MECE 4606 DIGITAL MANUFACTURING

Lampshade Lattice

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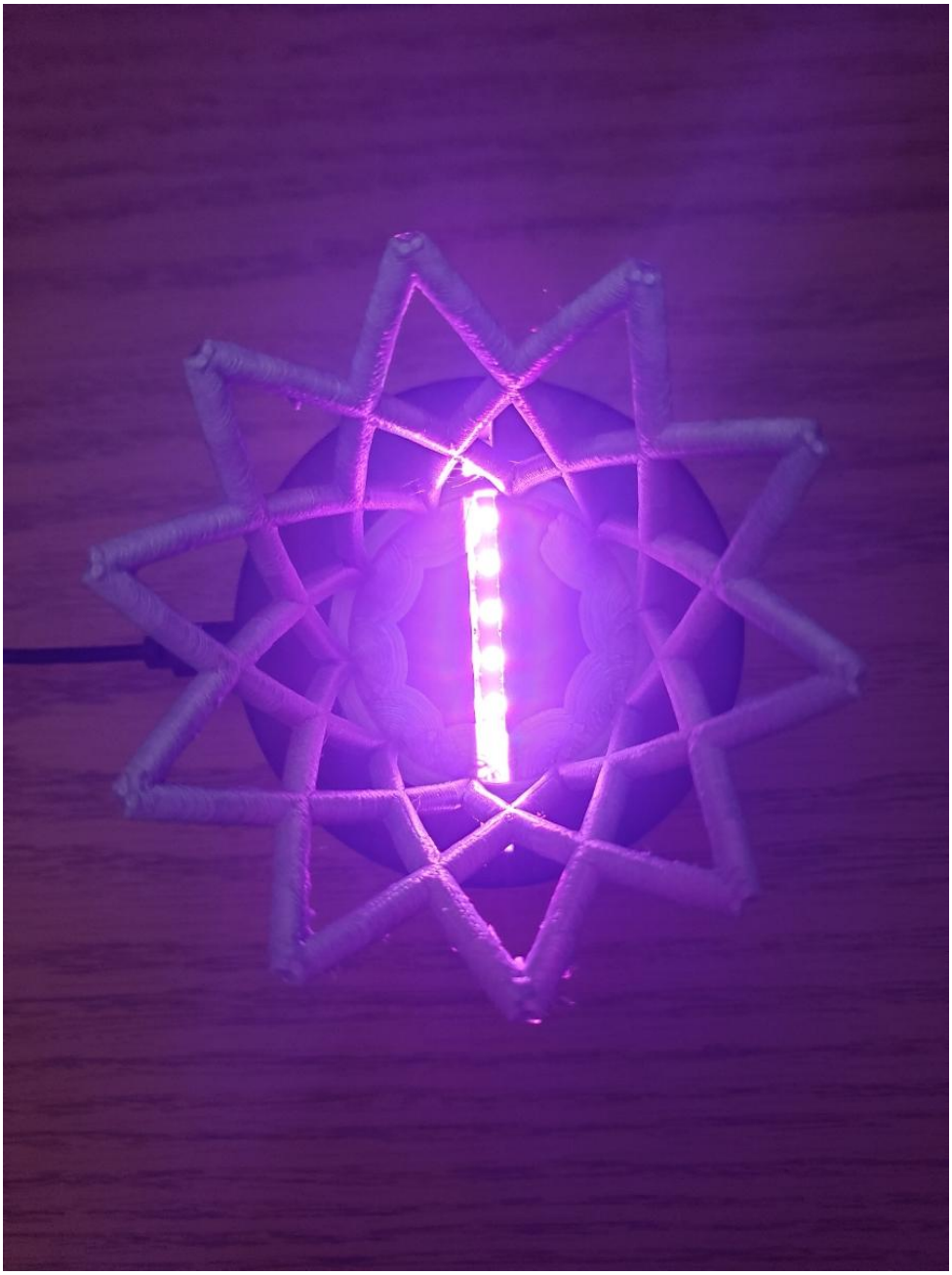
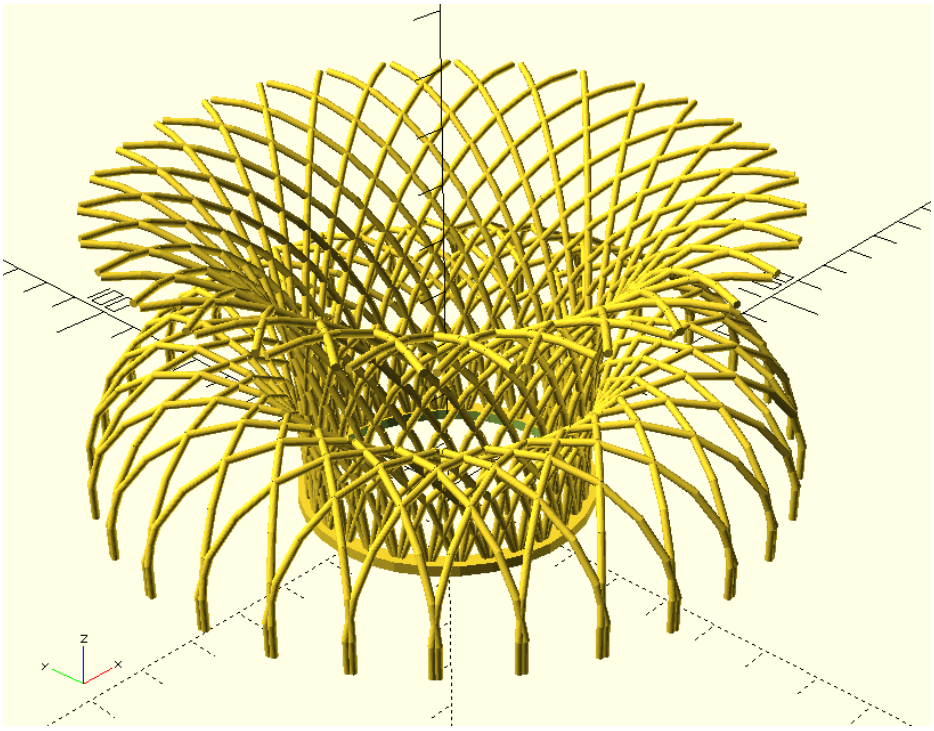
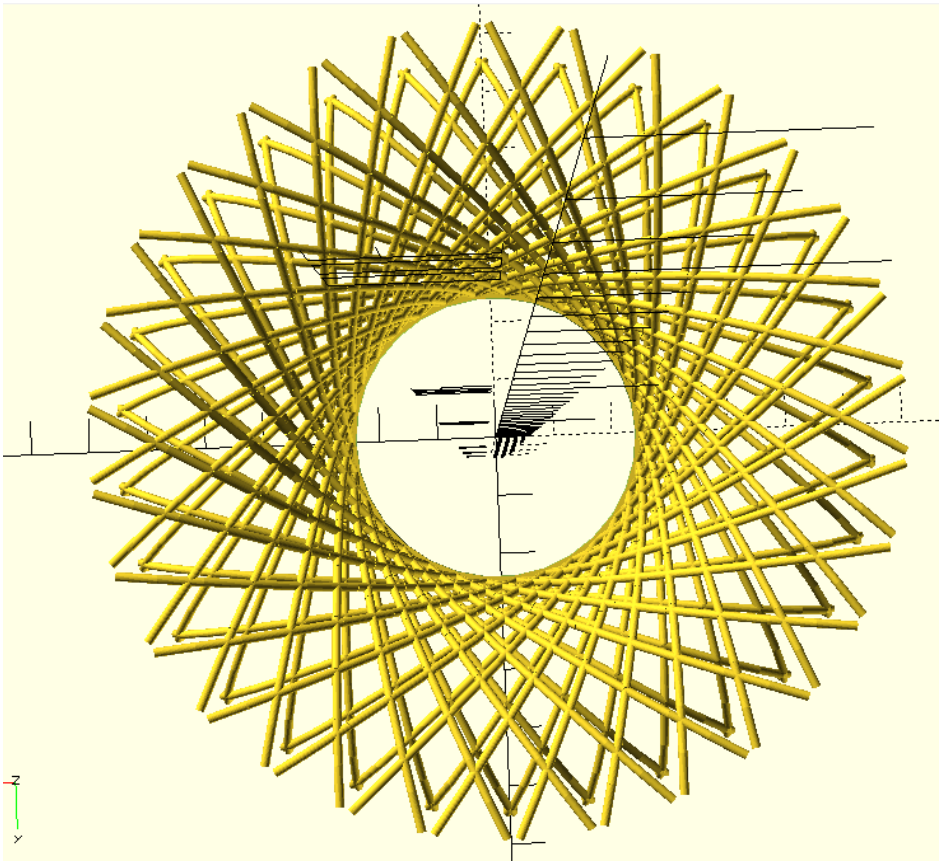
February 27th: 10 PM

