3D PRINTING TECHNOLOGY:

Practical use in medical industry

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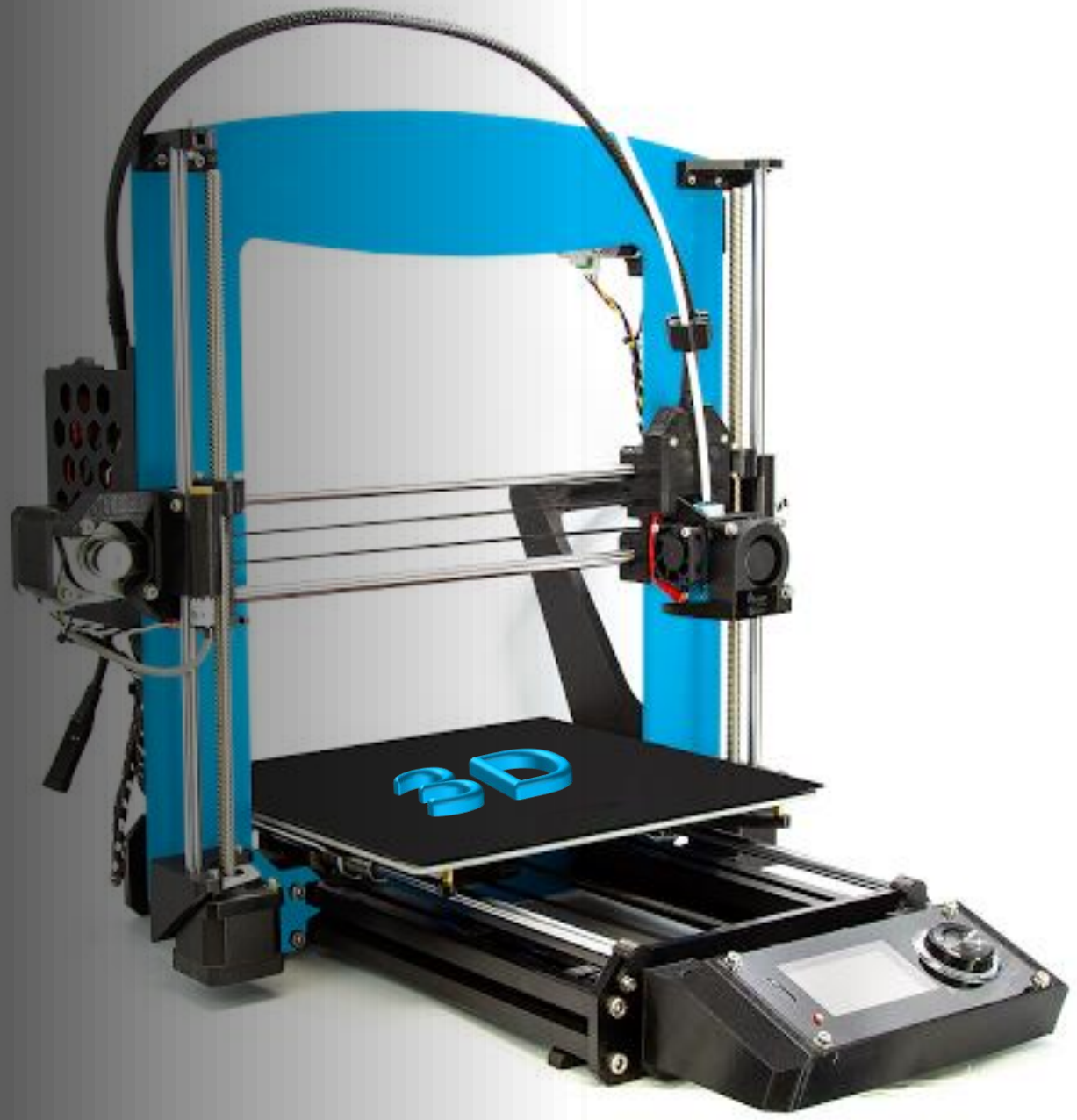


3D printing

- Process of building 3D objects from a computer-aided design models by adding material layer by layer – additive manufacturing
- 3D printers mostly print plastic materials, but they can also work with metals, ceramics or even eatable materials

