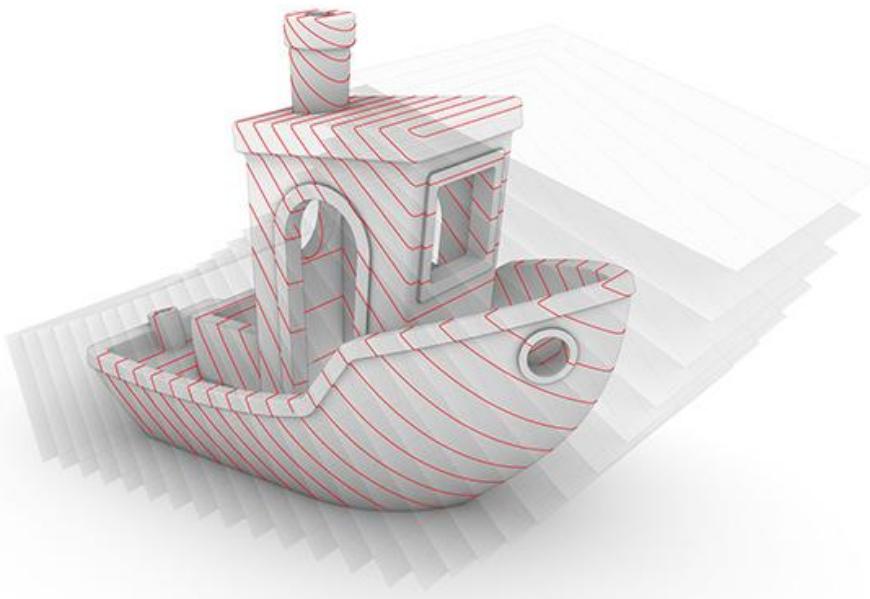


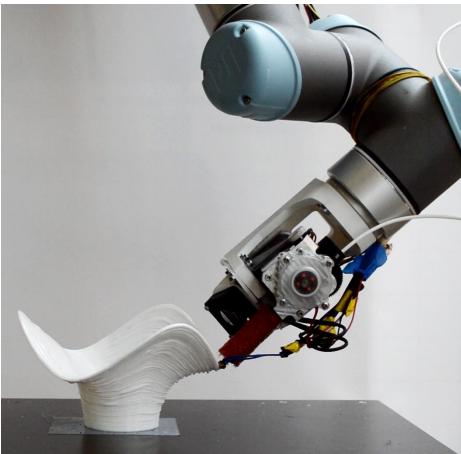
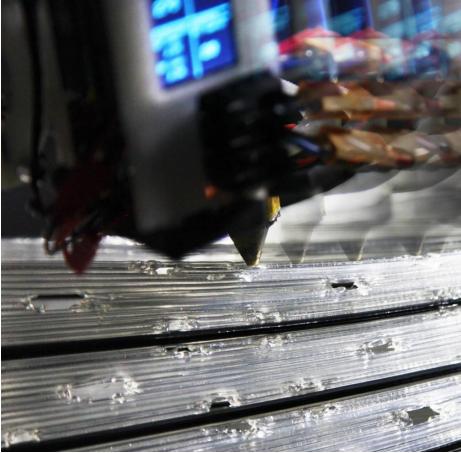
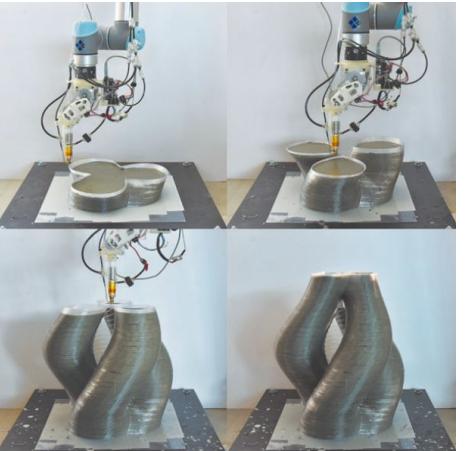


This lecture will be recorded

COMPAS SLICER



Motivation



Concrete extrusion, MAS Dfab, Anton 2019. Foam printing, Martinez and Bedarf 2020. FDM printing for concrete casting, Barney, Yang and Burger, 2019. Print Paths Key-framing, Mitropoulou 2020, Composite printing Y.Jeong, Lin and Hyunchul 2018



Eggshell, Burger et al., 2019.



Print Paths Key-framing, Mitropoulou et al. 2020

Scope

- Robotic Fused Deposition Modeling (FDM)
 - Desktop FDM
 - Planar print path generation
 - Non-planar print path generation
 - Single-shell printing
-
- Open Source
 - Easy to modify
 - CAD software independent

Overview

Geometry

Slicers

Visualization

Print organizers

Geometry



Layer

```
self.paths = []
self.is_brim = False
self.number_of_brim_offsets = 0
self.is_raft = False
```



Path

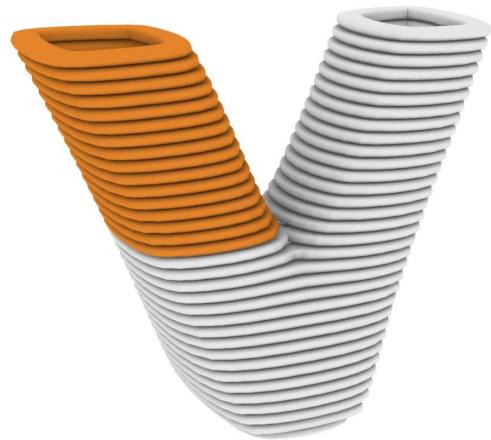
```
self.points = []
self.is_closed = True
```



PrintPoint

```
self.pt = Point(x, y, z)
self.layer_height = 1.00
self.mesh_normal = Vector(0, 0, 1)
self.up_vector = Vector(0, 0, 1)
self.frame = Frame(Point, Vec, Vec)
self.extruder_toggle = True
self.velocity = 50
self.wait_time = 0
```

Geometry



VerticalLayer

```
self.paths = []
self.is_brim = False
self.number_of_brim_offsets = 0
self.is_raft = False

self.id = 3
```



