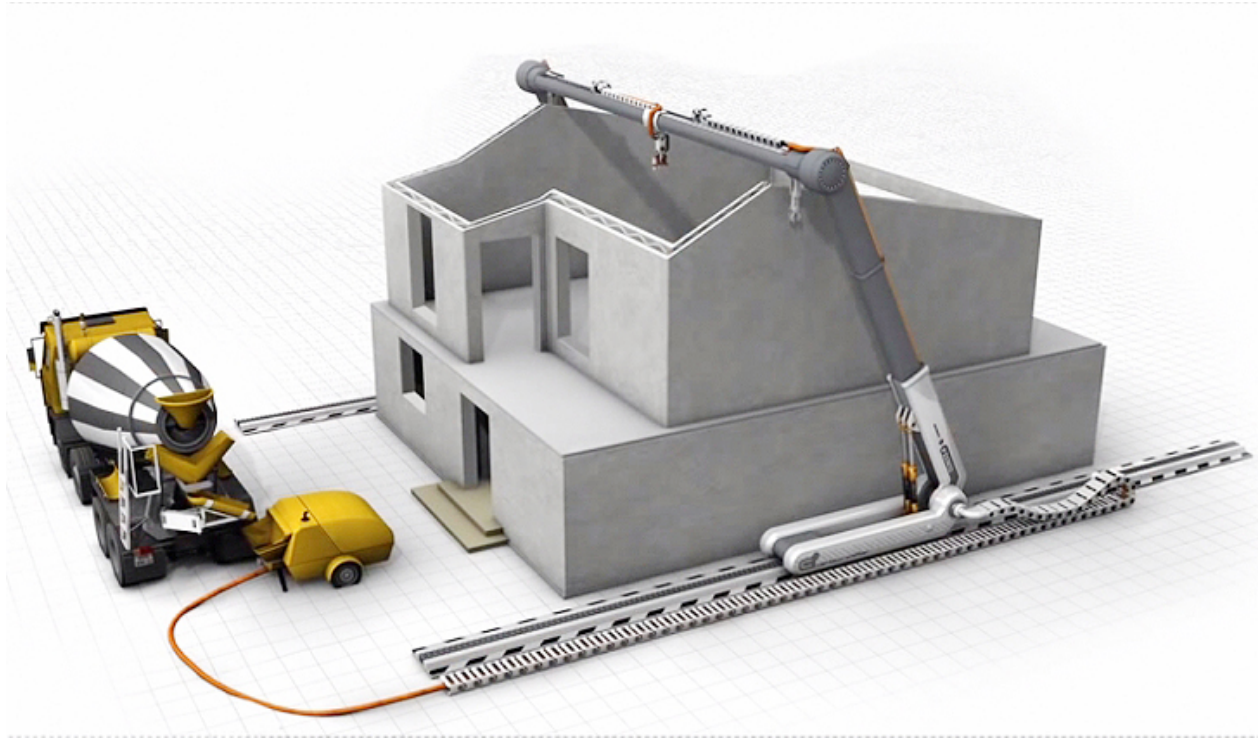
HOW WILL 3D PRINTING IMPACT MY LIFE?



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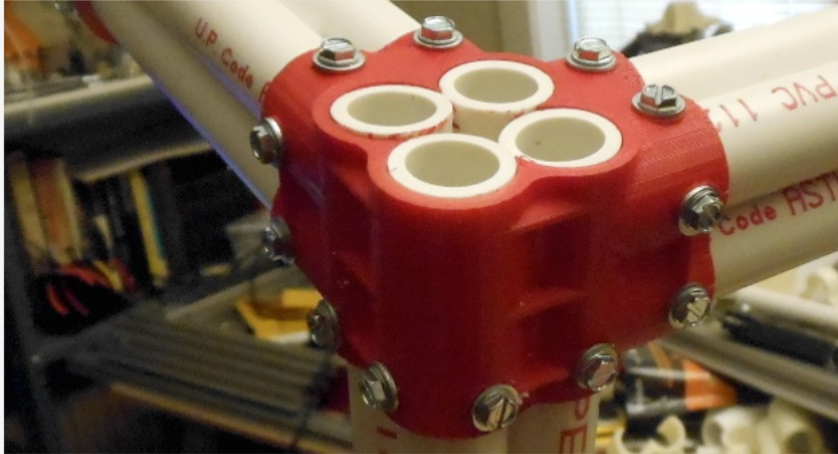
HOW CAN I USE 3D PRINTING?

