Infill Generation for PLA 3D Models

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Introduction

- Provide a new infill pattern not implemented by CURA or Bambu Studio

- Research current implemented infill patterns

- Slicer Implementation in Grasshopper/Rhino with ExtruderTurtle

- Test new infill pattern with a Tensile Stress
  - Compare results with existing patterns

Process - Design

- Paper sketches
  - Proof of concept
  - Logic Design

- Extruder Turtle
  - Prototyping
  - Experiment with Printer
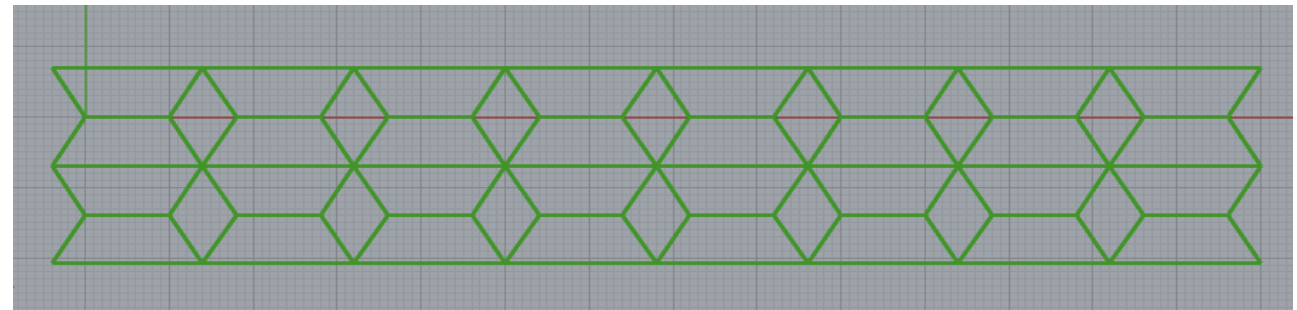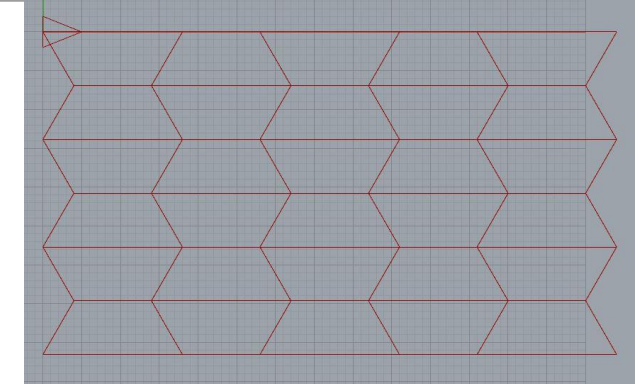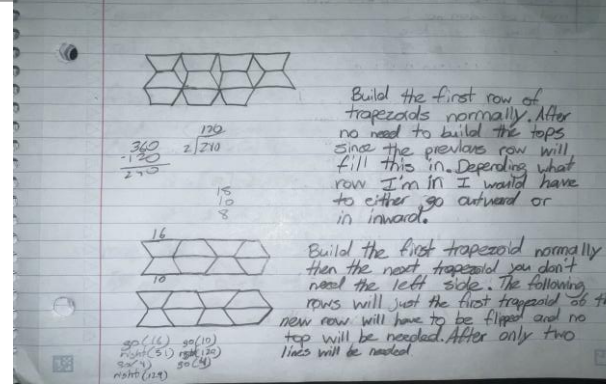
Process - Design

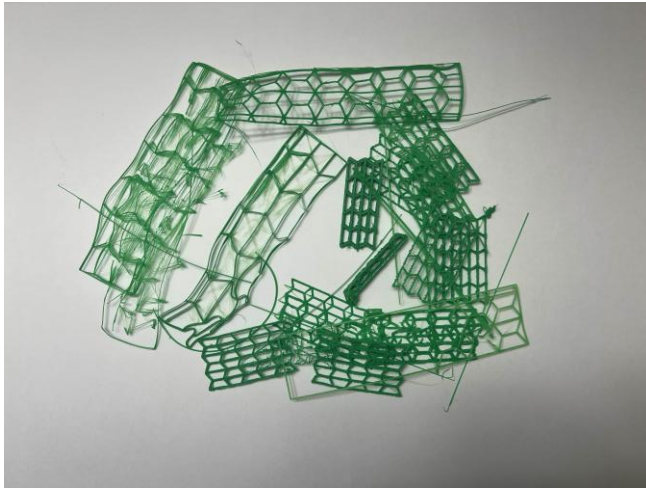- Lattice Intersection: CurveBrepIntersect() used to get lattice within model

- Toolpath Generation: Turtle traversal of adjacency list of infill edges defined by (start point, end point) at each layer.

