

MECE 4606 DIGITAL MANUFACTURING

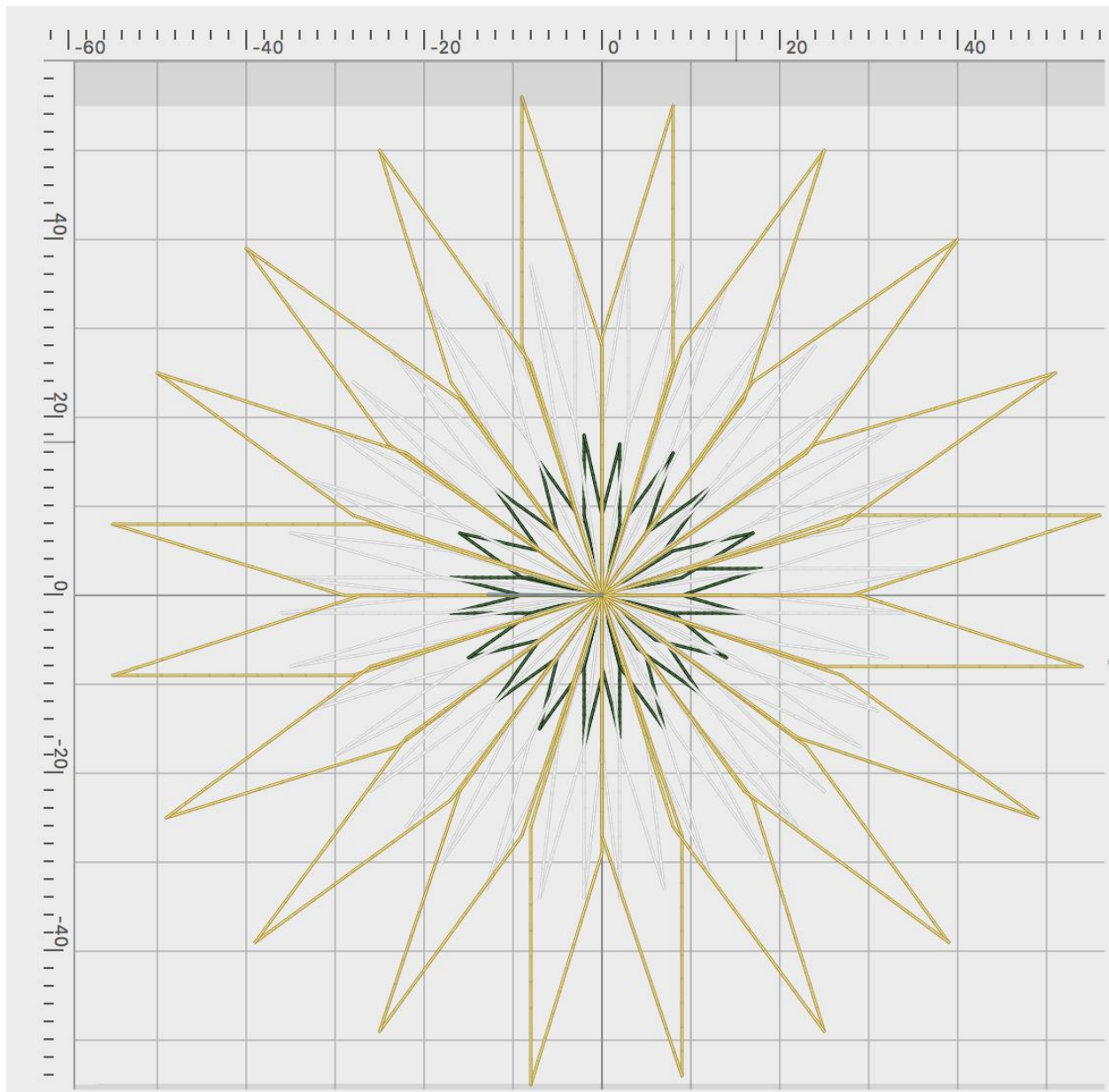
PROF. HOD LIPSON