- 1. Download files from a 3D repository and print on the Incubator's printers.**
- 2. Learn a 3D design program and print your own designs.**
- 3. Send files to a 3D printing service.**
- 4. Join a makerspace for access to 3D printers and other tools of digital manufacturing.**
- 5. Buy a 3D printer.**



REPOSITORY: WWW.THINGIVERSE.COM

MakerBot Thingiverse DASHBOARD EXPLORE CREATE SIGN IN / JOIN



Thingiverse Featured







You can build things with Legos. You can make stuff with toys. But eventually you've got to grow up and build real things. Big things. Donald.J's PVC Pipe Construction Set makes these things possible. OK, so maybe it's still a toy. But what a toy!

[Learn More](#)

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Global Feed

Latest Thingiverse Activity

-  ajsymmonds collected Enterprise 1701 Modular Snap-...
-  grice4584 started using Customizer
-  williamhardiek liked Coin cup holder
-  jakemestre collected Self-Watering Planter (Small)
-  tclima collected Drag Chain with mounts
-  NancyR liked #MakeltFloat Chinese Floating Lantern

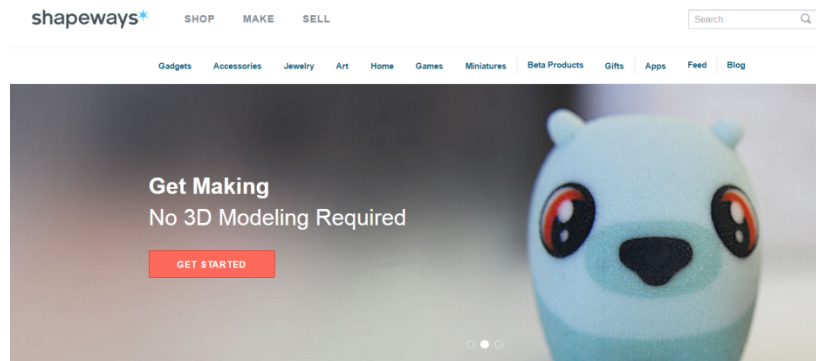
Featured Collections

Download and print today [see more >](#)

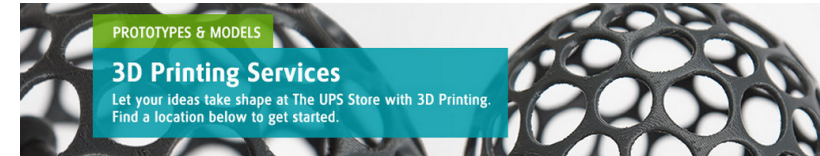
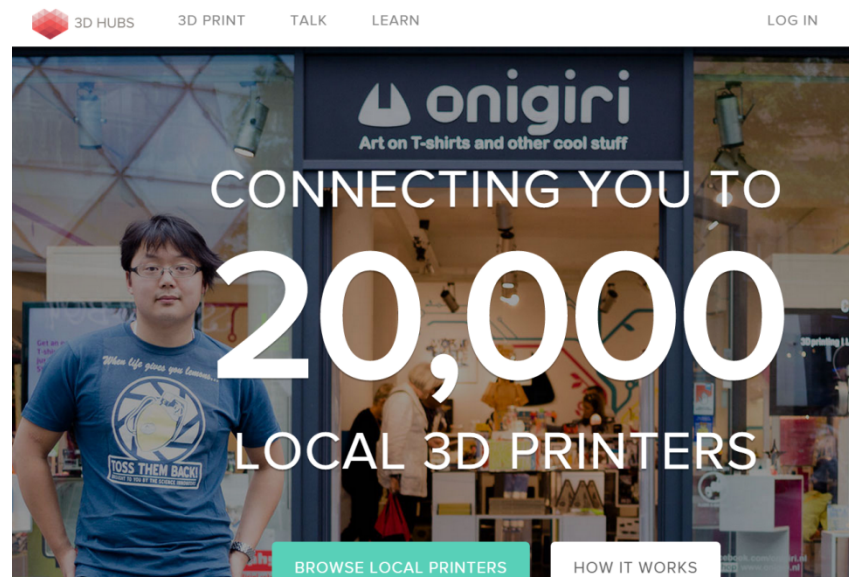
-  #MakeltFloat
-  Video Games
-  Tiny Computers
-  ArchitectureKIT
-  Fractals
-  Customizers
-  Apple Watch
-  Aztec & Mayan