Path

```
self.points = []
self.is_closed = True
```



PrintPoint

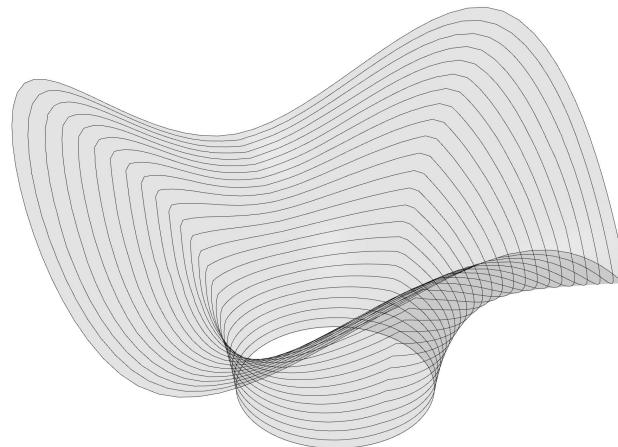
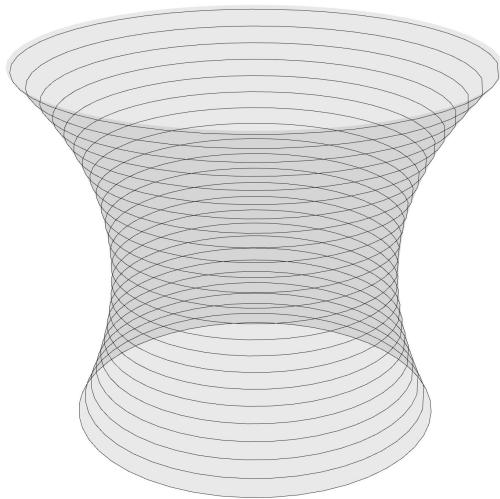
```
self.pt = Point(x, y, z)
self.layer_height = 1.00
self.mesh_normal = Vector(0, 0, 1)
self.up_vector = Vector(0, 0, 1)
self.frame = Frame(Point, Vec, Vec)
self.extruder_toggle = True
self.velocity = 50
self.wait_time = 0
```

Slicers

INPUT: Mesh (.stl/.obj)

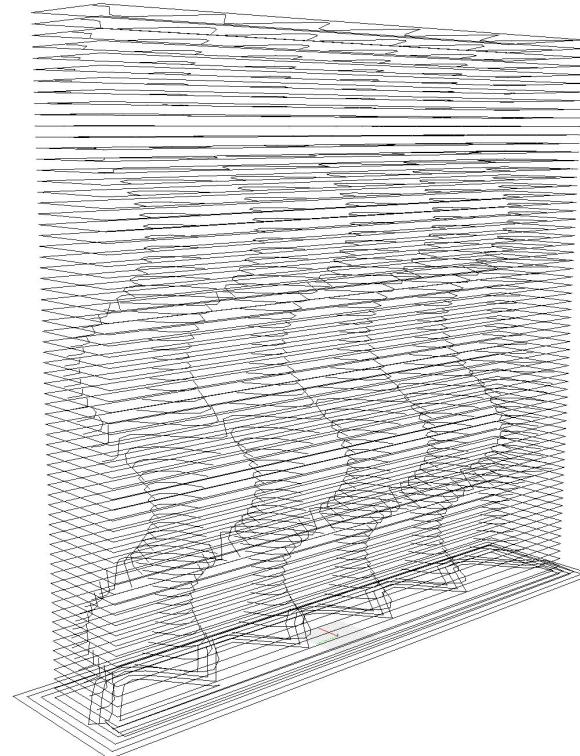
>

OUTPUT: Print paths (`compas_slicer.geometry.Path`)



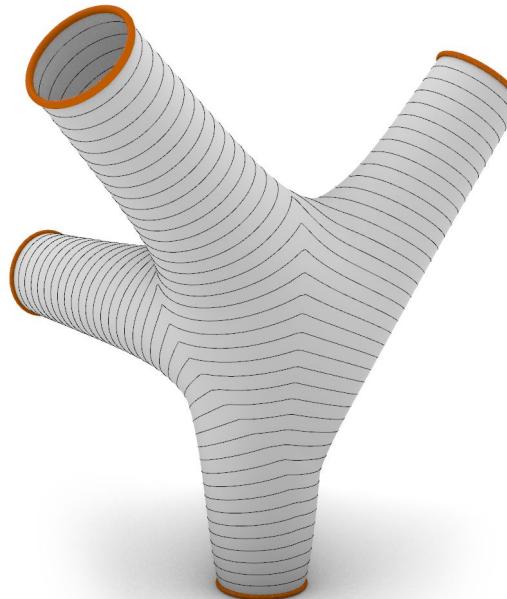
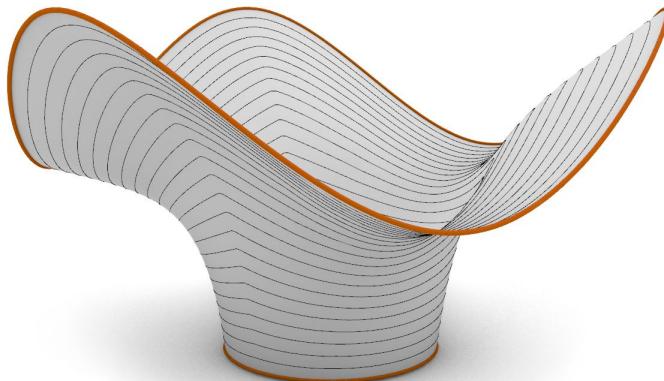
Slicers

