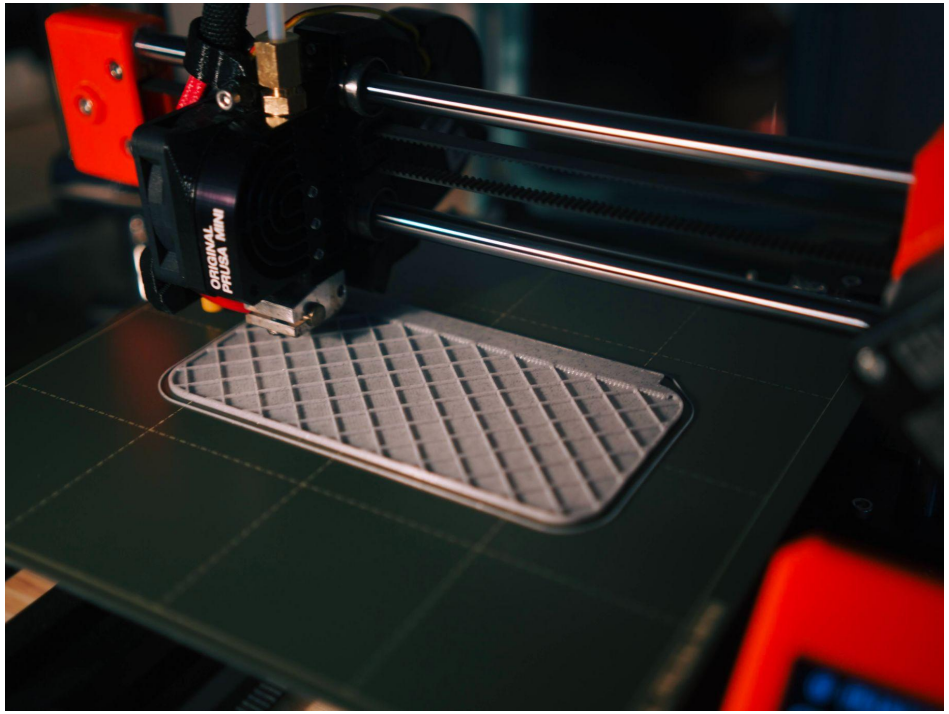
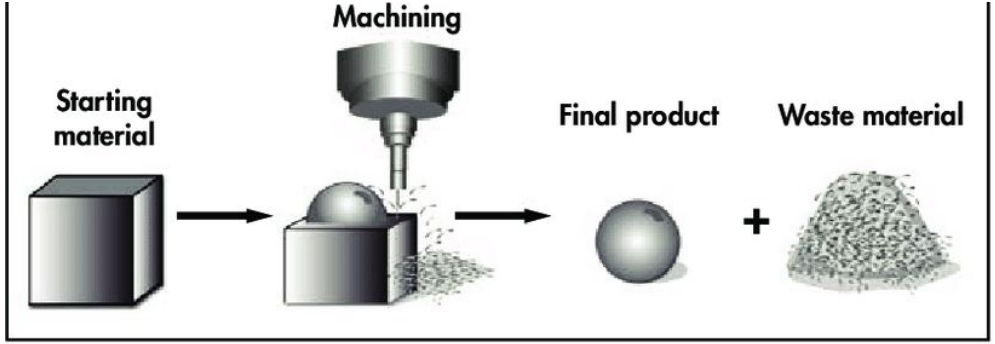


