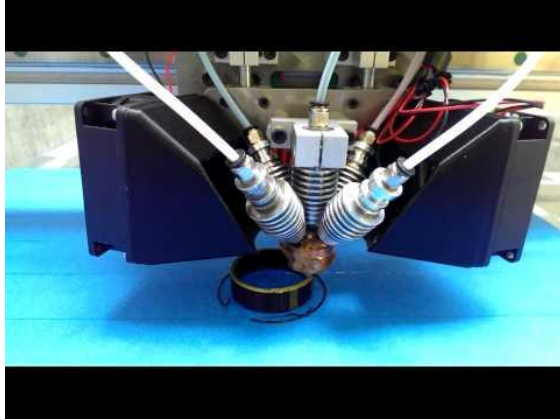


Full color 3D printing on fused deposition modeling printer with filament coloring addition mechanic and controlling algorithm

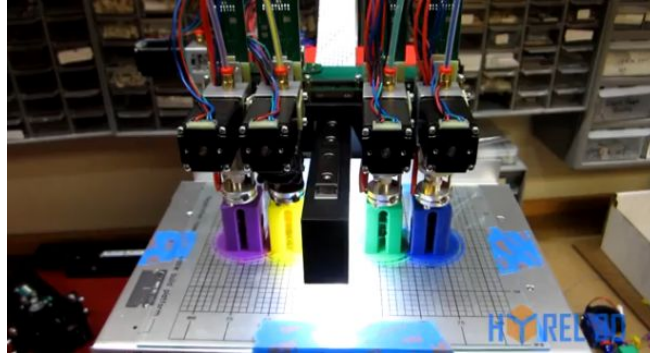
耗材顏料添加法全彩熔絲成型 3D 打印技術演算法及上色裝置



Current Methods of Colored 3D printing



Single HotEnd Multi
Extruder Blending
Method ^[1]



Multi HotEnd Multi
Extruder Method ^[1]

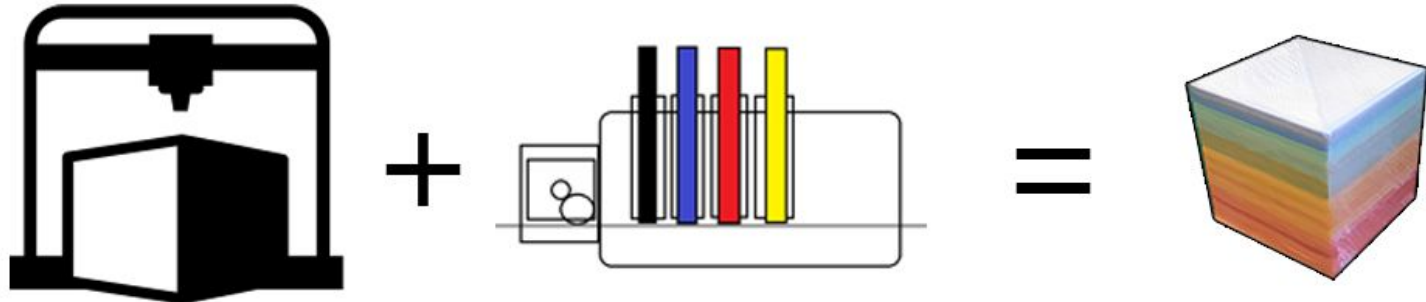


Paint after print
method ^[2]

^[1]3Ders
<http://www.3ders.org/articles/20131225-hyrel-3d-3d-printing-with-four-extruder-heads-simultaneously.html>
^[2]Shapeways
<https://www.shapeways.com/materials/frosted-detail-plastic>