Planar slicer



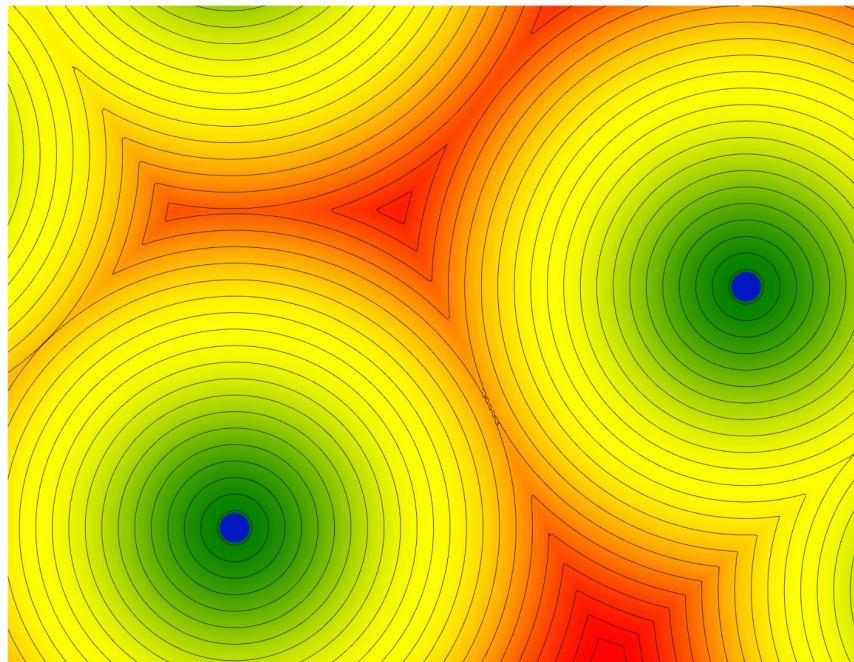
Slicers

Interpolation slicer



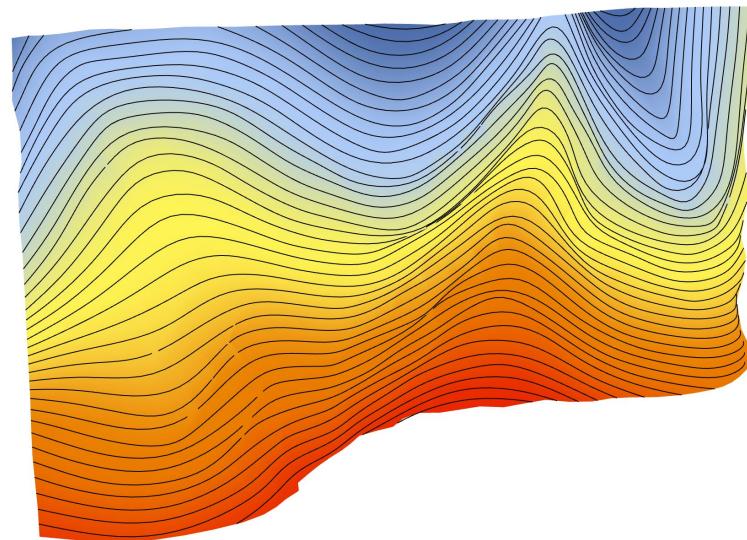
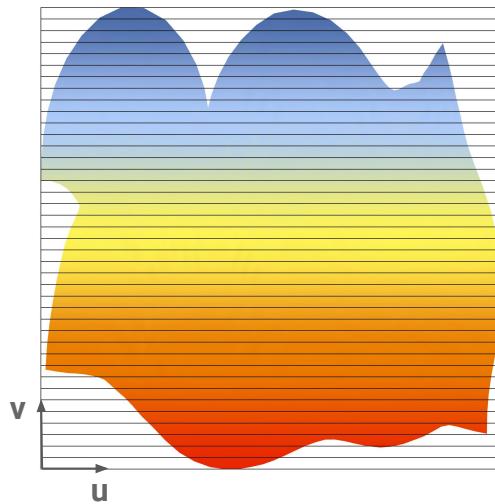
Slicers