Programmable Embroidery

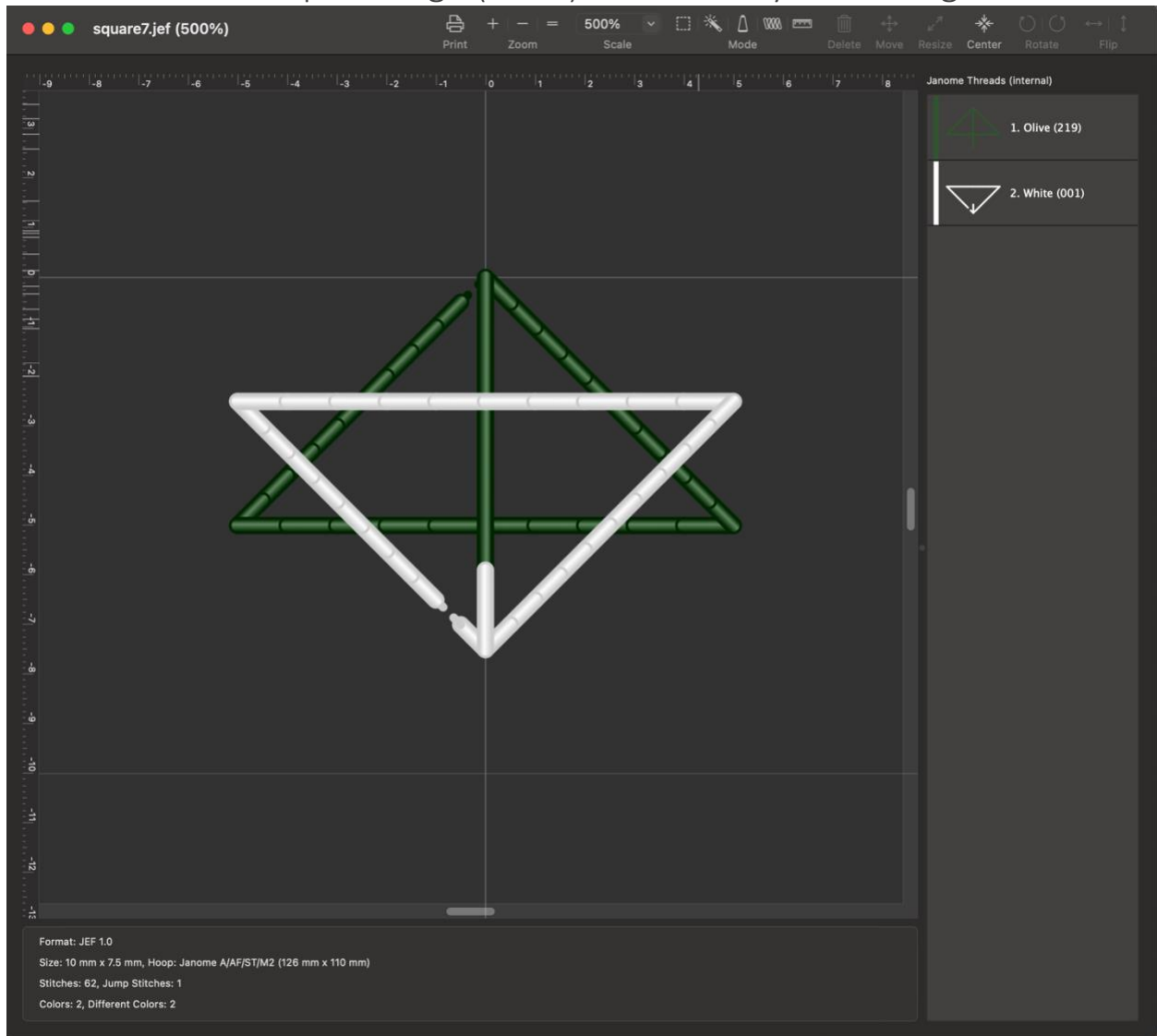
Rohan Sahu (rzs2120), Brock Taylor (btt2115)

