

3D Printed Static Animations

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Construct3D 2023, NYU Tandon: August 2, 2023

Joint work with Bernat Espigulé



ST. LAWRENCE UNIVERSITY

Land Acknowledgement

St. Lawrence University occupies the traditional lands of the Haudenosaunee Nations. We honor the heritage and existing cultures of the Haudenosaunee peoples, made up of the distinct nations that many now recognize as the Iroquois confederacy (Mohawk, Oneida, Onondaga, Cayuga, Seneca, and Tuscarora). While doing work in this space, we must acknowledge that our continued occupation of indigenous land can undermine our efforts at reparations to their communities.

Accompanying Files



<https://tinyurl.com/StaticAnimations>

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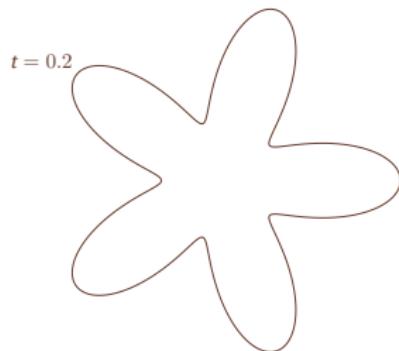
- An animation is a sequence of frames varying over time.
- Here is an animation of deforming polar flowers.
- In polar coordinates, the frames are given by the equations

$$r = 2 + t \cos(5\theta + 2\pi t)$$

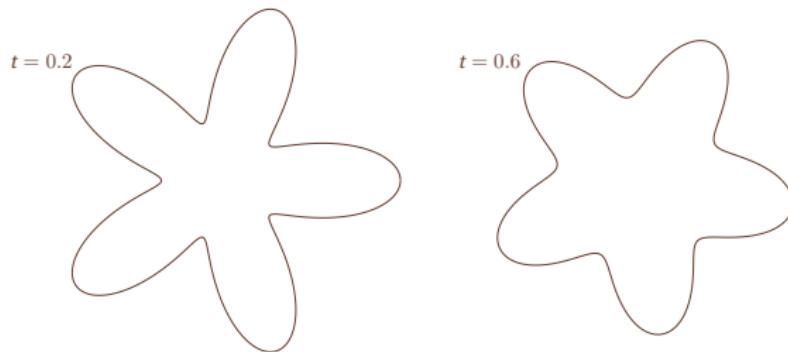
as t varies.

Let's extract a few of these frames...