120 Grace Hours Before Submission, +2 Hours Gained, 122 Hours After Submission

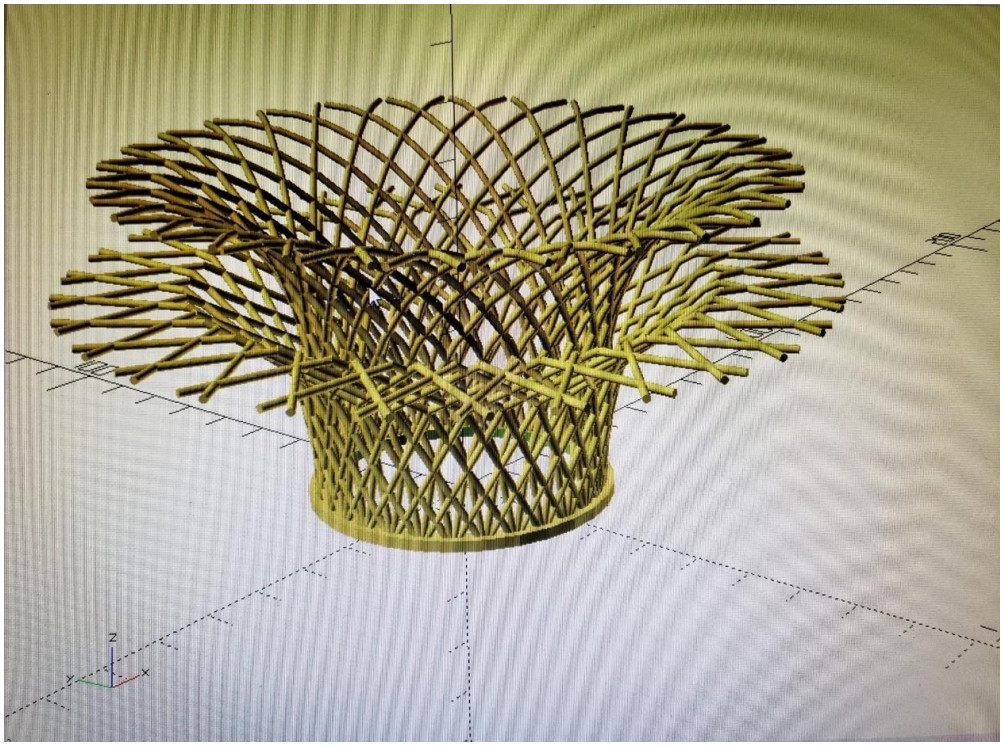


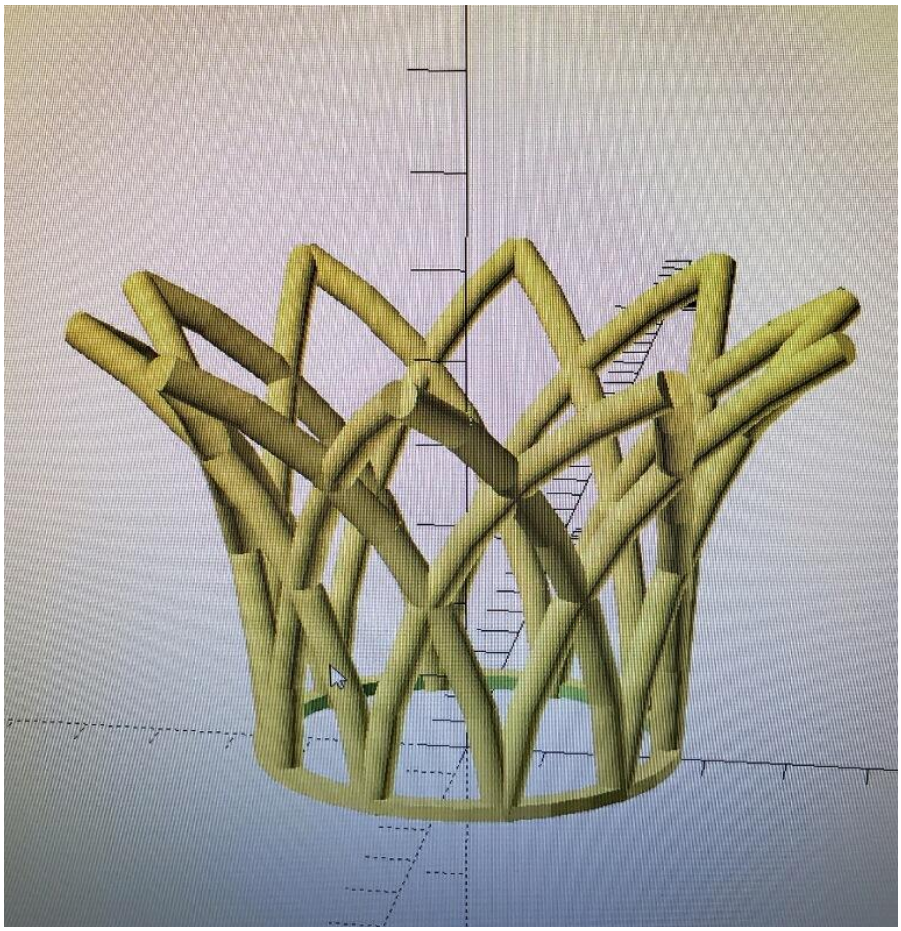
I. Design : CAD Rendering





Variant Designs

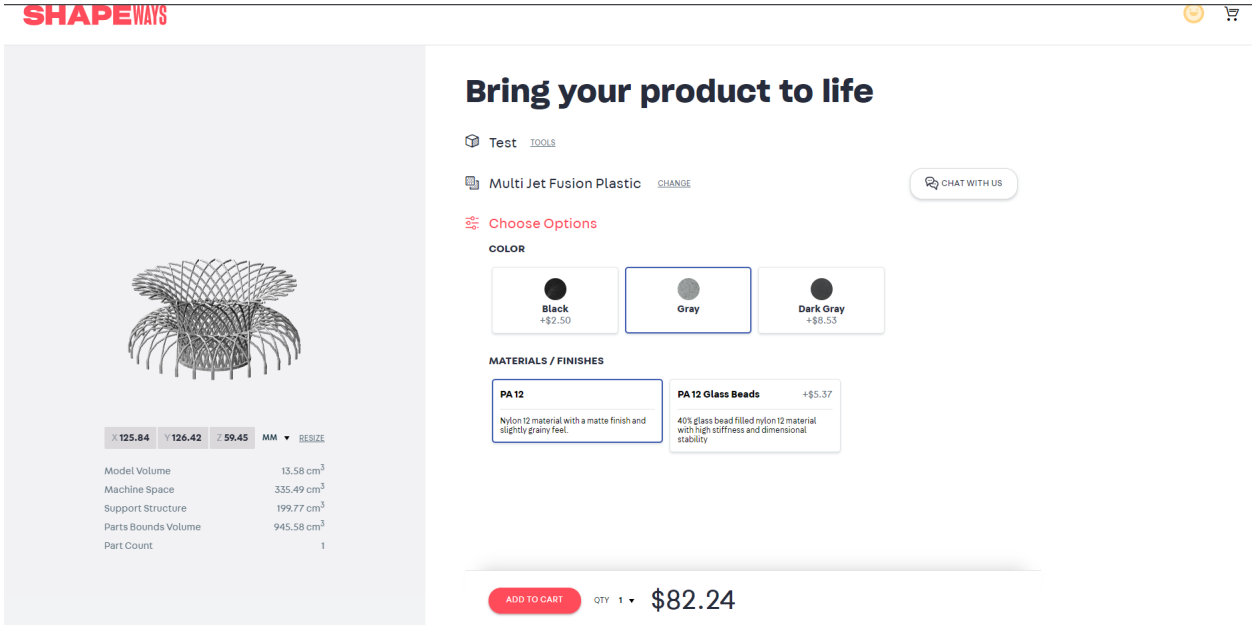




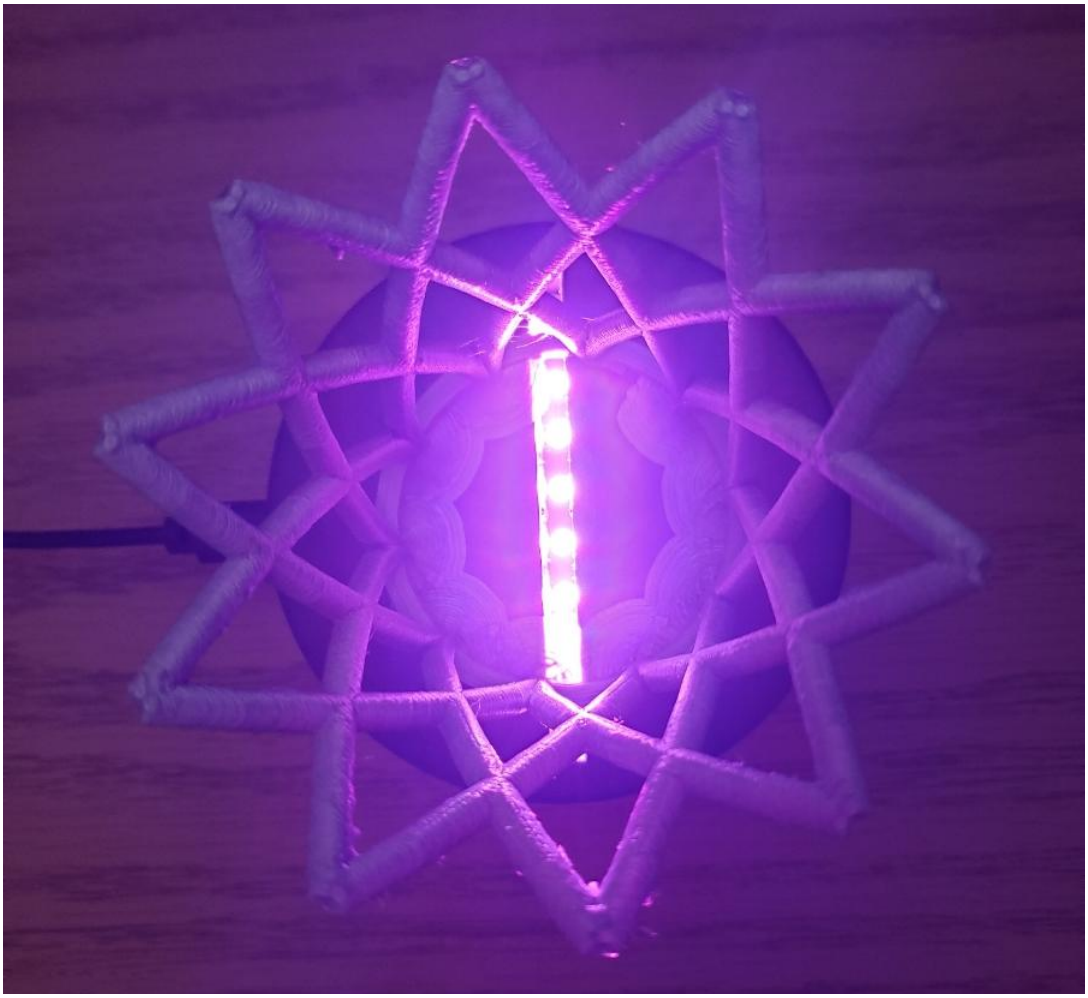
II. Algorithm Description

The algorithm works by calling various methods to construct different elements of the lampshade. It begins by creating a ring of inner radius, outer radius and height. It then calls a method that builds two ‘flowers’ which creates a lattice pattern with branches at a specified angle, branching in both the positive and negative direction of the angle. These branches recursively call themselves to a specified depth, which can be altered in order to produce different/alternative designs. Further description can be found in the code appendix at the end of the document.