March 13th: 9:30 PM

218 Grace Hours Before Submission, +2.5 Hours Gained, 220.5 Hours After Submission

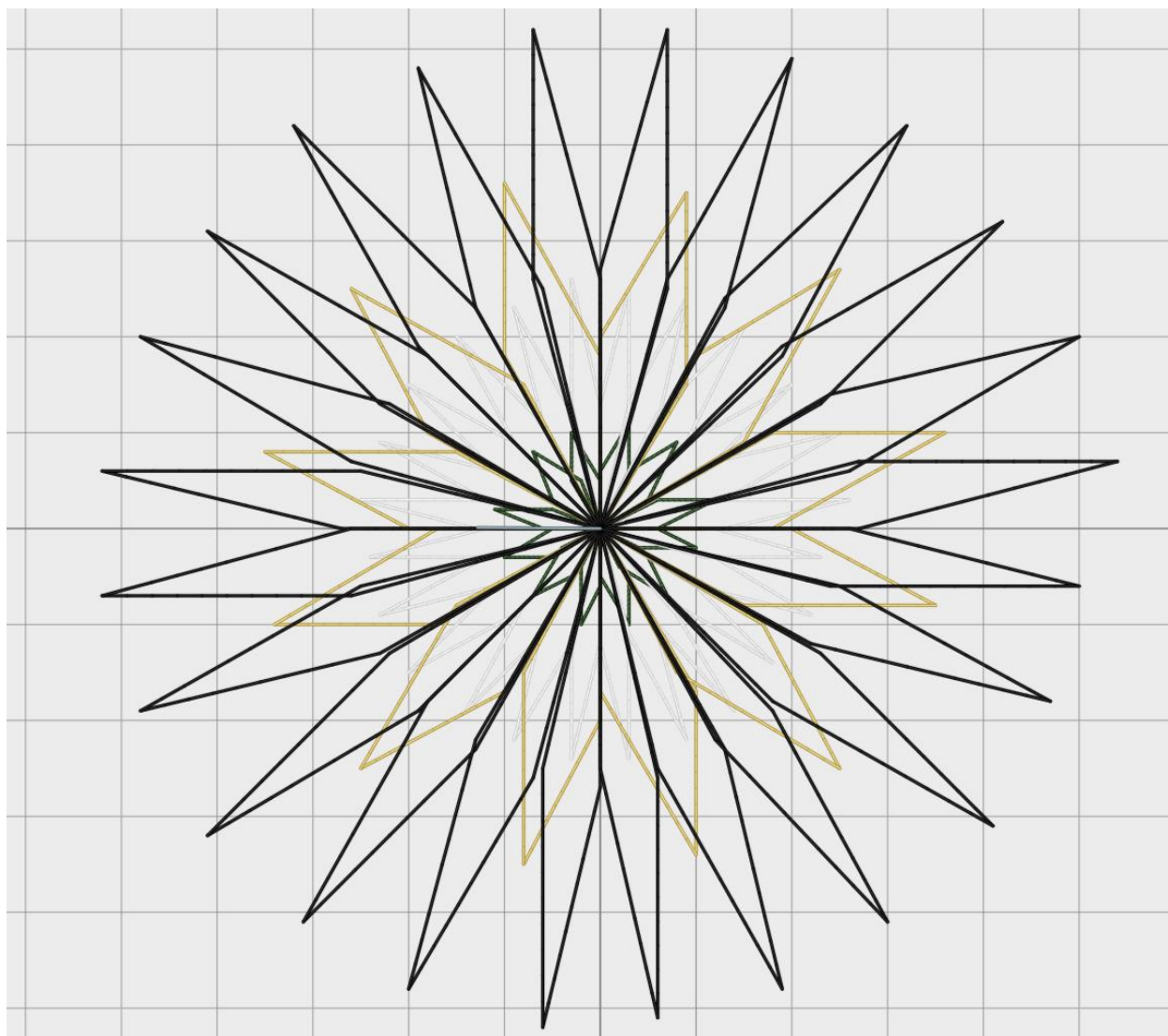


II. Simple Design (Draft): StitchBuddy Rendering

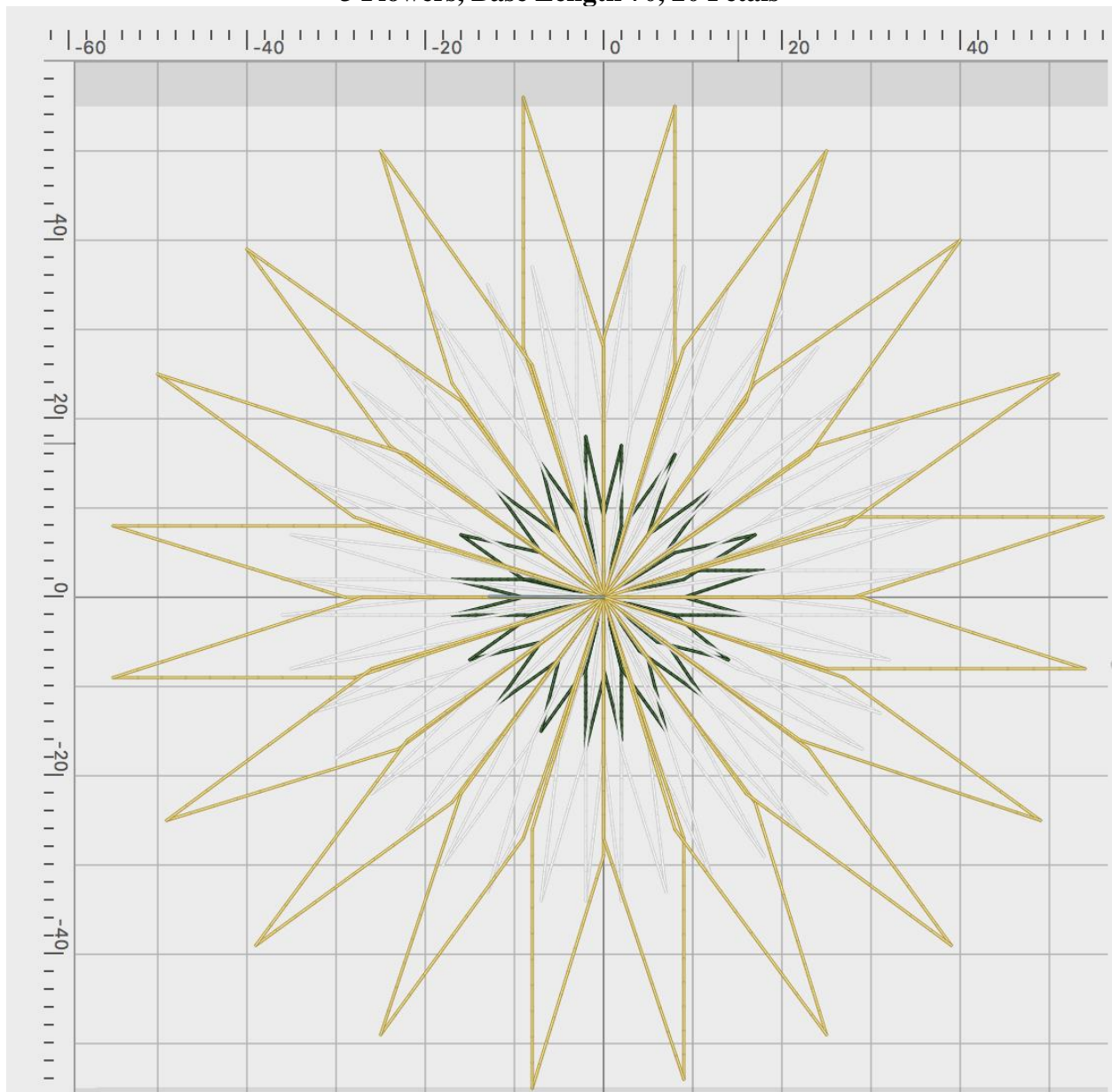


III. Photos of Simulated Embroidered Designs

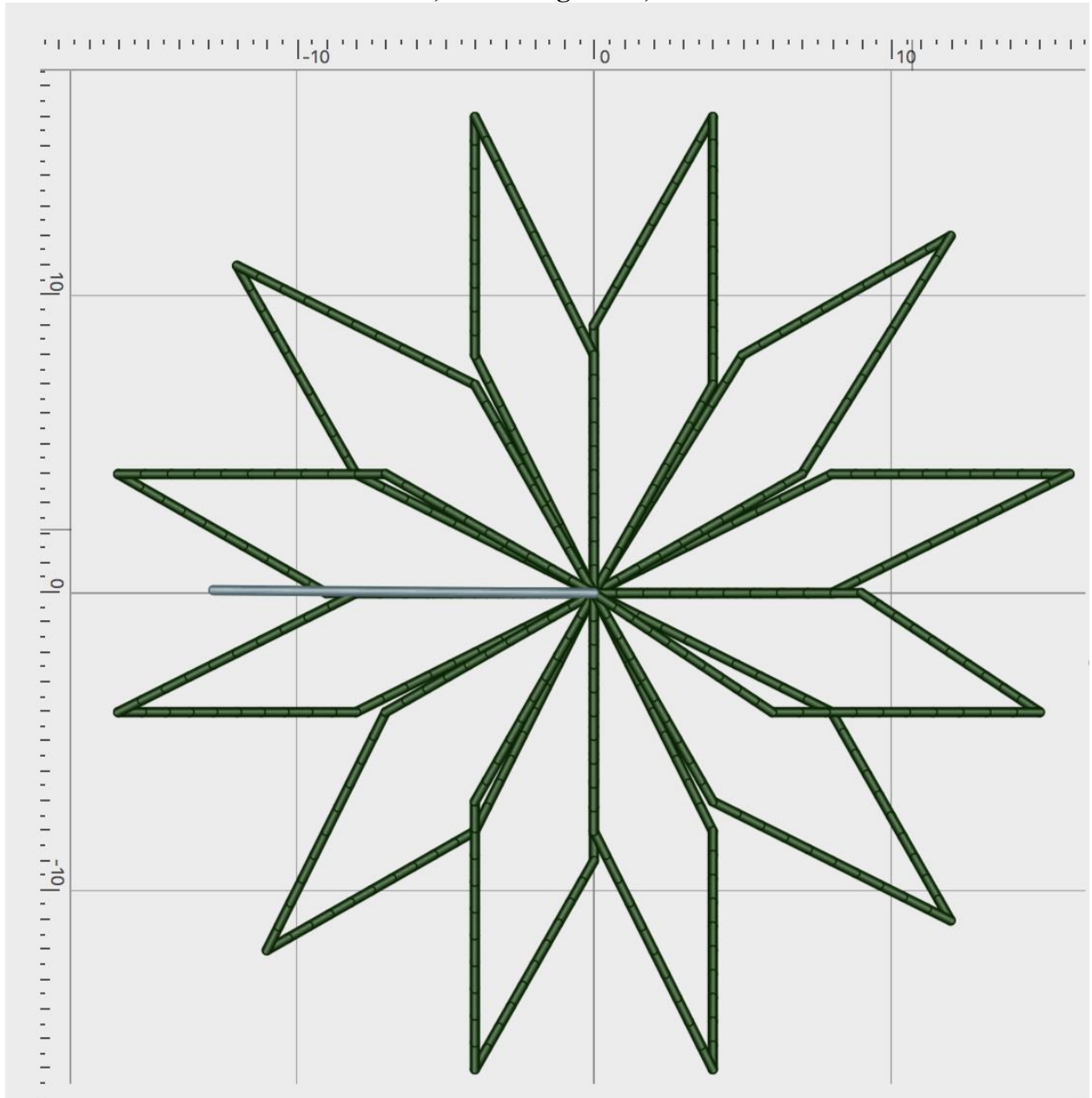
4 Flowers, Base Length 70, 24 Petals



3 Flowers, Base Length 70, 20 Petals



1 Flower, Base Length 100, 12 Petals



IV. Code Description

This embroidery program creates a parametric fractal flower. The scale and number of fractal expansions is specified by the user as inputs for number of petals, number of flowers, and the size of a petal. The base idea of the program is to create one diamond as a petal for the flower, then rotate that petal by a given angle until the full flower is created. The base petal is made according to the following formulae

