BLOW-UP PRINT:
RAPIDLY 3D PRINTING INFLATABLE OBJECTS IN THE COMPRESSED STATE

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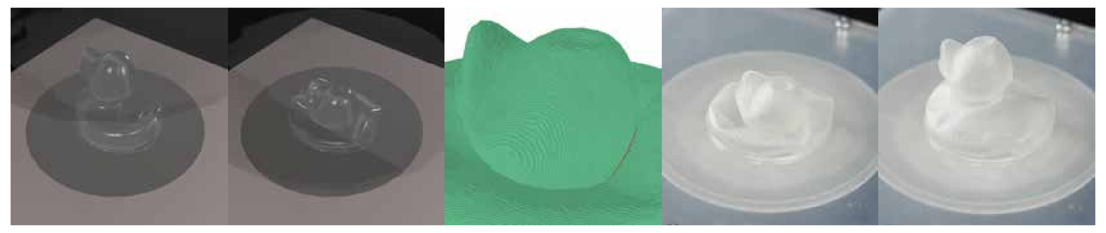
SIGGRAPH 2022
VANCOUVER+ 8-11 AUG

PROBLEM

- 3D printing is becoming a widely used technology not only for prototyping but for industrial fabrication.
- People generally suffer from longer printing time, support material consumption, and/or storage space as a printed object gets bigger.
- We propose the method to save time, support material, and storage space.

METHOD

1. Squashing by elastic simulation: press the mesh with a virtual panel
2. Solidification in voxel space
3. Unintentional contact reduction: check neighboring voxels
4. 3D printing
5. Inflation

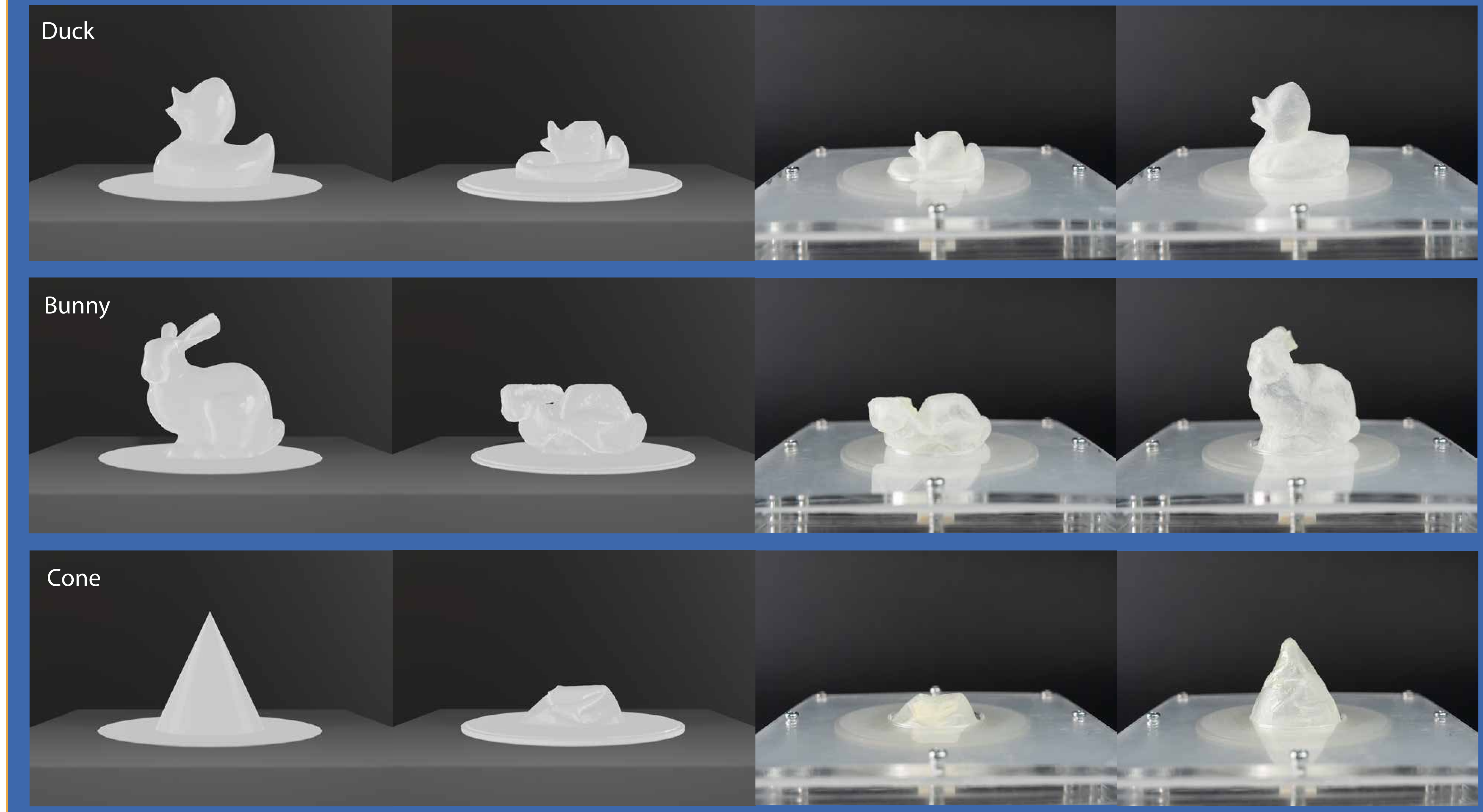


RESULTS

- Printed a duck, Stanford Bunny, and a cone with our method and all these three achieved similar shapes in less time and with less support material.
- Observed a few thin and vulnerable parts, and unintentionally connected surfaces, which can yield a low reproduction.

	height	support material	print time
Duck	5.6 cm ▸ 3.3 cm	170 g ▸ 120 g	8 h 10 m ▸ 5 h 00 m
Bunny	7.7 cm ▸ 3.9 cm	280 g ▸ 190 g	12 h 00 m ▸ 7 h 10 m
Cone	6.1 cm ▸ 2.2 cm	150 g ▸ 100 g	7 h 00 m ▸ 3 h 50 m

LESS TIME & LESS MATERIAL 3D PRINTING CAN BE ACHIEVED BY SQUASHING A TARGET 3D MODEL IN SIMULATION AND RESTORE THE ORIGINAL SHAPE BY INFLATION IN THE REAL WORLD.



SQUASH ▸ PRINT ▸ INFLATE

OUR APPROACH

- Presents a novel approach for rapid 3D printing.
- Elastic simulation allows us to squash arbitrary shapes to save time, material, and storage space.
- Further improvements in elasticity simulation and collision resolution

RELATED WORK

- Recent work establishes a way to 3D-print objects in a folded state [1] or telescoping structure [2].
- Also, inverse design of pneumatically actuated inflatables, such as planar channels [3] or balloons [4], have been explored.

REFERENCES

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ACKNOWLEDGEMENTS

This work was partially supported by JST CREST Grant Number JPMJCR17A1, Japan, JST ERATO Grant Number JPMJER1501, Japan, and Value Exchange Engineering, a joint research project between Mercari, Inc. and the RIISE.

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