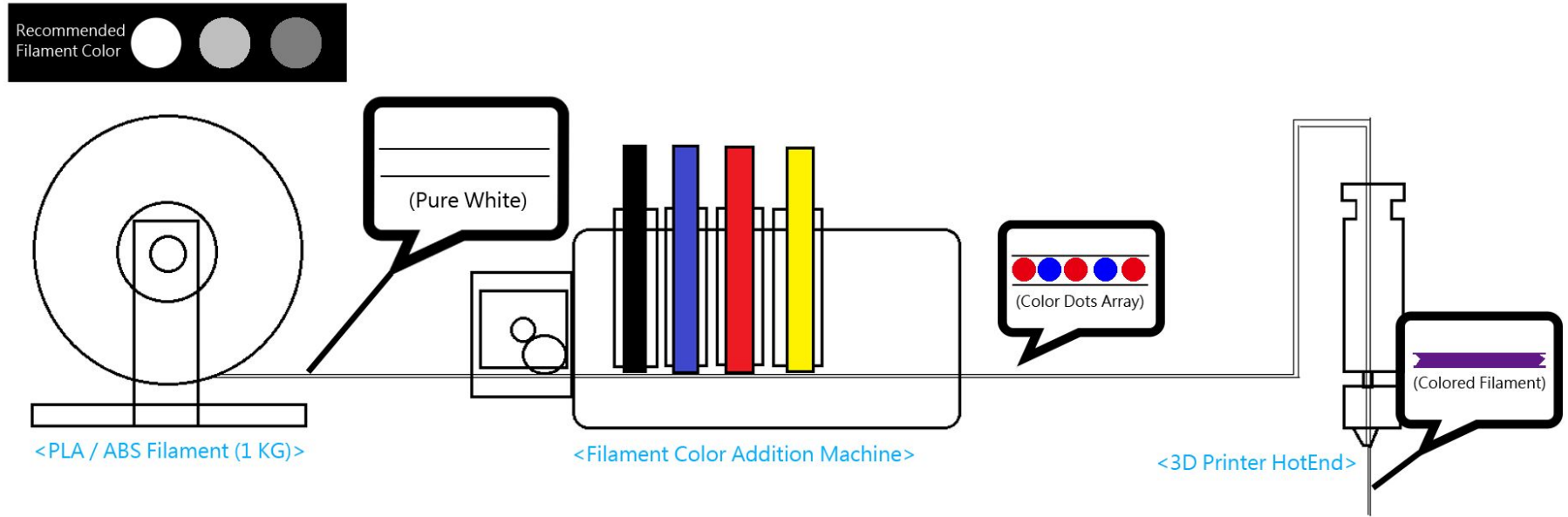
Aim of this Project

- Create full color printing object with single HotEnd single extruder FDM printers
- Develop the algorithm / maths for full color printing using gcode generated from stl files.
- Proof of concept over the "Filament Color Addition Method" on colored 3D printing.