```
x = length * math.cos(angle)
```

```
y = length * math.sin(angle)
```

```
a = [x, y]
```

```
b = [x, 0]
```

```
c = [-x, -y]
```

```
d = [-x, 0]
```

In which the vectors a through b are denoted as clockwise rotation around the diamond. This vector combination is fairly simple: positive diagonal displacement followed by positive horizontal displacement then by negative diagonal displacement and negative horizontal displacement. Each of these segments are broken up into 10 stitches for implementation. After drawing, the following rotation matrix is applied to each of the vectors in order to rotate them by a given angle.

$$R\mathbf{v} = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x \cos \theta - y \sin \theta \\ x \sin \theta + y \cos \theta \end{bmatrix}$$

This process is then repeated until the full flower is created. This functionality is captured in a function called `flower`, which is called multiple times according to user input and takes length and the number of petals as parameters. The colour of thread is changed for each flower. Please refer to the above pictures in section III for examples of varying each parameter. Further documentation can be found in the code appendix.

VI. Rubrics Attempted

1. 10pts Cover page correct and complete (pp. 1)
2. 10pts Report neatly organized and formatted (pp. 1-13)
3. 10pts Circle pattern submitted a week before the deadline (show screenshot)

Submission

✓ **Submitted!**

Mar 6 at 10:57pm

[Submission Details](#)

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[rzs2120&btt2115_programmable_embroidery_draft.pdf](#)

You may not see all comments right now