Scalar field slicer



Slicers

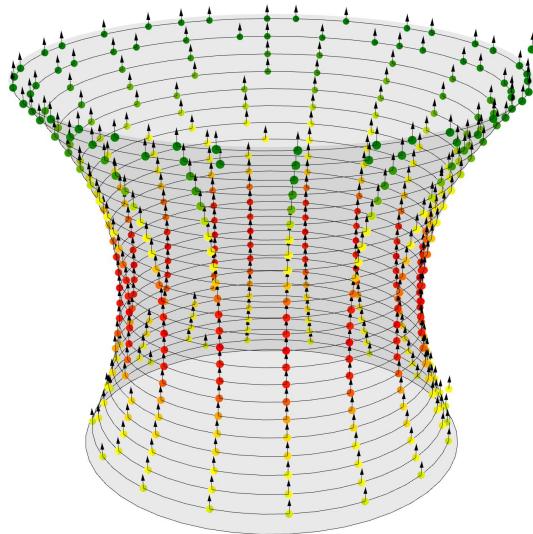
UV slicer



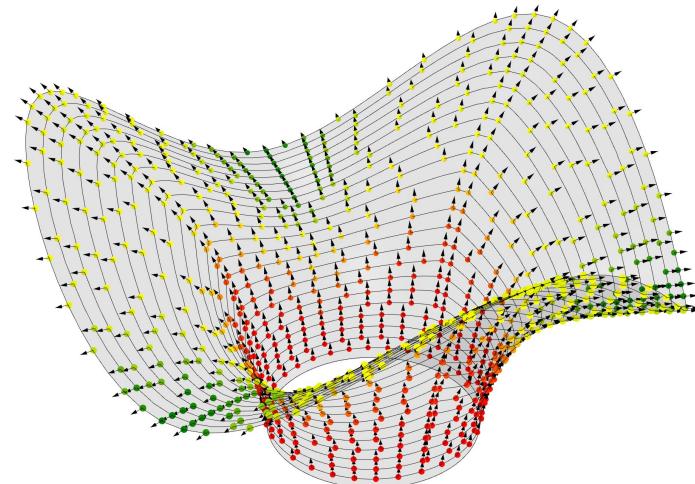
Print organizer

INPUT: Print path (polylines) >

OUTPUT: Print Points

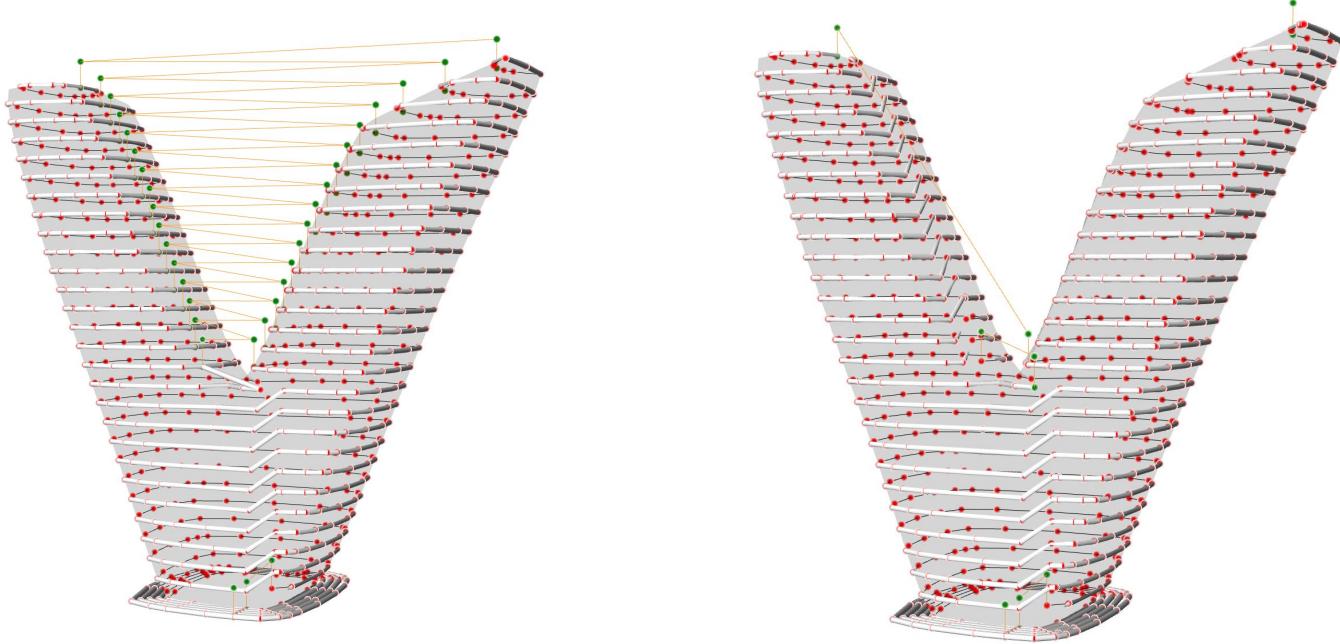


Planar print organization

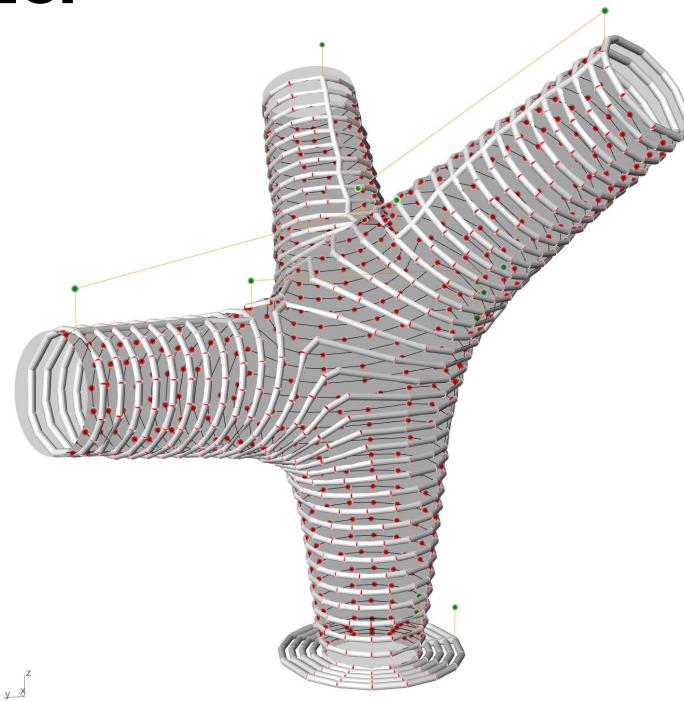


Non-planar print organization