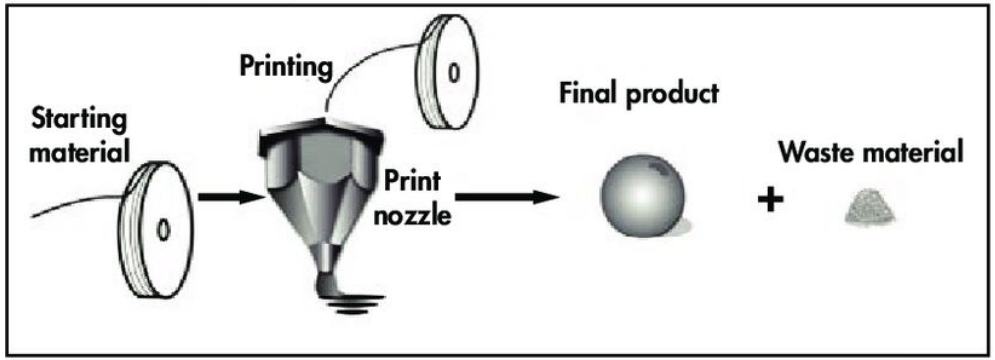
3D Printing

John Blackman

GEARS 2022



Additive manufacturing



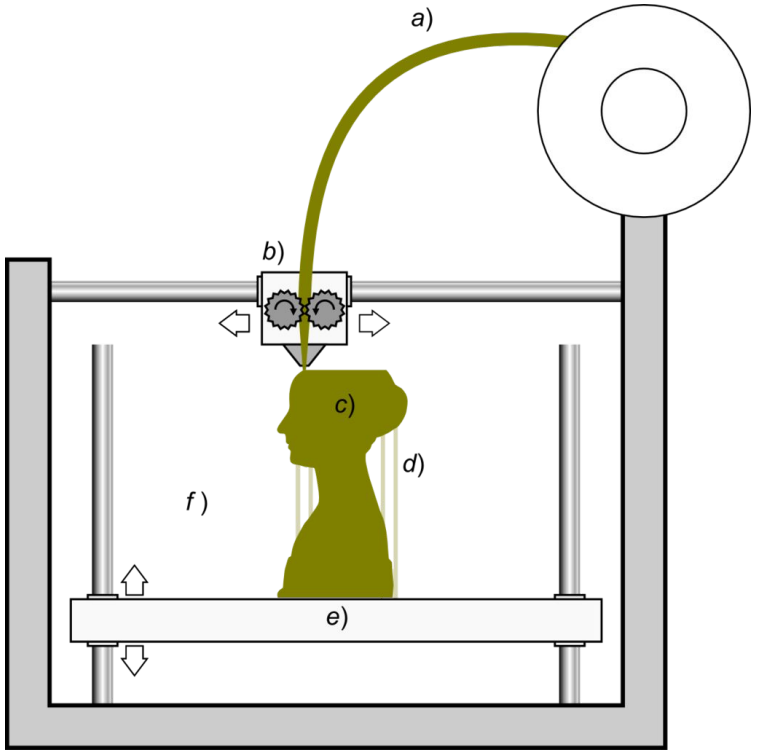
SOURCE: U.S. Government Accountability Office, 2015.

Applications

- Rapid Prototyping
  - Often cheaper and less labor intensive than other manufacturing methods
- Producing odd shaped components or components with complex internal features
- Low cost manufacturing
- Less waste than subtractive manufacturing.

3D Printing Methods

- FDM (Fused Deposition Modeling)
  - Most common and cheap. Filament extruded in layers.

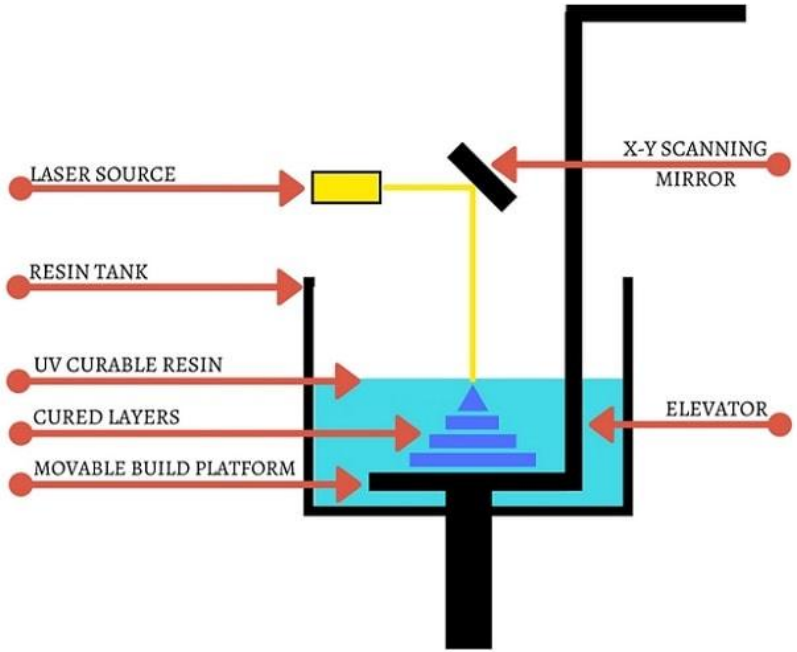


By Paolo Cignoni - Own work, CC BY-SA 4.0


Close-up!

