Print-and-Play Fabrication

3D-printed Interactive Objects Without Assembly or Calibration

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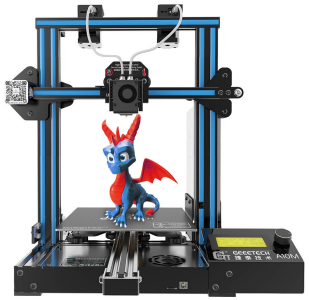
The first 3D printer: The SLA-1 from 3D Systems



Passive

Can't be interacted with

Previous Work

Previous Work

- Requires engineering expertise:
  - Assembly of parts
  - Assembly of circuits
  - Calibration of models

Print-and-Play Fabrication

Print-and-Play Fabrication

- Printed, not assembled.
- Lowering the difficulty.
  - Increase adoption.

Print-and-Play Fabrication

- No assembly of parts or circuits.
- No calibration.
- Minimal disruption of original geometry.

Print-and-Play Fabrication

- Well-studied concepts (e.g. acoustic resonance, fluid dynamics).
- Structures that leverage these concepts.

Print-and-Play Fabrication

- Benefits:
  - Only internal structures are modified.
  - Mathematical equations, or pre-trained models.

Print-and-Play Fabrication

Blowhole
GI '18

AirTouch
CHI '20

Blowhole

Blowing-Activated Tags for Interactive 3D-Printed Models

- Resonant, spherical cavities, with tubular openings.
- Variations in tube length, and cavity volume, vary the resonant frequency.
- Printed as a single structure.
- Use mathematical equation to identify interactions.

Blowhole
GI '18

Blowhole

Blowing-Activated Tags for Interactive 3D-Printed Models

- Susceptible to external, acoustic interference.
- Only 6 locations.

Blowhole
GI '18

AirTouch

3D-printed Touch-Sensitive Objects Using Pneumatic Sensing

- Pneumatic sensing.
- Flow distribution structure.
- From compressed air source to outlets in the surface.
- Outlets from 0.65 to 1.5mm in diameter.

AirTouch
CHI '20

AirTouch

3D-printed Touch-Sensitive Objects Using Pneumatic Sensing

- Covering each causes an identifiable pressure increase.
- Printed as a single structure.
- Uses pre-trained machine learning models to identify interactions.

AirTouch
CHI '20

Ongoing Work

Ongoing Work

- Embed computation on fabricated objects.
  - Reduce the need for assembling circuits.
- First steps: Logic gates.
- Physical toolkit for experimenting.
- Embed resulting design inside a 3D-model.

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