III. Upload to Shapeways



IV. 3-D Physical Print Out



V. Code Appendix

```
$fn=30;

module branch(start, length, angle, phi, depth, max_depth) {
    //recursive method for branching with a given angle
    if(depth < max_depth){
        // move to the starting position and rotate
        translate(start)
        rotate(angle, [1, 0, 0])
        //place one cylinder with specified length
        cylinder(r=2/3, h=length);

        //move to start again, then call this function again
        translate(start)
        rotate(angle, [1, 0, 0])
        translate([0, 0, -1/2])
        branch([0, 0, length], length * 0.9, angle, phi, depth + 1,
max_depth);
    }
```

```
}
module ring(inner, outer, height){
    //method for creating a ring with specified inner radius, outer radius,
and height
    difference(){
        cylinder(r=outer, h=height);
        translate([0, 0, -1])
        cylinder(r=inner, h=height + 2);
    }
}
module flower(length, num, angle, depth){
    //method for creating a "flower" pattern with branches on each degree
    for(i=[0:360/num:359]){
        // rotate to specified angle by i then make a branch
        rotate(i, [0, 0, 1])
        translate([25, 0, 0])
        branch([0, 0, 0], length, angle, i, 1, depth);


        // rotate to specified angle by i then branch opposite direction
(negative angle)
        rotate(i, [0, 0, 1])
        translate([25, 0, 0])
        branch([0, 0, 0], length, -angle, i, 1, depth);

    }
}
module flowers(){
    flower(15, 30, 10, 10);
    flower(15, 30, 20, 10);
}

ring(24, 27, 2);
flowers();
```

VI. Rubrics Attempted

Items highlighted in yellow will be present after printing:

1. 10pts Cover page correct and complete
2. 10pts Report neatly organized and formatted
3. 10pts Report with initial upload to Shapeways submitted a week before the deadline
4. 10pts Program code listed in appendix
5. 10pts rendering in OpenSCAD or Blender
6. 10pts model complexity (based on number of elements, pattern)
7. 10pts Screenshot of Shapeways page with product cost <$500
8. 10pts multiple variations of the design shown
9. 10pts product is stable on flat surface (attaches to base)

10. 30pts 3D Printed lampshade
11. 10pts Glamour photo of printed lampshade with light, in dark
12. 10pt lampshade rendering posted on Ed at least 24h day before the deadline (show screenshot):