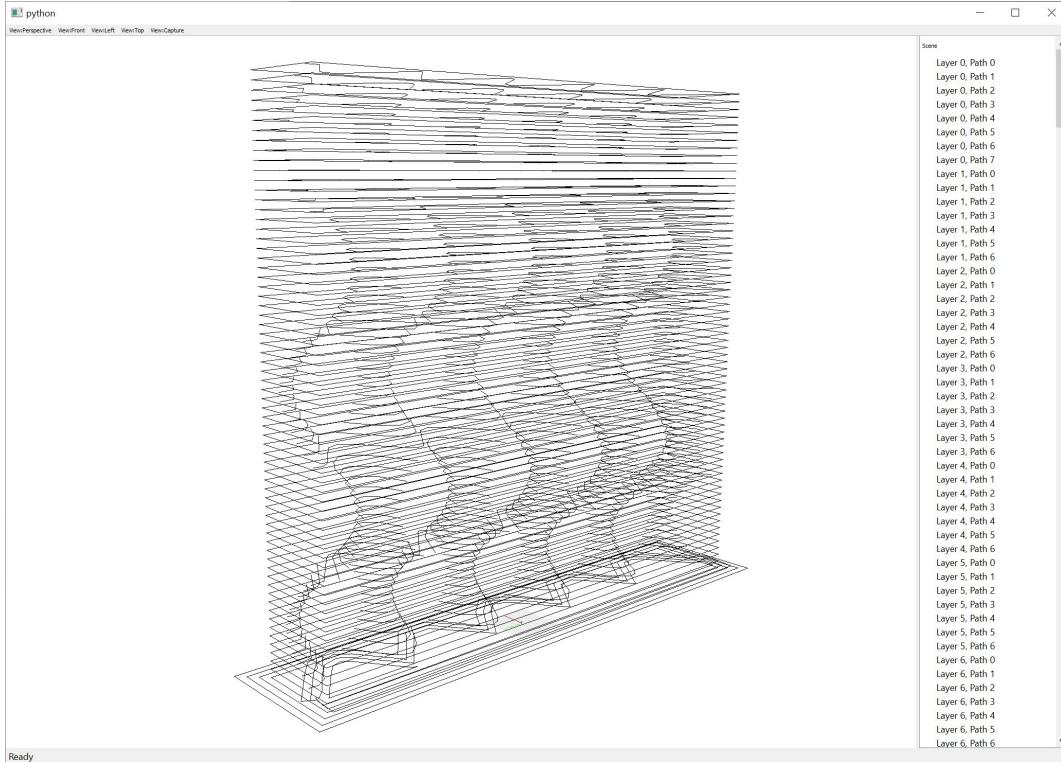
Print organizer



Print organizer

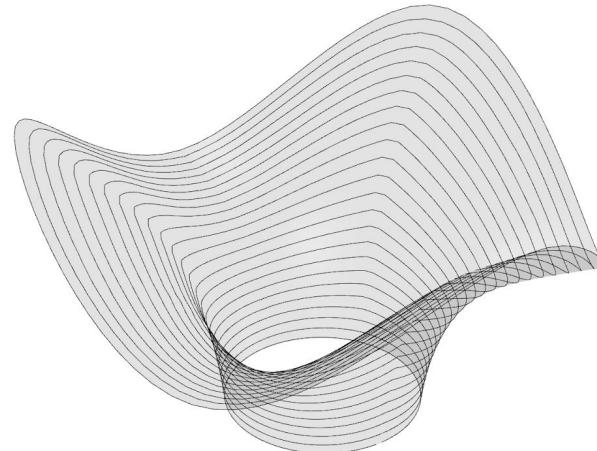
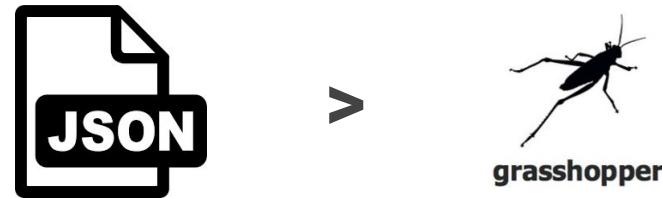
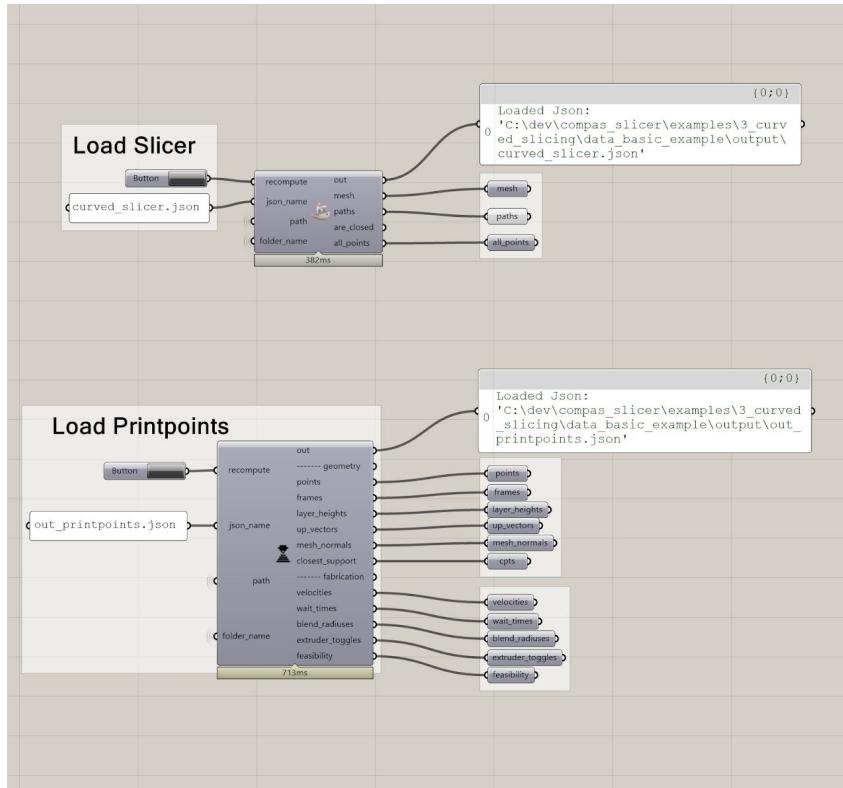


Visualization

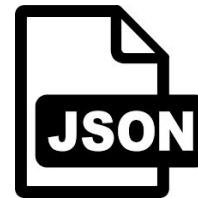


COMPAS VIEWERS

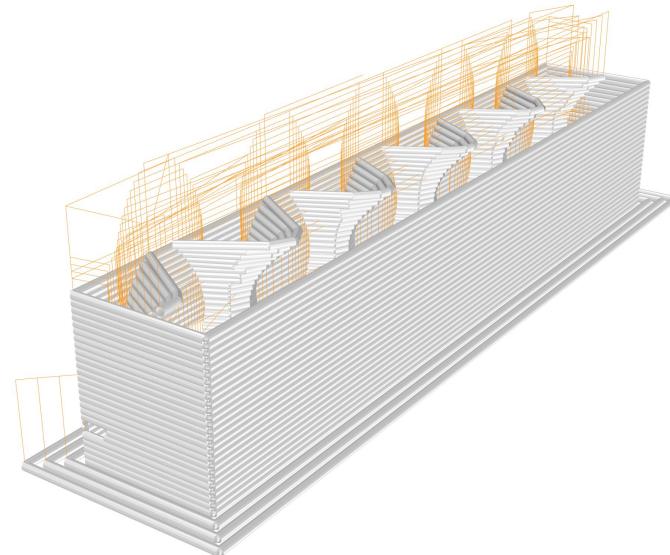
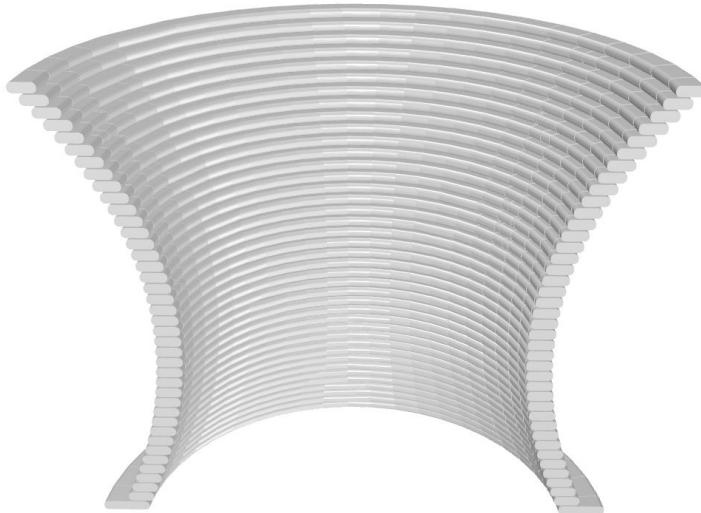
Visualization