How it works

Filament Color Addition Machine Simplified Workflow Diagram



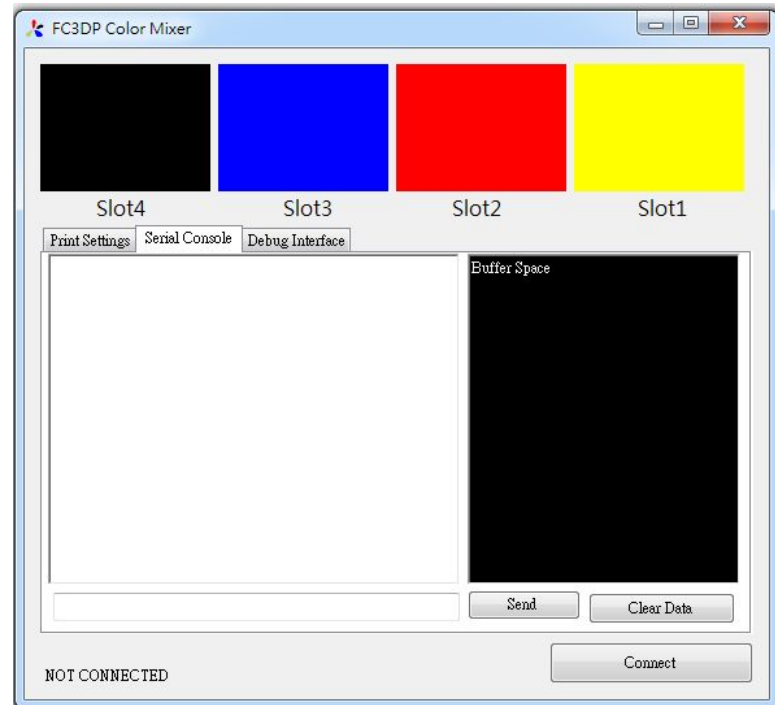
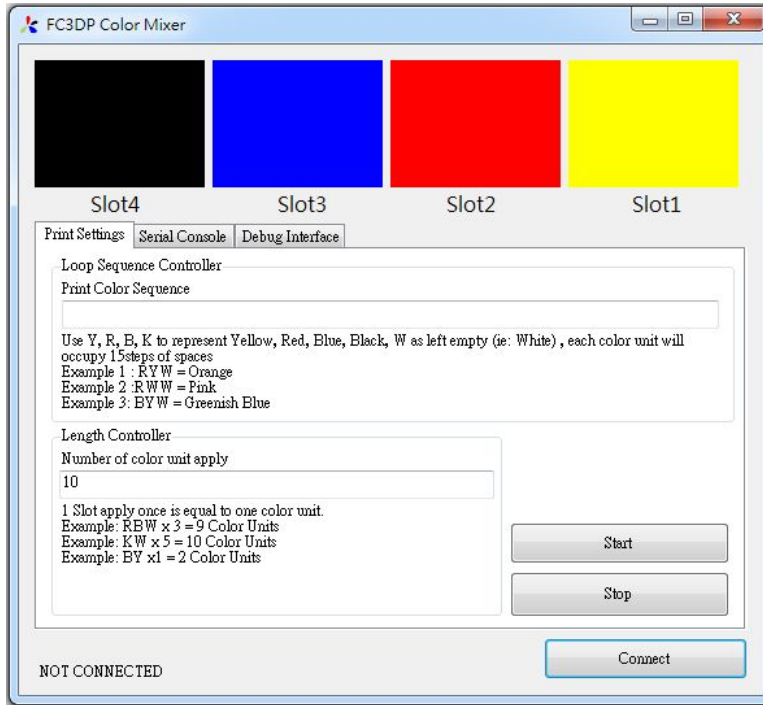
Applications

- All RepRap open source 3D printer
- E.g. "Reprap prusa i3", "Reprap Delta", "Reprap Prusa" , "i3 Rework"