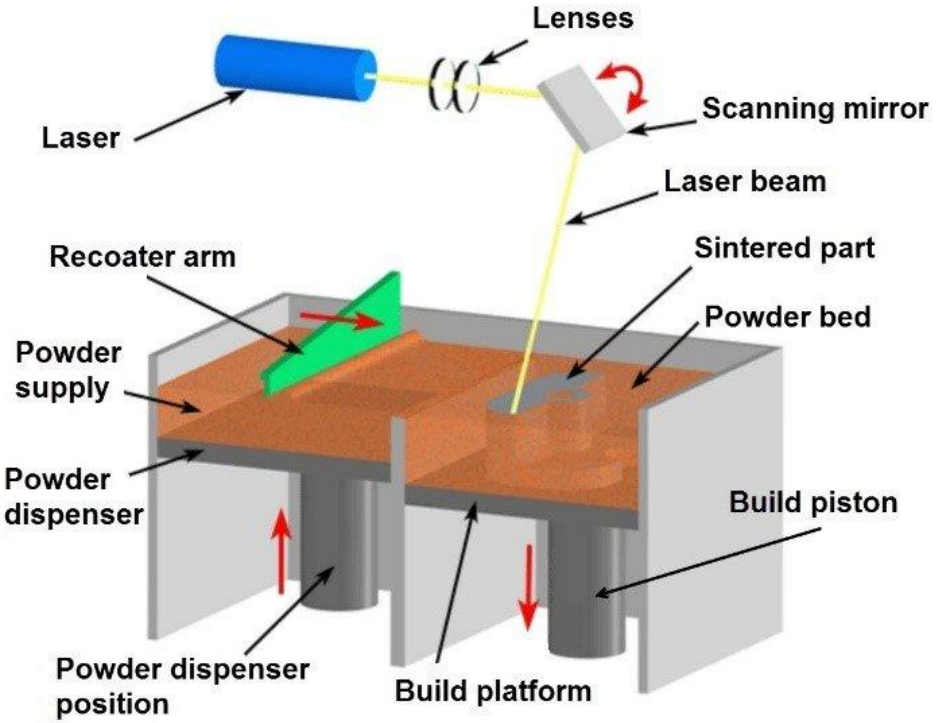
3D Printing Methods

- SLA (Stereolithography)

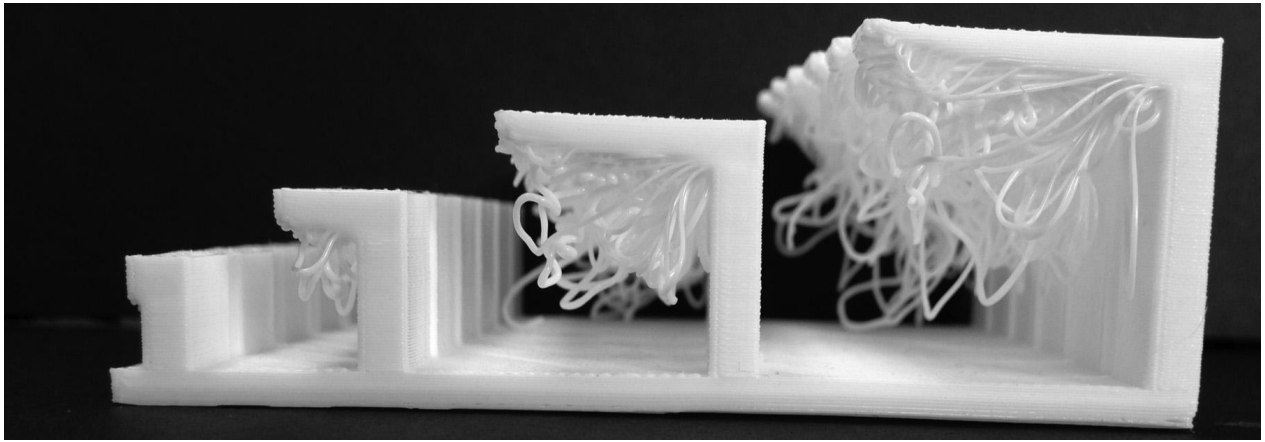


3D Printing Methods

- Selective Laser Sintering (SLS)
  - Used for one type of metal, or metals with the same melting point.
- Direct Metal Laser Sintering (DMLS)
  - Similar process to SLS, can be used with alloys, or metals with different melting points.