Process – Challenges

- Filament smearing on layers

- Rhino/grasshopper doesn't know how to deal with intercepting lines.

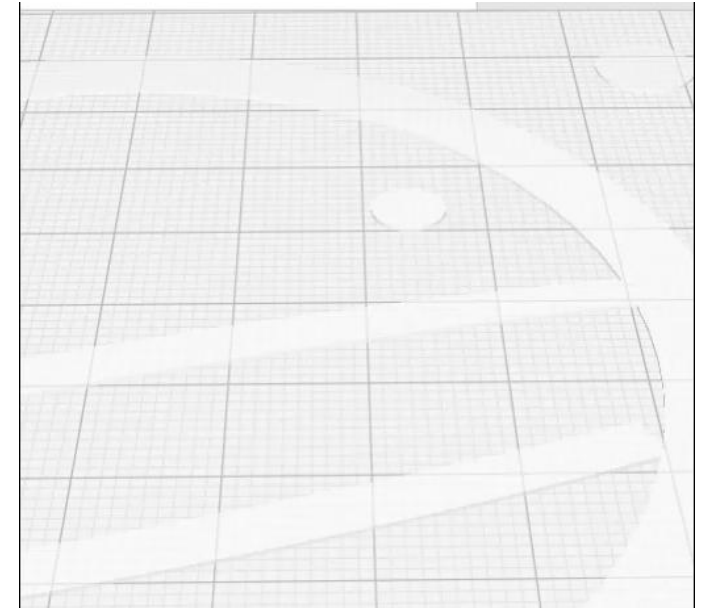- Infill generation for non-linear z-axis models

Outcome

- Two new infill patterns using trapezoids as the base shape

- Can integrate into shapes for printing

- Spacing between trapezoids added to structural strength

- Gyroid is crazy strong

- Rudimentary tool for custom infill patterns
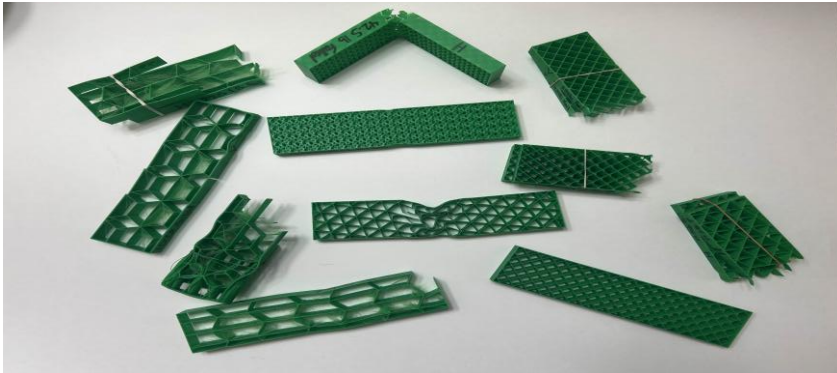
Name	Weight (grams)	Failure (lbs)
Grid H	23	25
Grid V	23	25
Triangle H	23	17.5
Triangle V	23	17.5 Deformation, 20 Failure
Gyroid H	23	42.5
Gyroid V	23	50 (Stop Point… No Break)
Trapezoid (No Gaps) H	20	22.5
Trapezoid (No Gaps) V	20	7.5
Trapezoid (Gaps) V	29	15
Trapezoid (Gaps) H	29	27.5

Future Work

1. Allow slicing for complex models

2. Optimizing toolpath generation for infill patterns
(Eularian Circuits/Paths)

3. Create infill patterns that introduce non-linear curves

THANK YOU

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