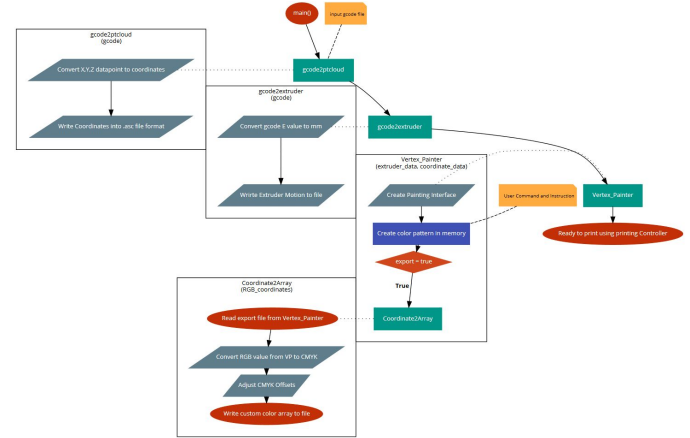
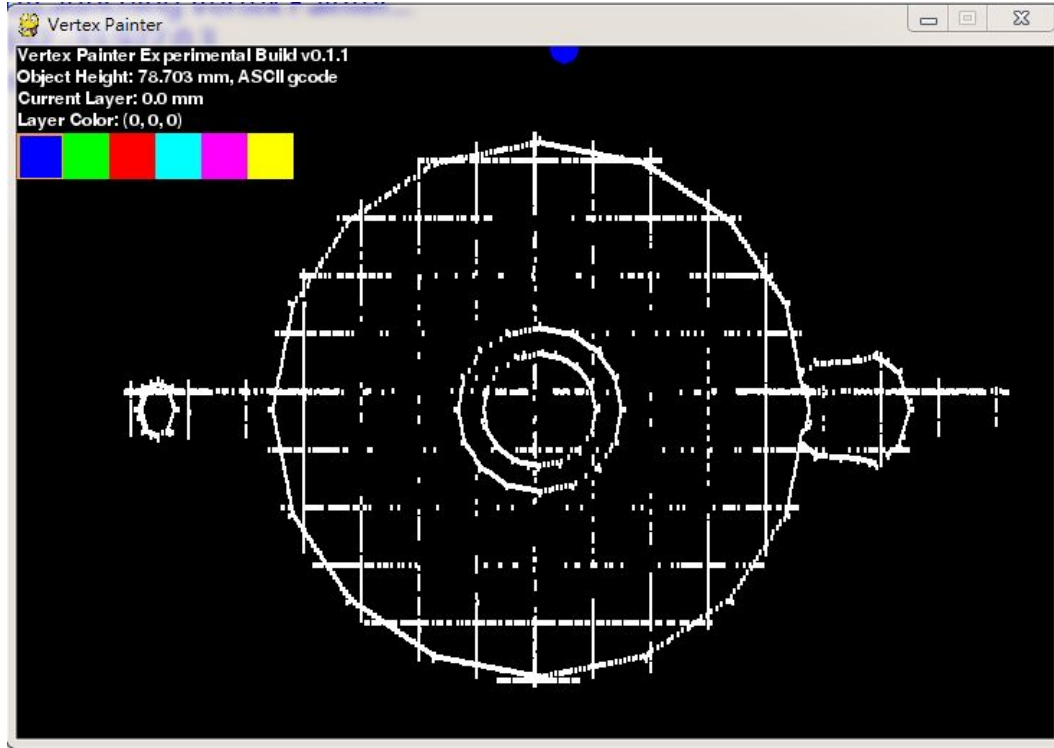
Or other 3D printers with the following specification:

Hot End Temperature	>200 Degree Celsius
Filament Diameter	1.75mm (1.70mm - 1.80mm)
Hot End Type	E3Dv5 / E3Dv6 / Some Ultimaker Machine (Theoretically workable)