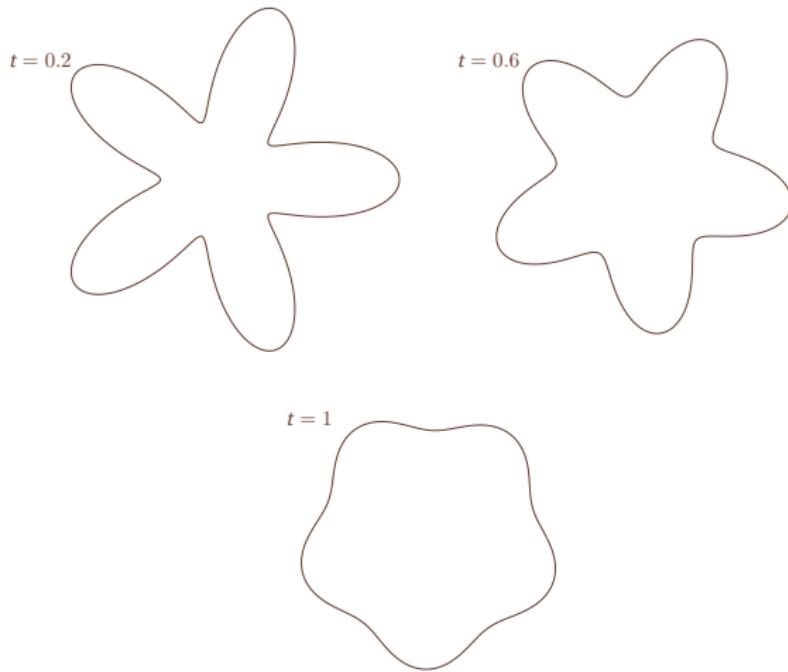
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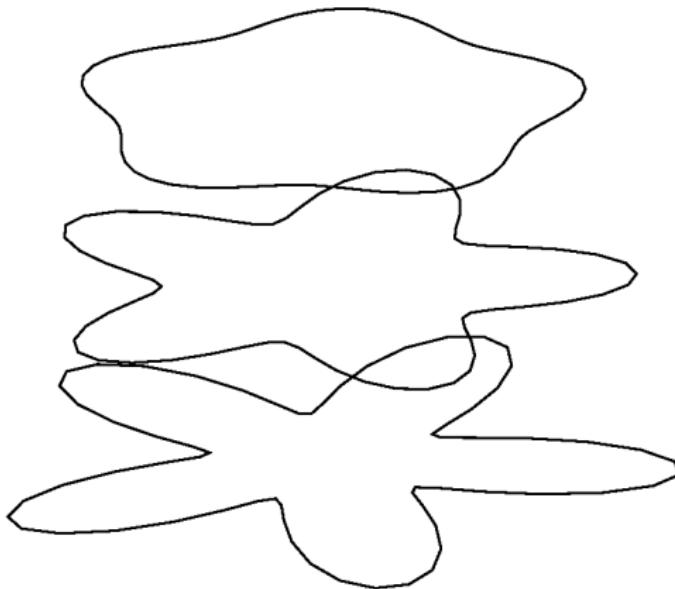
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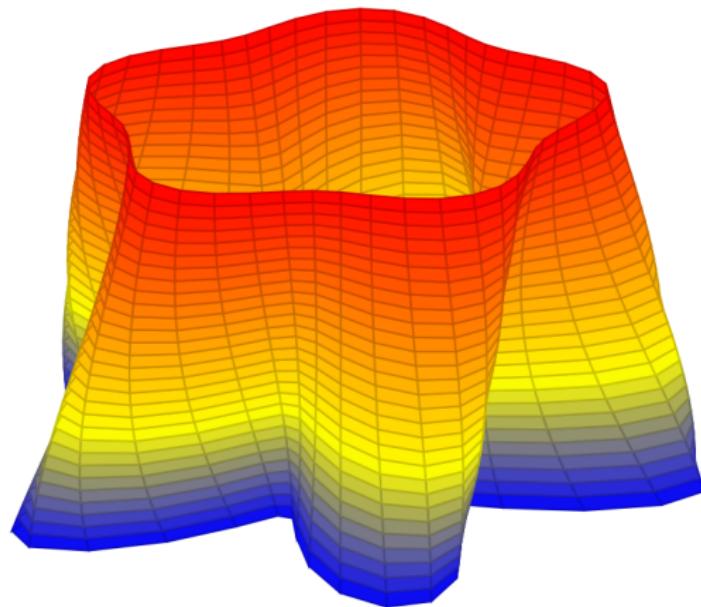
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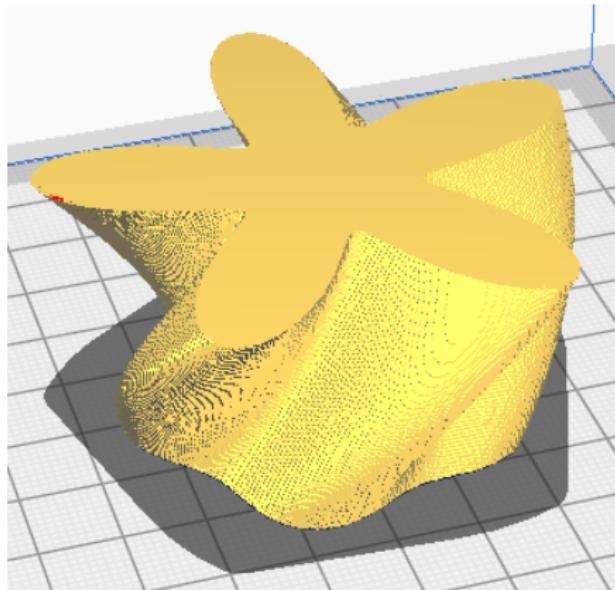
...align them vertically...



...fill in the rest...



...cap the top and bottom...



...and print it!



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The main idea is to feed a stack of 2D images to an open source medical and molecular visualization software called UCSF Chimera which will stitch them together into a 3D model.



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- Resize STL as desired (for example, in Cura).
- Slice and print!

Time to follow along!

- Install Chimera.
- Download the shared frames:

`flowers_1000.png`

`flowers_1001.png`

`:` `:` `:`

`flowers_1160.png`

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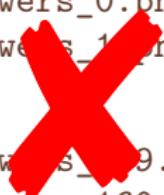
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- It will load the list on the right in the wrong order.
- To fix this, you can start counting at 100 with 2 digits worth of frames, 1000 with 3 digits worth of slides, etc.

A few details: On Color Schemes

The frames we used drew our polar stars as white on black.