YOU DON'T NEED A PRINTER TO PRINT



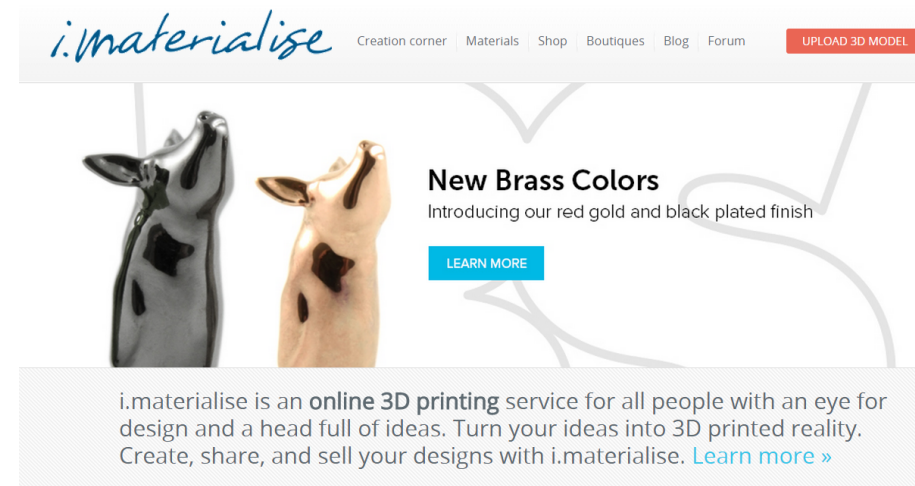
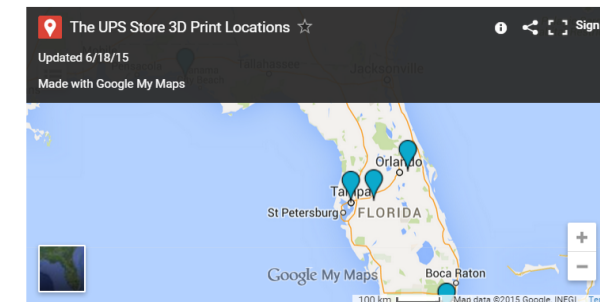
The World's Leading 3D Printing Service & Marketplace
Shapeways Enables Everyone to Bring Their Ideas to Life



[The UPS Store](#) > [Small Business Solutions](#) > 3D Printing Services

3D Printing Services Expanded Across Nation




Following the successful launch of 3D print in six markets across the country, The UPS Store® has expanded 3D printing services to meet the growing demands of its small business customers to nearly 100 additional locations nationwide.



MAKERSPACES PROVIDE THE BEST SUPPORT




YOU CAN BUY ONE . . .

| Play For beginners, kids and enthusiasts. | Simple Our most popular 3D printer | Plus Great Value |
|--|--|--|
| \$ 399 | \$ 599 | \$ 1199 |
|  <ul style="list-style-type: none">• 100mm x 105mm x 130mm (X-Y-Z) build dimensions (apx 4" x 4" x 5")• 80 cubic inch build volume• 50 microns resolution• 80mm/sec max print speed• 1.75mm PLA/flexible filament |  <ul style="list-style-type: none">• 150mm x 150mm x 150mm (X-Y-Z) build dimensions (apx 6" x 6" x 6")• 216 cubic inch build volume• 50 microns resolution• 80mm/sec max print speed• 1.75mm PLA filament |  <ul style="list-style-type: none">• 250mm x 250mm x 265mm (X-Y-Z) build dimensions (apx 10" x 10" x 10")• Heated bed comes standard (max temp 80C)• 50 microns resolution |



2. USING 3D PRINTERS, SOFTWARE AND HARDWARE

- Software (specific apps vary by site)
 - Cura – setup and slicer
 - Pronterface – machine control
- Filament, material, diameter, and quality
- Extrusion, temperatures, speed, nozzle health & cooling
- Bed preparation, material, leveling, additives
- Print removal, tools & techniques
- Post print finishing, clipping, sanding, painting



3. THE CLASS PROJECT HARDWARE

1. Arduino
2. WS2812 ring
3. Pushbutton
4. Resistor
5. USB cable
6. Diffusion material
7. Wire



4. FINISHING THE DESIGNS FOR THE CLASS PROJECT

- Sketching, dimensioning, CADing
- Checking printability
- Scheduling printing



5. 2D WITH TINKERCAD AND CRICUIT

- 2D output from Tinkercad
- Other software to generate SVG files
- 2D digital fabrication
- Cricuit hardware
- Designspace software



7. DEMONSTRATION OF A PROTOTYPING PROJECT

- Goal of the project: to provide 3D printer owners something functional to create with their machine.
- Product: a LED lamp module for sale and accompanying free 3D design files for printing.
- Process (for the LED module):
 - Scan for competing products
 - Paper sketches
 - 3D designed and printed looks-alike prototypes
 - Hand fabricated works-alike prototypes