Basic Controls

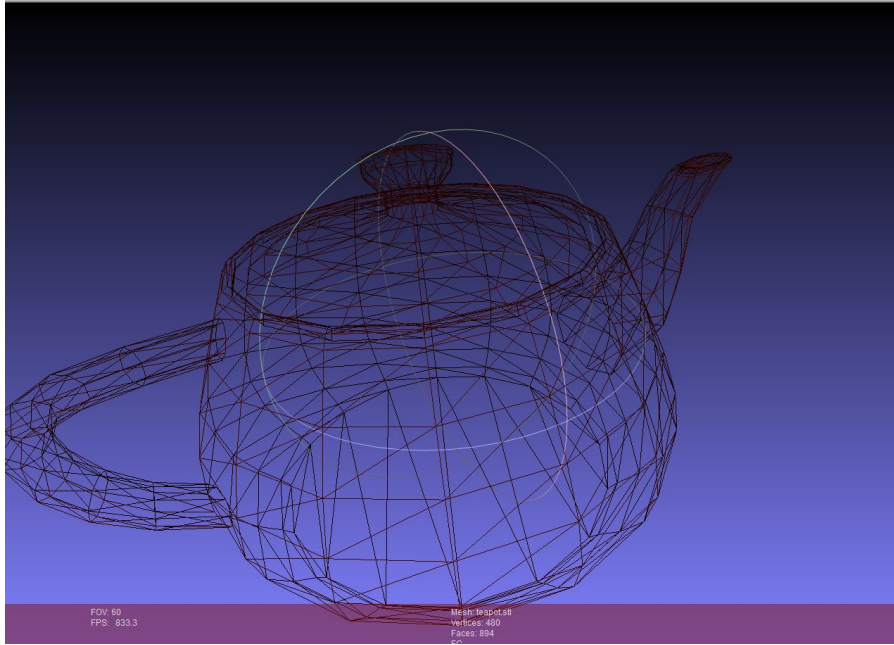


Advanced Coloring Control Algorithm

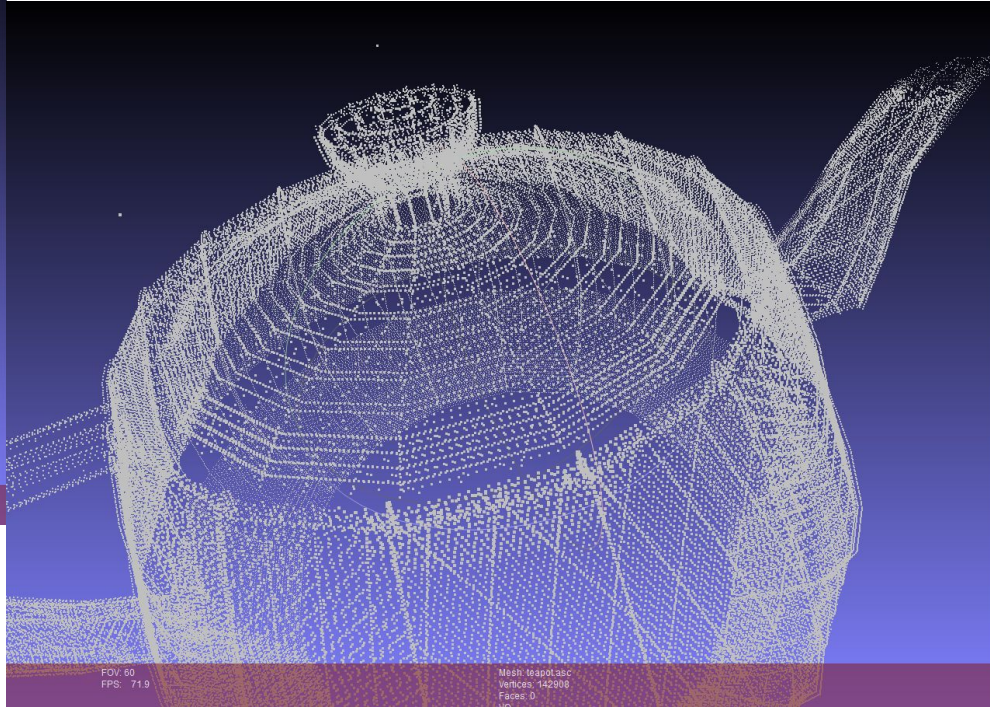


Gcode Reconstruction Accuracy

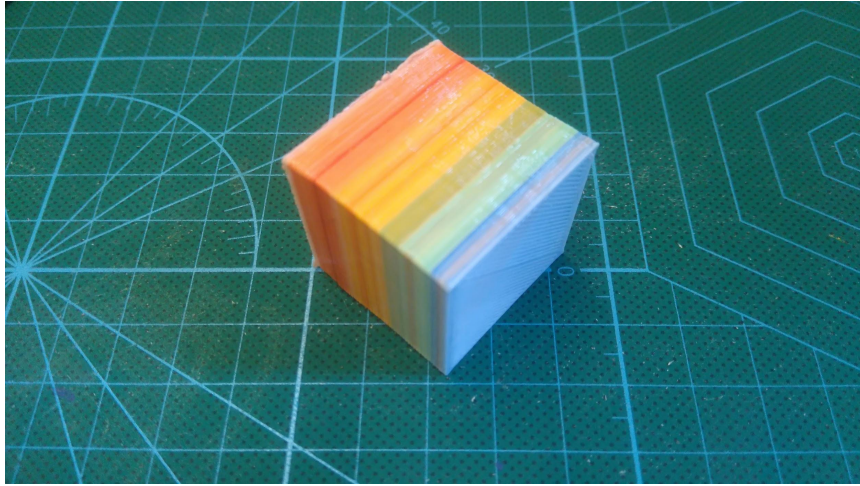
< Raw stl file that being converted into gcode file.