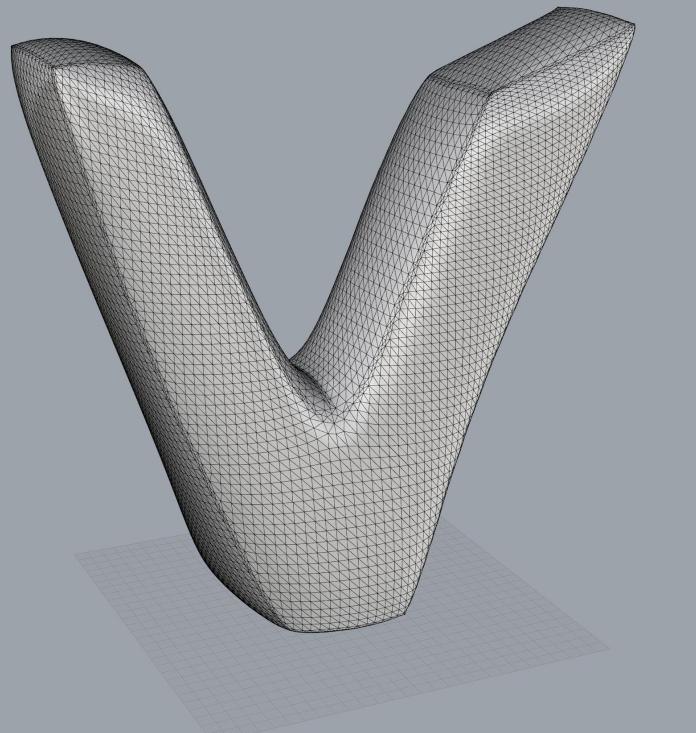
Visualization



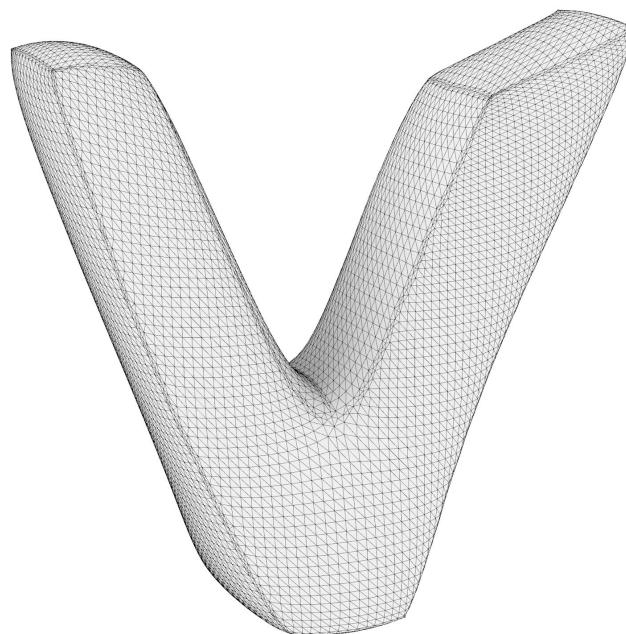
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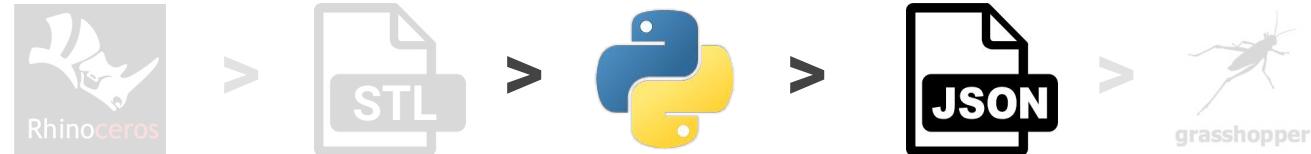
Workflow



Workflow



Workflow



```
compas_mesh = Mesh.from_stl(os.path.join(DATA, MODEL))

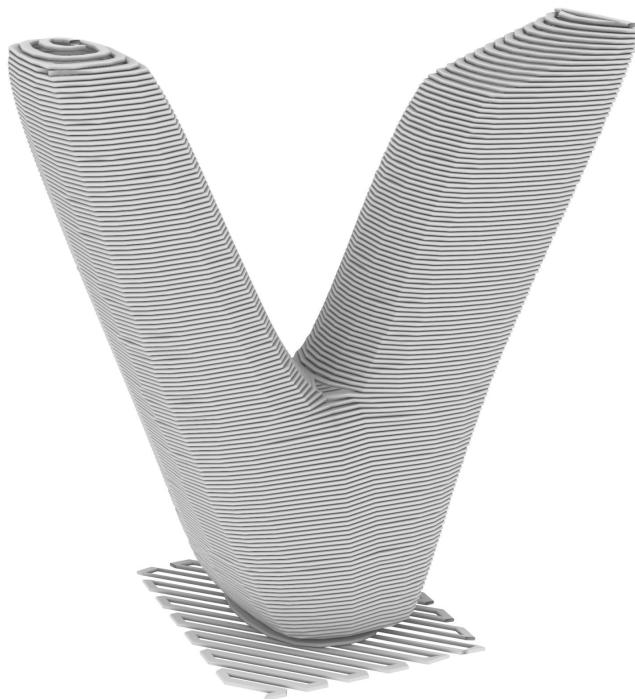
slicer = PlanarSlicer(compas_mesh, slicer_type="cgal", layer_height=1.5)

slicer.slice_model()

generate_raft(slicer,
              raft_offset=20,
              distance_between_paths=5,
              direction="xy_diagonal",
              raft_layers=1)

save_to_json(slicer.to_data(), OUTPUT_DIR, 'slicer_data.json')
```