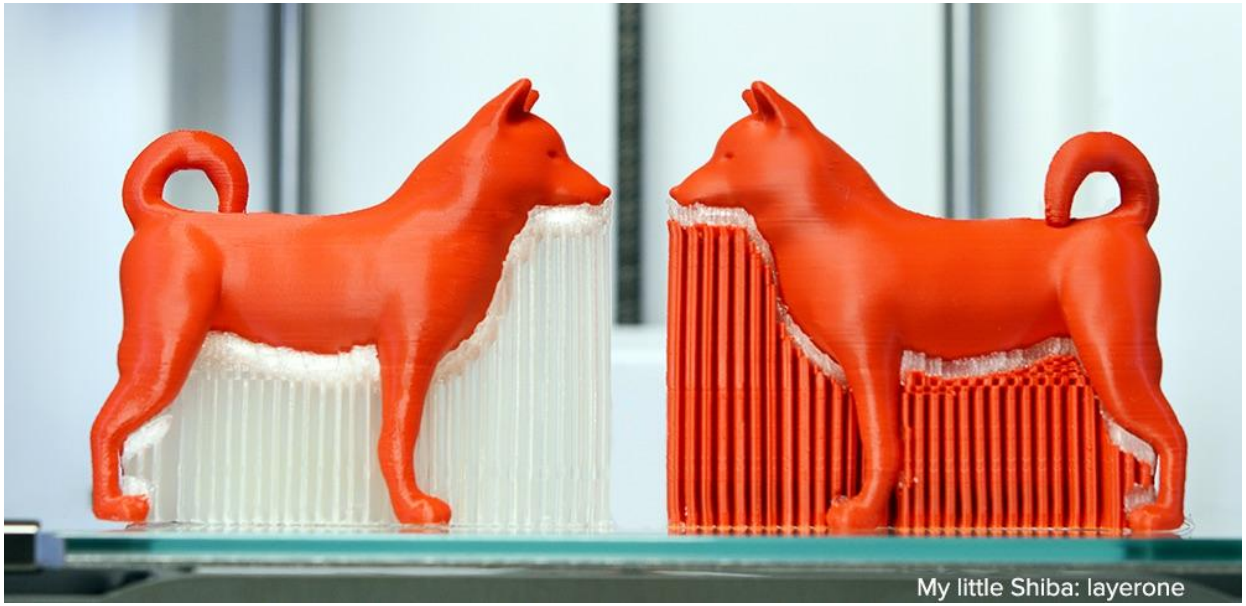


Design Considerations



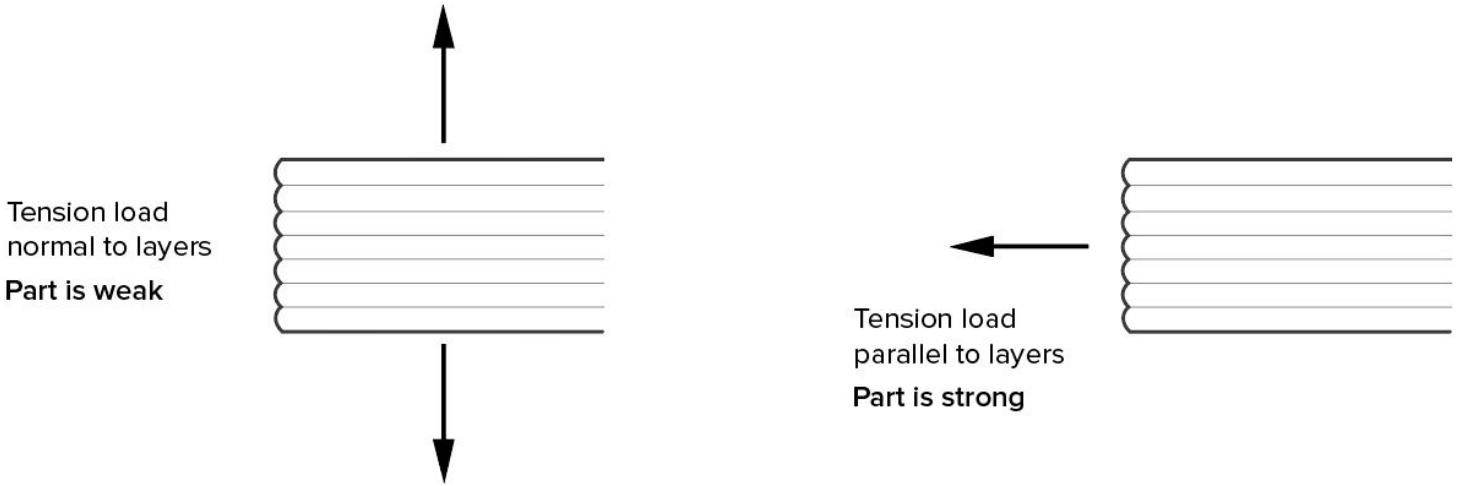
- Avoid large overhangs and unsupported features.

Design Considerations



Design Considerations

Print orientation affects strength



Hubs.com

Design Considerations

Different material choices change the characteristics of the print:

- PLA
  - Most common, cheap, easy to print. Not very strong
- ABS
  - Stronger than PLA, still easy to print and higher melting point
- Resin
  - Higher Detail
- Metals, carbon fiber, kevlar
  - High strength and lightweight parts, but the machines are expensive and specialized.

3D printers can be cheap!

- Basic FDM printers can be less than $200