

Assignment 1: Building your own models and applying transformation, projection, lighting and shading to give the models a realistic look

In this assignment, you will learn how to create models, (i.e., cube, pyramid, cone etc.) from scratch; next, you will apply transformation and projection onto the models. Lastly, you'll apply lighting and shading to give the models a realistic look. You already have learnt how to build some simple models. Gradually, you'll learn how to build complex models like cone, sphere etc. You need to implement the following in this assignment:

1. Building Models:

You need to build the following models:

- A hexagon (use the same dimension as you did in the tutorial of week 1); (required)
- A cube with dimension **1.5X1.5X1.5**; (required)
- A pyramid (use the same dimension as mentioned in the tutorial of week 1);(required)
- A disc with radius '**1**'; (required)
- A cone with radius '**1**' and height '**2**' (we'll discuss about that in the class). (required)
- A sphere with radius '**1**' (we'll discuss about that in the class). (optional, 2 bonus points will be given to those who will be able to draw a sphere)

With the keyboard button press (i.e., '**I**' or '**L**'), you will be able to switch between '**normal**' mode to '**wireframe**' mode. (You already have learnt about this in the class). Feel free to apply different colors to different models. You'll learn about this in the coming weeks.

2. Applying Transformation: (required)

You need to apply transformation to move different models to different places in your virtual environment. Till now, you can only draw model at the center of the screen. But when you have multiple models, you need to rearrange the models in the virtual environment. We will learn about transformation in the next class.

3. Applying Different Projections: (required)

Default projection is orthogonal projection and default view volume (where you've drawn objects so far) is a cube of size (2X2X2). You'll need to expand the view volume so that your virtual view volume can accommodate all the models. Next, you need to apply different projections (orthogonal and perspective projections). With a keyboard button press '**s**' or '**S**', you'll be able to switch between orthogonal and perspective projections. (We'll learn about that in the class).

4. Applying Lighting and Shading: (required)

Lastly, you need to apply lighting and shading to give the models a realistic look. Without lighting or shading, object does not look realistic as you can see from the following figure. In the absence of lighting and shading, a sphere looks like a disc. You'll use directional lighting in your assignment. (You'll learn about that in the class).

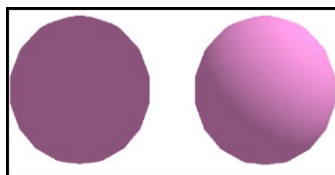


Figure 1: A sphere (left) without lighting and shading and (right) with lighting and shading.

After you complete all the above-mentioned steps, you will be able to get some similar output as shown below (models may differ in size):

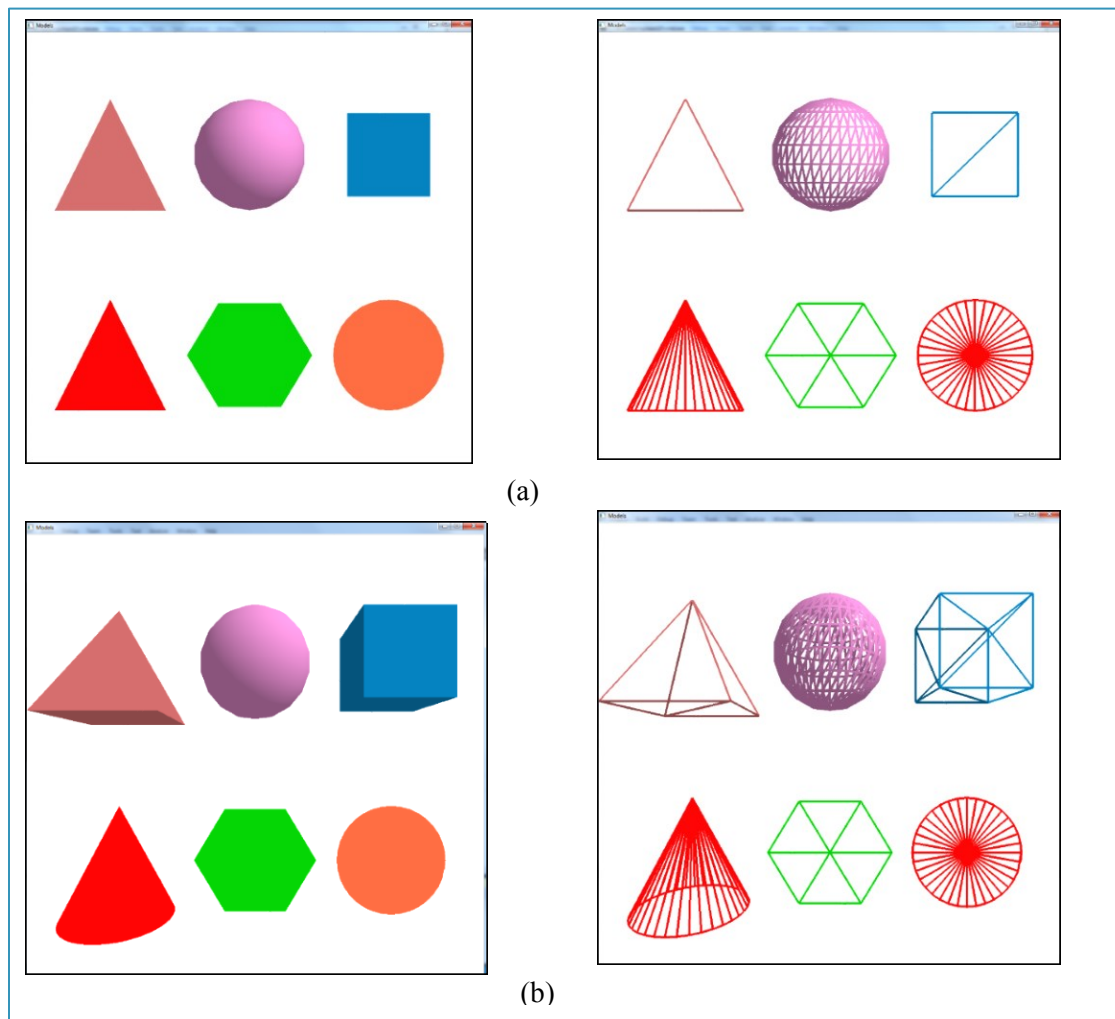


Figure 2: (a) Orthogonal view (left) normal and (right) wireframe mode. (b) Perspective view (left) normal and (right) wireframe mode.

Hints: You can start working on the assignment using last week's tutorial. Start creating objects as mentioned in the 'Object' folder of the tutorial. Keep on adding objects and apply transformation, projection, lighting etc. as you'll learn in the coming weeks.

Submission:

Submit all necessary files in a zipped format. Name the zipped file as **Firstname_Lastname_1.zip** (your first name and last name). Please compile and run your code in the school computer using either windows or linux platform before you submit the assignment.

Submission deadline is **Friday, April 20, 11:59 pm**. Upload your assignment via canvas.

No late submission will be accepted.

This assignment carries a weightage of **15%** of this course.