Reconstructed 3D coordinates (Point Cloud, asc file)
from gcode generated by CURA, ready to be
painted >>

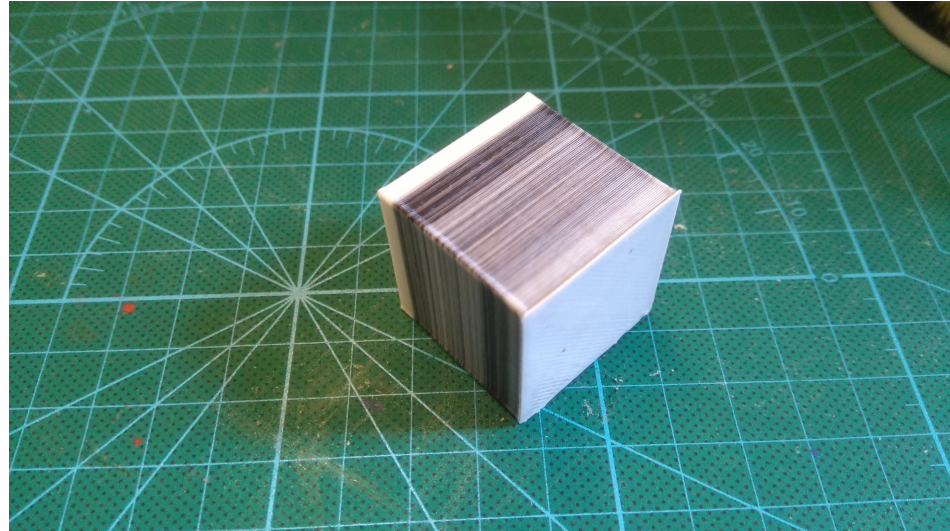


Results

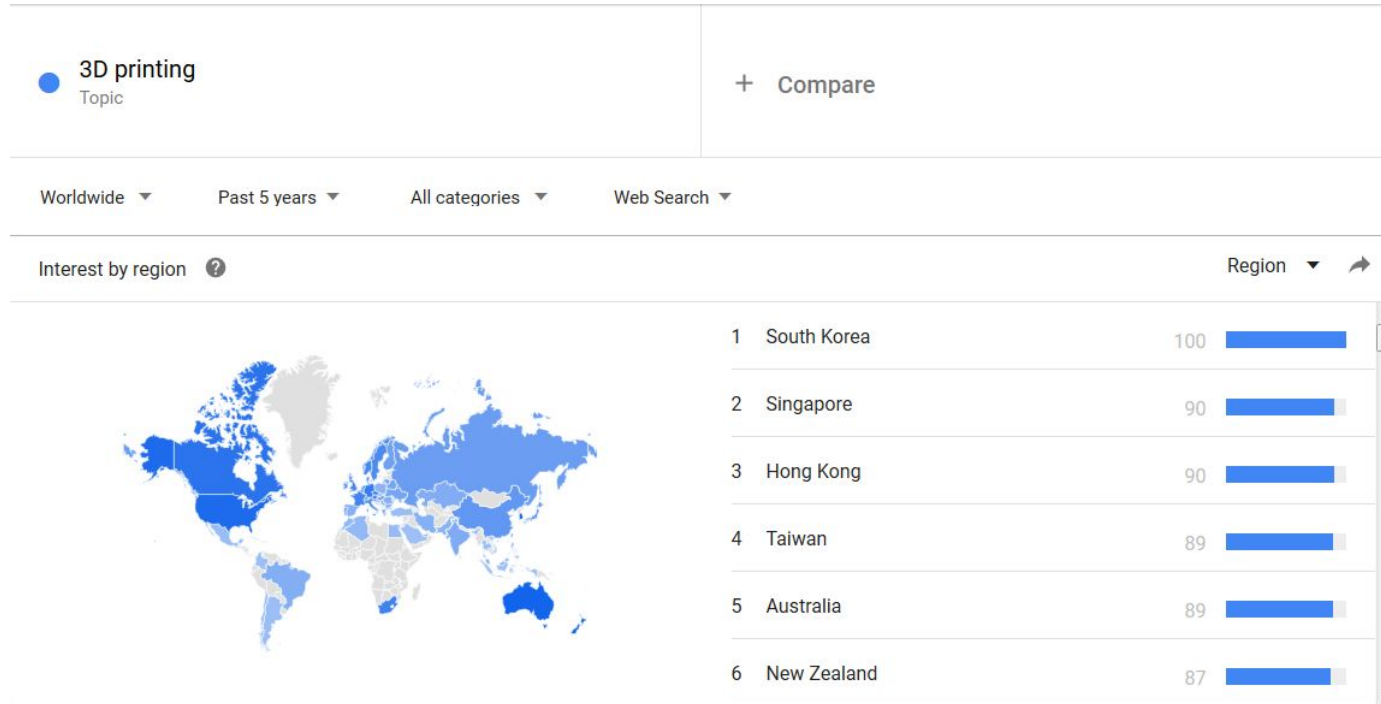


< Full Color Printing with CMYK color scheme

Grey Scale Test with Black Paint Only >



Business value



Educational Value

3D PRINTING REVOLUTIONISING *the* **CLASSROOM**

Biology students can study cross-sections of hearts or other organs.



Chemistry students can print out complex molecules to study.



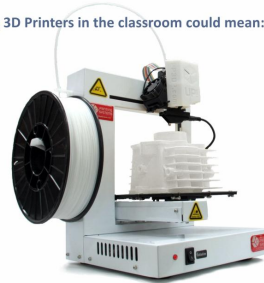
Engineering students can print modified car or robot parts.



Geography students can print out topography, population or demographics of an area.

3D Printers have actually been around for about 25 years. Barriers like costs are breaking down, so they are now very affordable and easy to use. 3D Printing has caught the attention of educators who are looking into ways to incorporate it into the classroom.