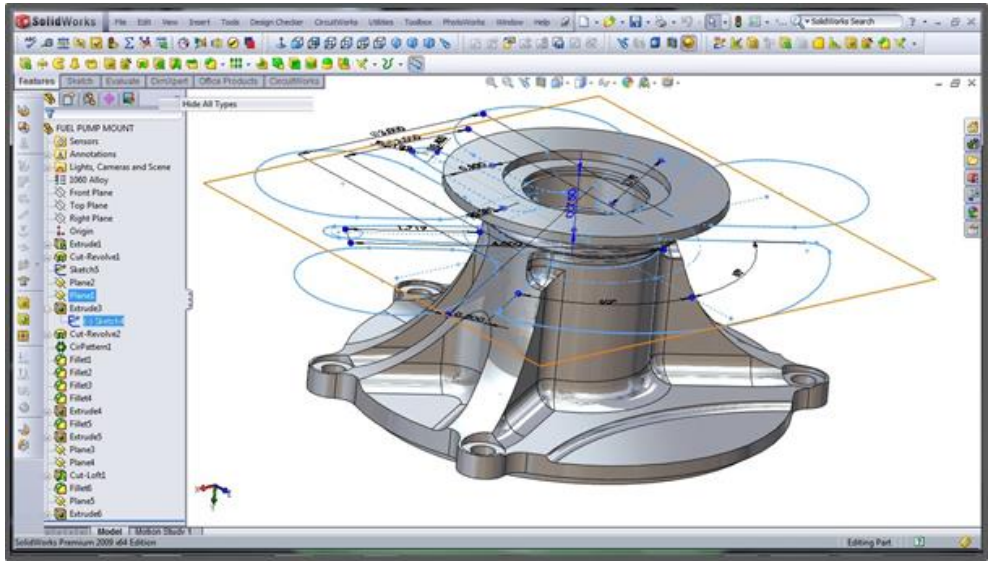
Very little history

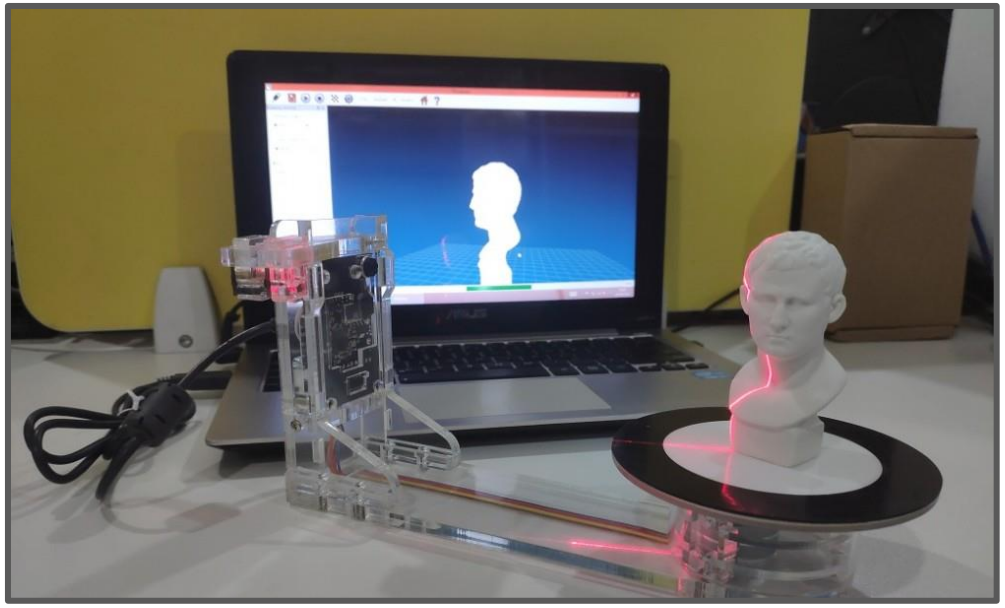
- 1974 - first concept
- 1984 - first principle patented
- 1986 - first commercial 3D printer
- 1988 - FDM developed
- 1990s - metal printing
- 2000s - breakthroughs in healthcare
- since 2007 - commercialization

2014 - first multi-colour, multi-material 3D printer on the market

Process

1. Modeling
   - Computer-aided design package
   - 3D scanner
   - Digital camera and photogrammetry software
   - Internet



