

Homework #2:

Modeling, Interaction, Shader Basics

Assigned: 09.04.2021 Due: 23.04.2021

1. Objective

There are three main objectives of this homework:

1. Learn how to build interactive applications
2. Learn how to model simple geometric objects
3. Learn how to use shader variables

2. Specification

In the assignment, you are given [initial codes](#) that draw one triangle (Figure 1). You are also given some input controls on which you will implement the callback functions. There are mainly two parts in the assignment:

1. *Modeling*: Model the geometry described below.
2. *Interaction*: Implement the callback functions of the given controls, namely, ellipse parameters, color, and transformations.

Finally, your program should work as [in this video](#). Don't forget to write your name, surname, and ID on top of the page. **!!!Otherwise, you WON'T GET POINTS!!!** (If you are doing the homework in pairs, write each of the member's details.)

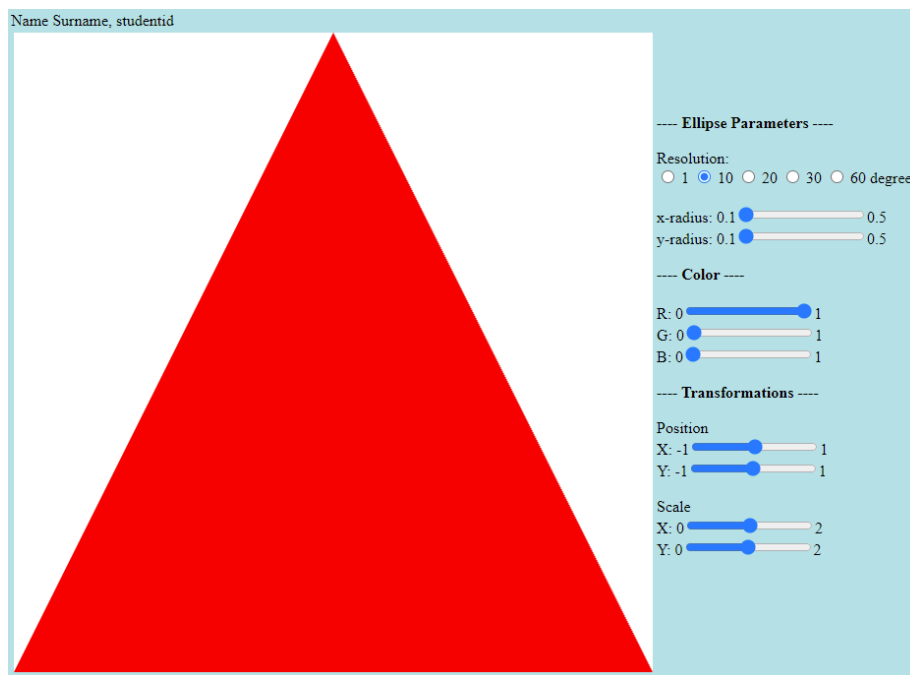


Figure 1: Output of the Initial code.

Task 1 – Modeling

You will model the geometry of an ellipse, centered at the origin, as shown in Figure 2.



Figure 2: Left – The geometry to be modelled. Right-top – Parameters of the shapes. Right-bottom – How to model circle/ellipse geometry.

The parameters of the ellipse are given in Figure 2 right. You can model a circle/ellipse using *triangle fans* as shown in right-bottom, by varying θ values:

- An ellipse is defined in polar coordinates as $(xr * \cos\theta, yr * \sin\theta)$. You will get xr, yr , and θ values from user, using the input widgets.
- Initial values for the parameters are $(xr = 0.2, yr = 0.1, \theta = 10)$
- Note that you can use Javascript Math object for cosine and sine functions, they take input as radians.

Task 2 – Interaction

- **Resolution:** Theta angle (Figure 2 – right-bottom) to determine the resolution of the vertices in ellipse.
- **X-radius:** Radius of the ellipse in x direction.
- **Y-radius:** Radius of the ellipse in y direction.
- **Color:** Pass the color obtained from sliders to the fragment shader to determine the color of the ellipse.
- **Position:** Perform 2D displacement according to X and Y slider values.
- **Scale:** Scale the size of the shapes according to the slider values. (**Scaling should be local (about the center of the geometry. It should not change the position.)**)

- **Note that we have not covered transformation matrices in class yet. You can perform changing position and scale of the shape in vertex shader.**

3. Submission

- This homework can be done individually or in pairs.
- Place all your source files (.html and .js, including Common directory) in a zip archive with name **HW2_StudentID1_Surname1_Name1_StudentID2_Surname2_Name2.zip** and submit through MS Teams.
- Single submission from one of the group members is required.
- If you have further questions, you can send me an e-mail.

4. Late Submission Policy

Deadline for homework submissions is **23:59 pm** at the specified date. For each additional day, **25% cut-off** will be applied.

5. Grading

Grading will be done according to the following scheme:

- Drawing shape (30 pts)
- Ellipse parameters control (20 pts)
- Color control (20 pts)
- Transformations (30 pts)

6. Checkpoints

YOUR ASSIGNMENT WILL NOT BE GRADED IF YOU DON'T OBEY THE BELOW RULES:

- Name of your submission file must be as described above.
- Write name and ID of each member at the top of the web page.
- Do not copy the codes of any others (or from the Internet). You can borrow ideas and use partial codes from elsewhere, in case you give proper citation.

Dr. Zeynep ÇİPİLOĞLU YILDIZ