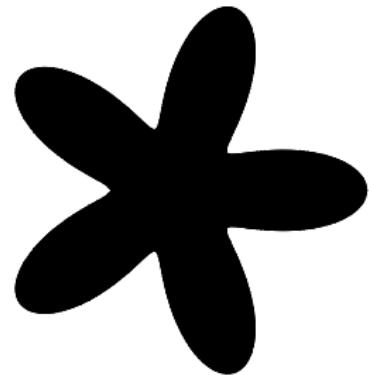
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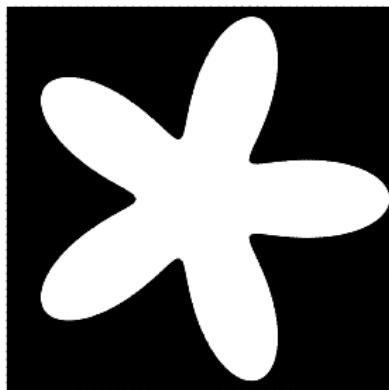
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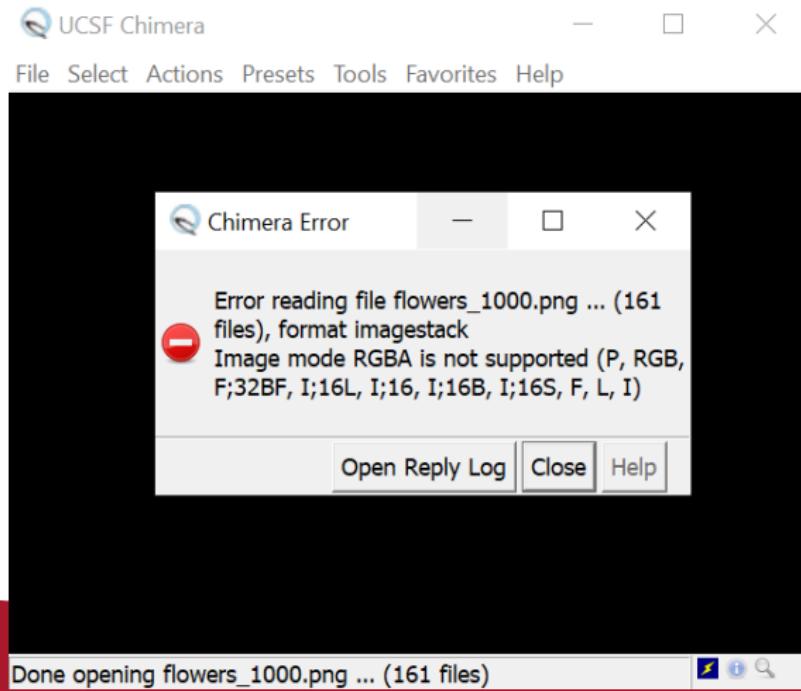
- Chimera reads white as solid, and black as empty space.
- (Think X-rays!)

A few details: Alpha Layers

When importing to Chimera you may get the following error message.

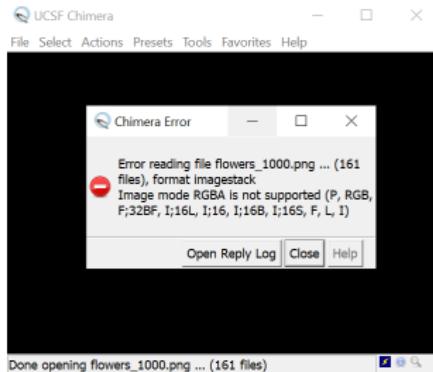
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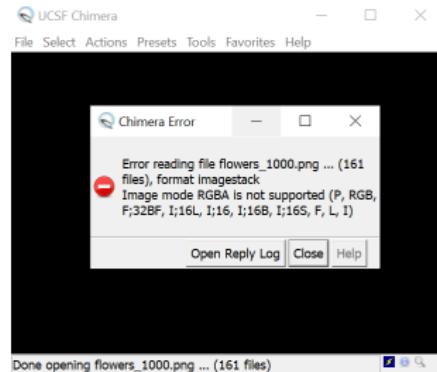
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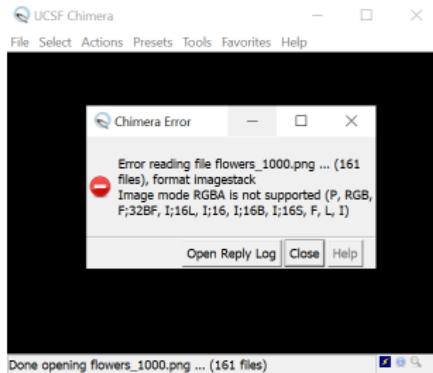
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- You must remove this layer. For example, using `alpha_remover.py` in the repository.

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- Keep this in mind when generating your images, and considering how many frames you'd like.
- If you want more resolution, you can make it too large and scale down in post production.
- Note: this can lead to very large files.

There are files on the repo!

Feel free to download and edit code on the repo. For example, frames and code for animations of Julia sets. Here again is the link.

<https://tinyurl.com/StaticAnimations>

Thank you!