because the assignment is currently being
graded.

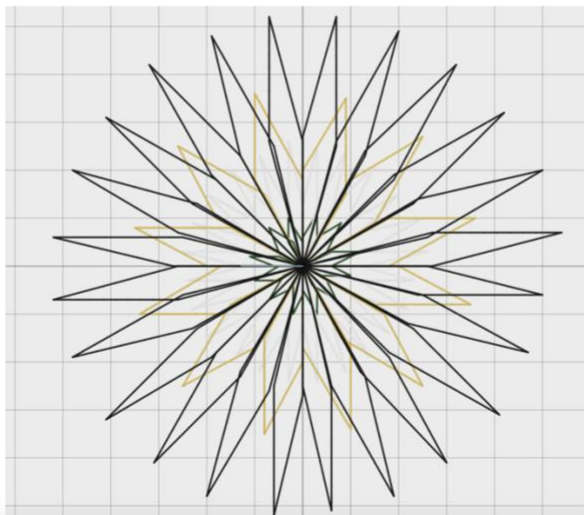
4. 10pt A parametric fractal shape embroidered (pp. 3-6)
5. 10pt Complexity/Aesthetics of the best pattern (pp. 3-5)
6. 10pt Quality of the stitch (over-stitching, wide stitches) (pp. 3-5)
7. 10pt Number of input parameters in software interface (pp. 6)
8. 10pt A description of the software you wrote – calculation steps, formulas, conditions. (pp. 6-11)
9. 10pt A fractal shape that is not a tree (pp. 3-5)
10. 10pt Multiple threads used (at least two) (pp. 3-6)
11. 10pt Multiple threads colors used (excluding bobbin thread) (pp 3-6)
12. 10pt Embroidery posted on Ed at least 24h before deadline (show screenshot)

Embroidery- Brock Taylor and Rohan Sahu #301



Brock Taylor
a day ago in General

★ 75
STAR WATCH VIEWS



Total: $12 \times 10 = 120$ points