Workflow



Workflow



```
compas_mesh = Mesh.from_stl(os.path.join(DATA, MODEL))

slicer = PlanarSlicer(compas_mesh, slicer_type="cgal", layer_height=1.5)

slicer.slice_model()

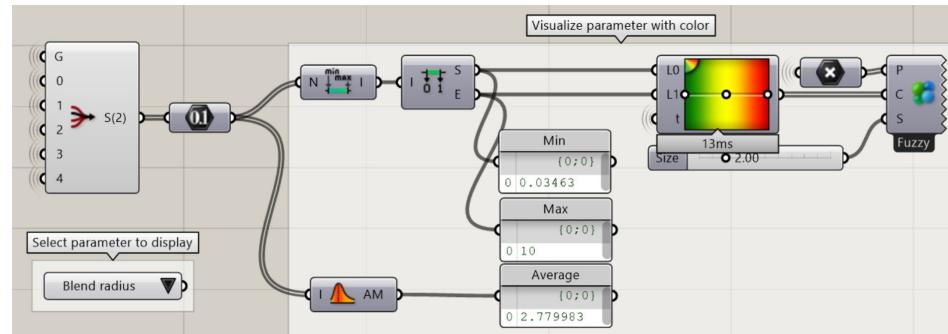
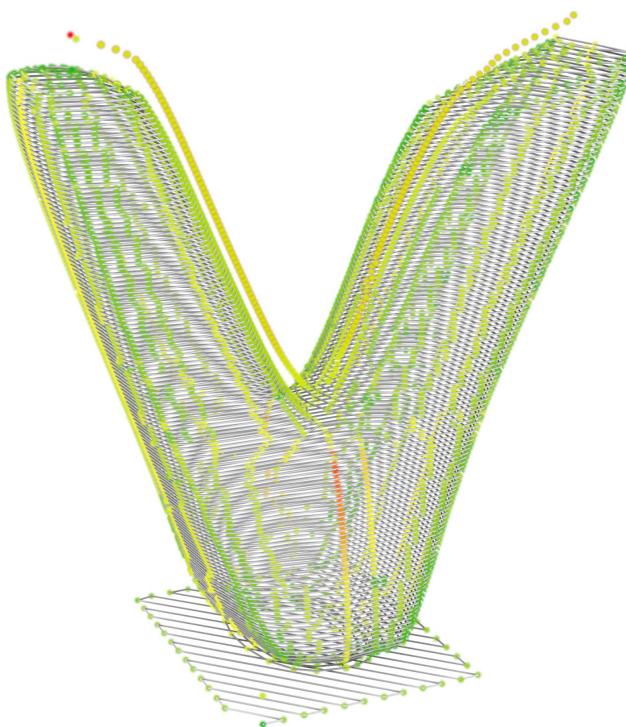
generate_brim(slicer, layer_width=3.0, number_of_brim_offsets=10)

save_to_json(slicer.to_data(), OUTPUT_DIR, 'slicer_data.json')
```