Using 3D Printers in the classroom could mean:



Graphic design students can create prototypes of product designs



Food Technology students can design molds and cookie cutter templates



Design and Engineering students can make prototypes of their creations.



Architectural students can print new or existing designs.



History classes can print artifacts for closer examination

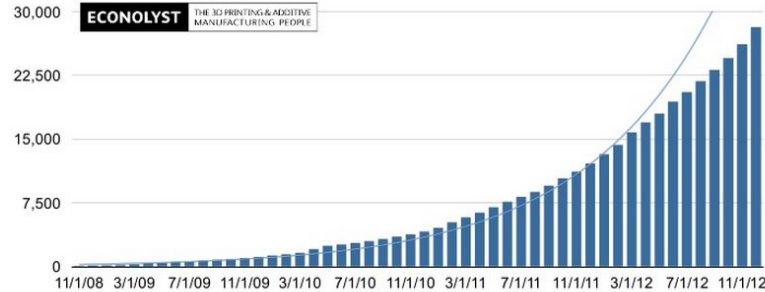
Innovation and Ideas

The rate at which open-source design repositories are growing looks a lot like the growth of other social and collaborative online endeavors - which is exponential



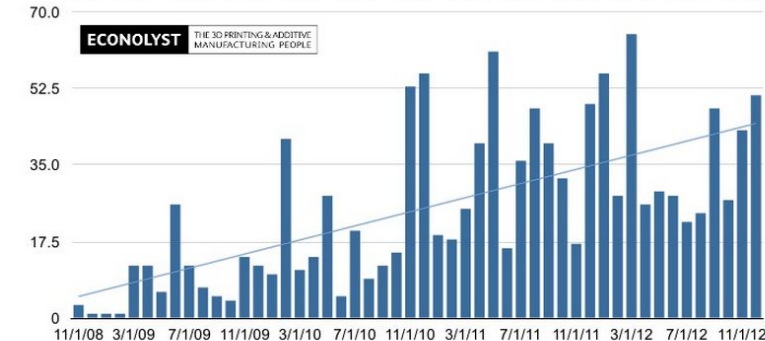
The number of items on Thingiverse is on an exponential upwards path.

Number of new items uploaded into Thingiverse each month.



The complexity of new items is on a steady upward path.

As measured by the most complex new item uploaded each month - in terms of number of parts.



Demonstration



Q & A