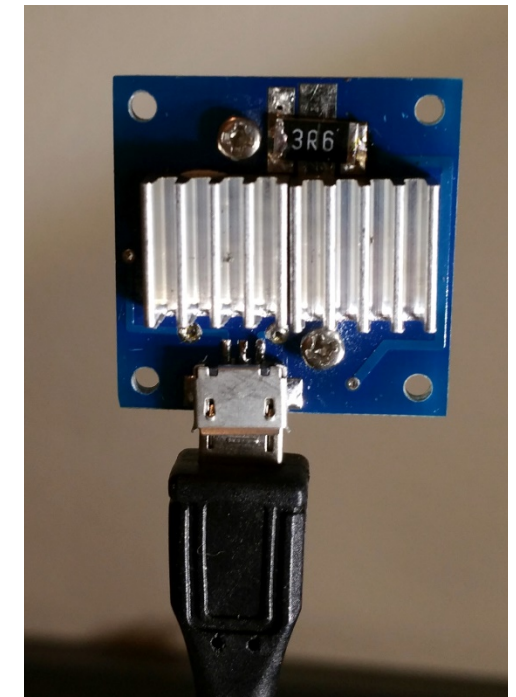
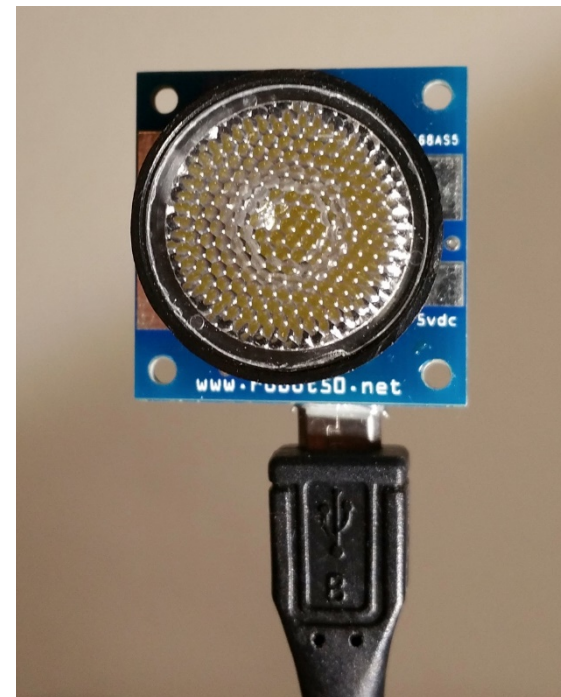
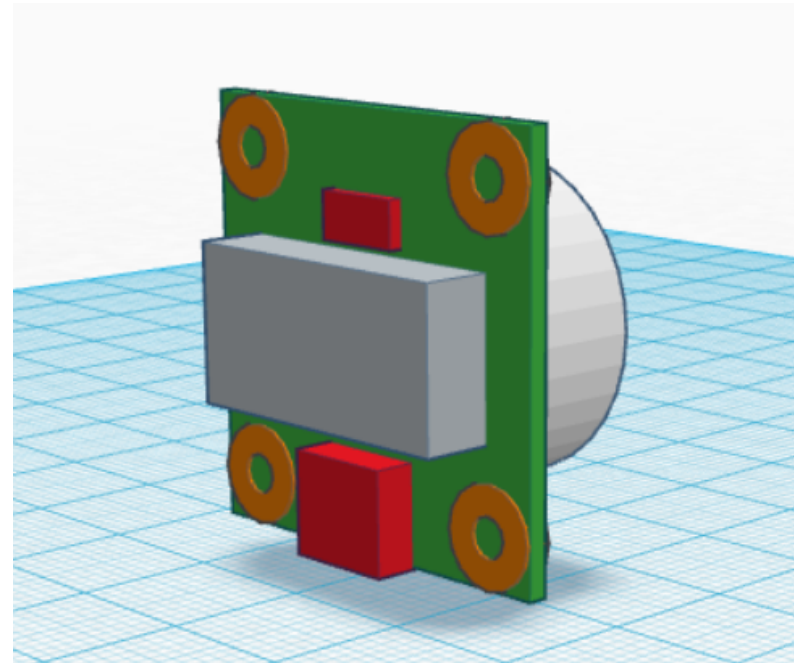