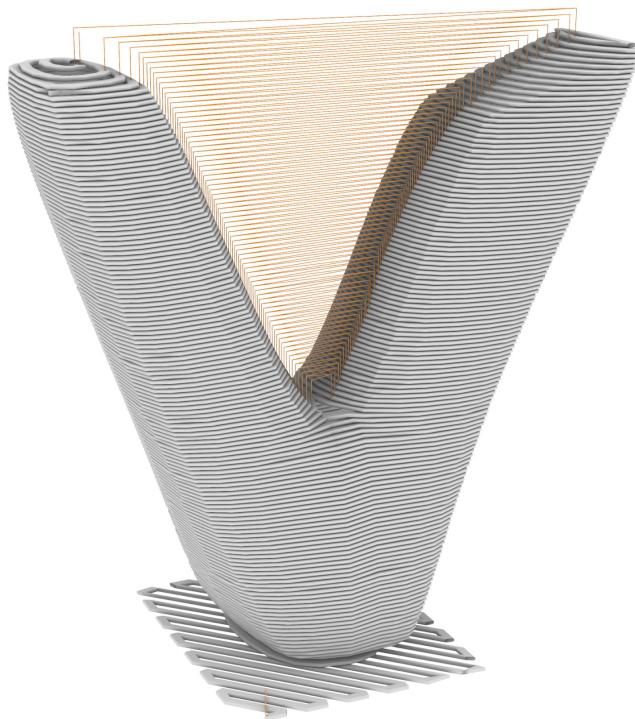
Workflow



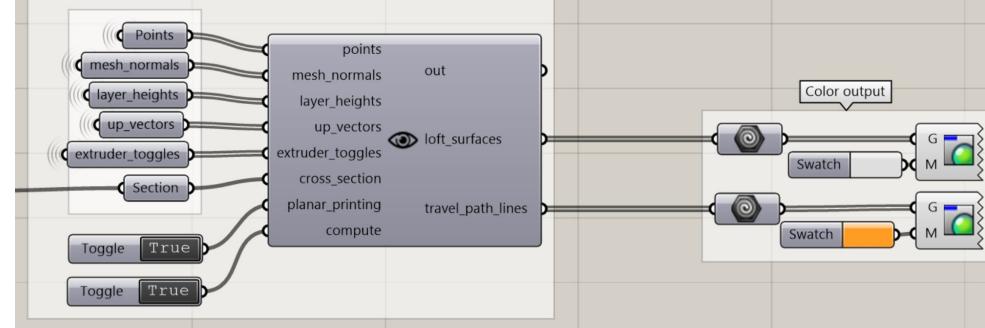
Workflow



Workflow



Render Path Visualization



Workflow



```
compas_mesh = Mesh.from_stl(os.path.join(DATA, MODEL))

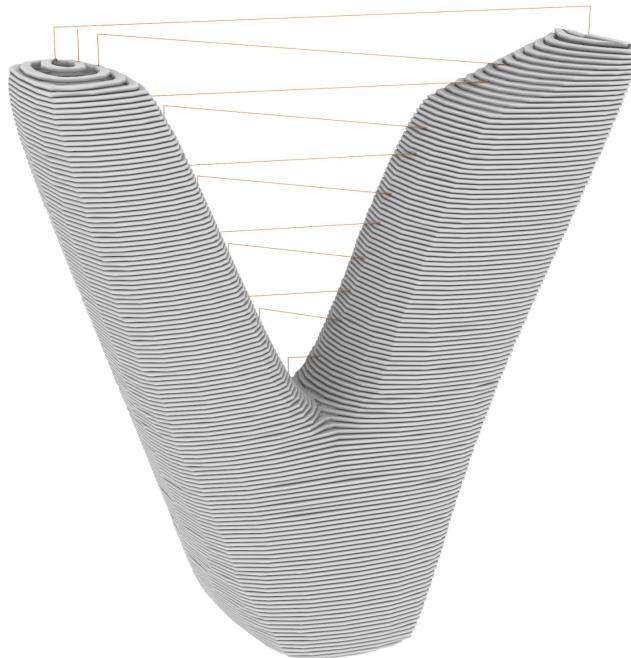
slicer = PlanarSlicer(compas_mesh, slicer_type="cgal", layer_height=1.5)

slicer.slice_model()

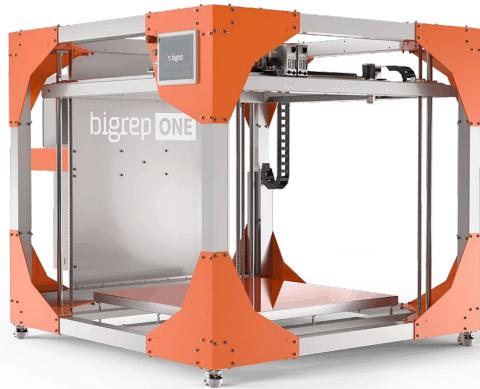
sort_into_vertical_layers(slicer, max_paths_per_layer=15)

save_to_json(slicer.to_data(), OUTPUT_DIR, 'slicer_data.json')
```

Workflow



Fabrication



Case studies

Eggshell



Design Freedom in Eggshell

MAS T3 Master Thesis

Antonio Barney & Wenqian Yang (2019)



A. Barney &
W. Yang
(2019)

Case studies

Eggshell



A. Barney &
W. Yang
(2019)

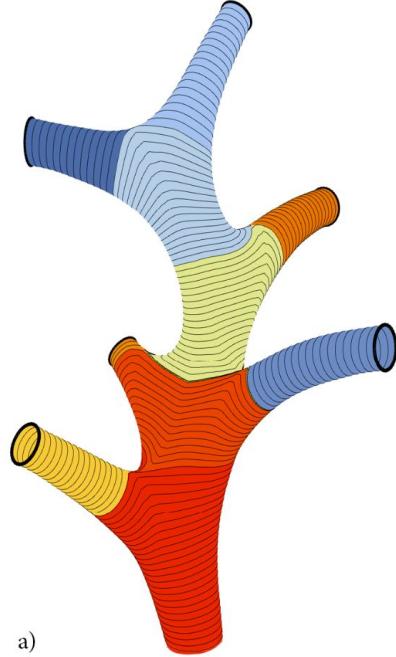
Case studies

Non-planar layered morphologies



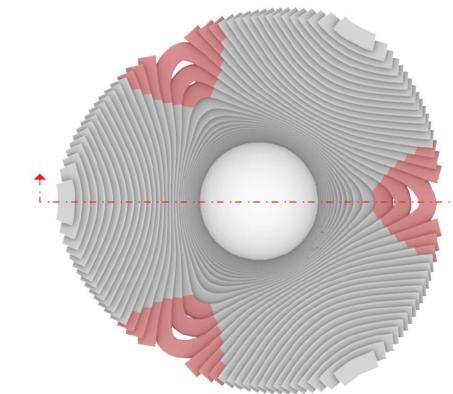
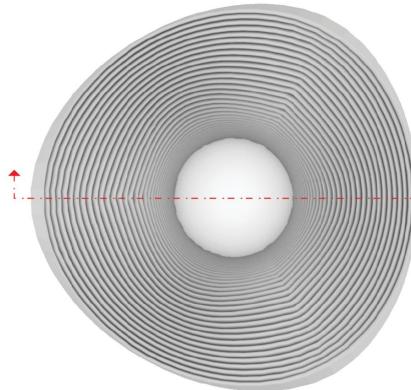
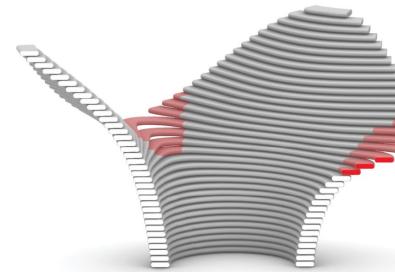
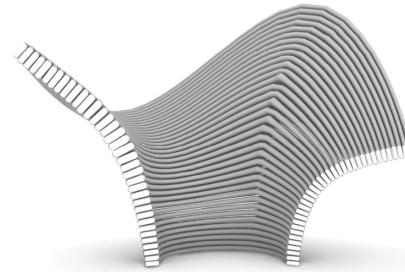
Case studies

Non-planar layered morphologies



Case studies

Non-planar layered morphologies



bugs



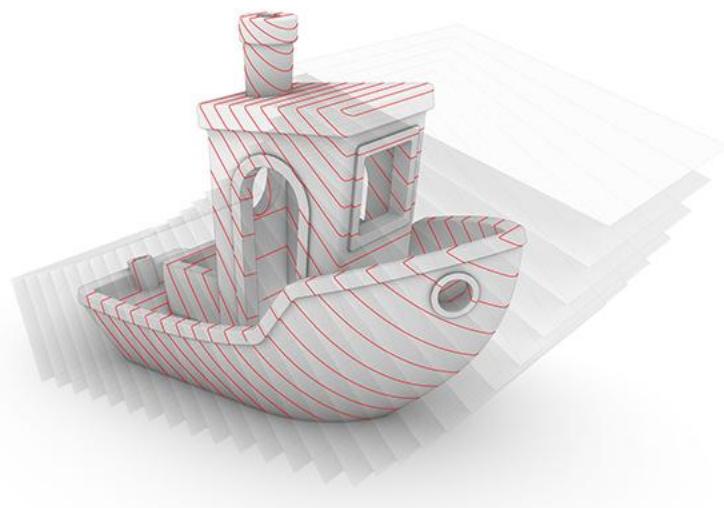
https://github.com/compas-dev/compas_slicer/issues

contributions



https://compas.dev/compas_slicer/

thank you



```
conda env update -f environment.yml
```