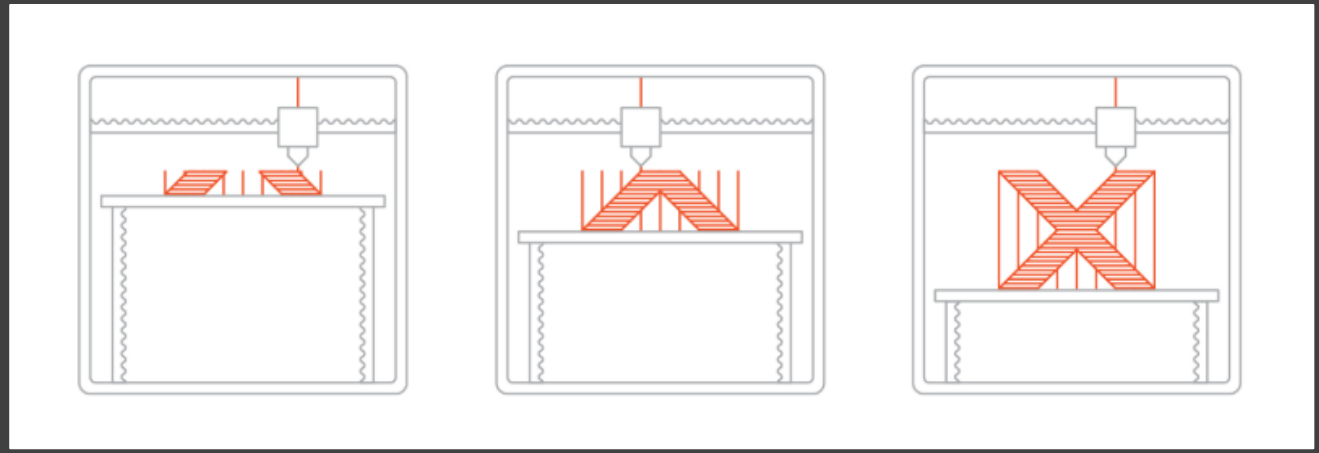


Process

2. Preparation
   - Fixing mistakes
   - ‘Slicer’ converts the model into a series of layers and produces a G-code
   - Layer thickness: 100 micrometers (up to 16 µm)
   - 3D dots (voxels) are 50 to 100 µm in diameter

Process

3. Printing
   - Vat polymerization
   - Material jetting
   - Binder jetting
   - Powder bed fusion
   - Material extrusion (FDM)
   - Directed energy deposition
   - Sheet lamination



Process

4. Finishing
   - Removing the extra layer
   - Removing supporting constructions
   - Cutting off the base
   - Polishing, smoothening

Fields of use

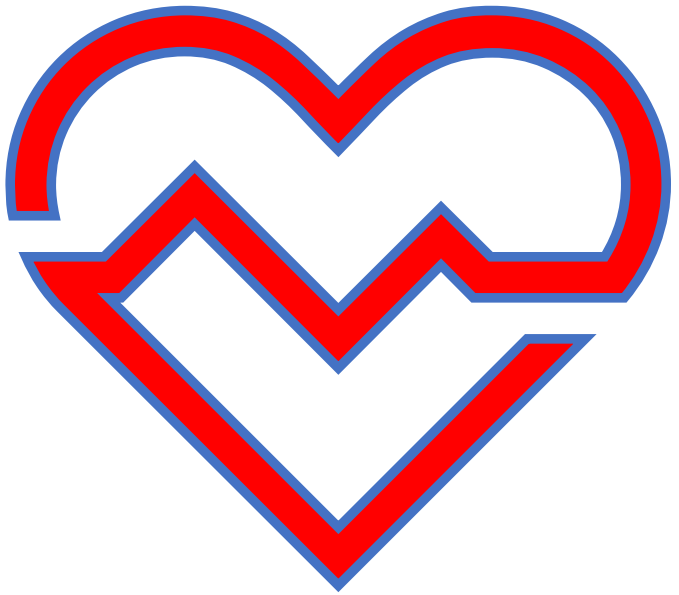
- Machinery industry
- Healthcare
- Food industry (decorations, NASA)
- Architecture
- Art
- At home

The biggest projects

- Coral reef regeneration
- Social housing in The Netherlands
- Formula 1 car parts

APPLICATIONS IN HEALTHCARE

- Surgery preparation assisted by the use of 3D printed models
- 3D printing of surgical instruments
- Custom-made prosthetics using 3D printing
- Bioprinting tissues and organoids



Conclusion

Positives

- Speed of production
- Cost
- Precision resulting in better quality
- Product testing
- Personalization
- Unlimited shapes
- Mixing materials
- Sterility
- Less waste
- Risk reduction

Negatives

- Energy consumption
- Limited materials
- Reliance on plastic
- Speed of production
- Cost
- Copyright infringements
- Misuse for crime
- Emissions
- Job losses

THE END

(thank you for your attention)