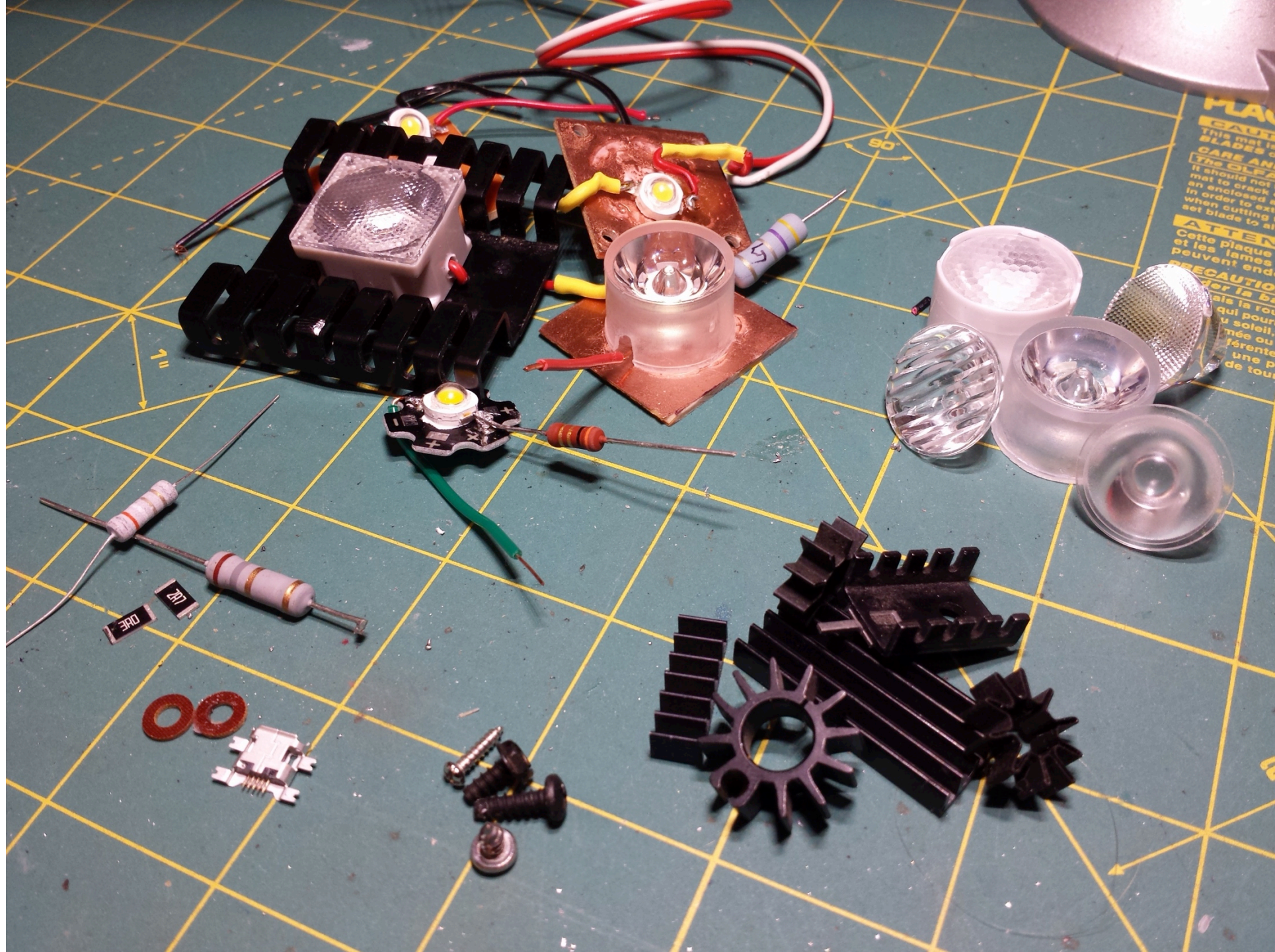
6. ONLINE 3D DESIGNS / PRINT SERVICES

- Thingiverse <http://www.thingiverse.com/>
 - creative commons licensing
 - customizer
- Other download sites
<https://all3dp.com/best-sites-free-stl-files-3d-printing/>
- Shapeways <http://www.shapeways.com/>
- UPS <https://www.theupsstore.com/print/3d-printing>



- Iterating prototypes of the LED module to balance:
 1. Small size
 2. Low cost
 3. Minimal part count
 4. Design for manufacturing
 5. High light output
 6. Neutral light color
 7. Good light dispersion
 8. Appropriate power consumption
 9. Acceptable heat generation
 10. Flexibility for different applications
 11. Ease of use





- Individual prototypes were made for:
 1. Electronics schematic
 2. Component placement (switch, USB jack)
 3. Color of LED emitter
 4. Lens spread and surface pattern
 5. Heat sinks
 6. Overall size
 7. 3D printed mounting rings
 8. 3D printed lamp components

