

1 Lab 9.5 - Loops and light

Goals

The goals for this lab are:

1. Practice using a loop control structure to *simulate* shading
2. Practice a simple setting that uses nested loops to redraw the same scene
3. Practice creating an image with simulated shading
4. Study the role of color to simulate lighting effects in an image

Modality

Pair or Individual (per instructors specifications)

Details

Task: You must create one sketch that draws four copies of a shape that appears to look like a sphere using a shading trick. In general, one of our visual cues to discern shape is shading (ie we perceive the brightest spot in the image as facing the light and the darker portions of an image are perceived as turning away from the light, helping our vision system to discern some depth from the shading based on our understanding of where the light is in a scene). We can somewhat simulate this effect for a sphere shape using ellipses drawn on top of one another of different shades. Note that this effect works for a sphere because the darker regions are a consistent shape (circular). To create this sketch you must:

- include four different versions of a 'sphere', each with the light from a slightly different direction

- create each sphere with a loop structure that draws multiple ellipse on top of one another with varying color (smallest = lightest to largest = darkest)
- create the four different versions using a nested `for` loop - the outer loop will control where the spheres are drawn in the final sketch
- be 800 by 800, which each 'sphere' taking up a 400 by 400 region

To complete this lab, you must:

- use a `loop` control structure to draw multiple ellipses as a representation of a 'sphere' – within the loop, the diameter and exact center of the ellipse should vary to simulate shading (variation in color due to light direction)
- vary the color of the ellipse to simulate shading
- use a variable to represent the direction of light (both in x and in y)
- add a final outer `for` loop to draw four versions of the 'sphere', each with the light coming from a different direction.

Demo:

In order to receive credit for this lab, you and your partner must demo your sketch to your instructor.

Resources:

- If you are interested in more information see:
http://people.csail.mit.edu/bkph/articles/Shape_from_Shading.pdf

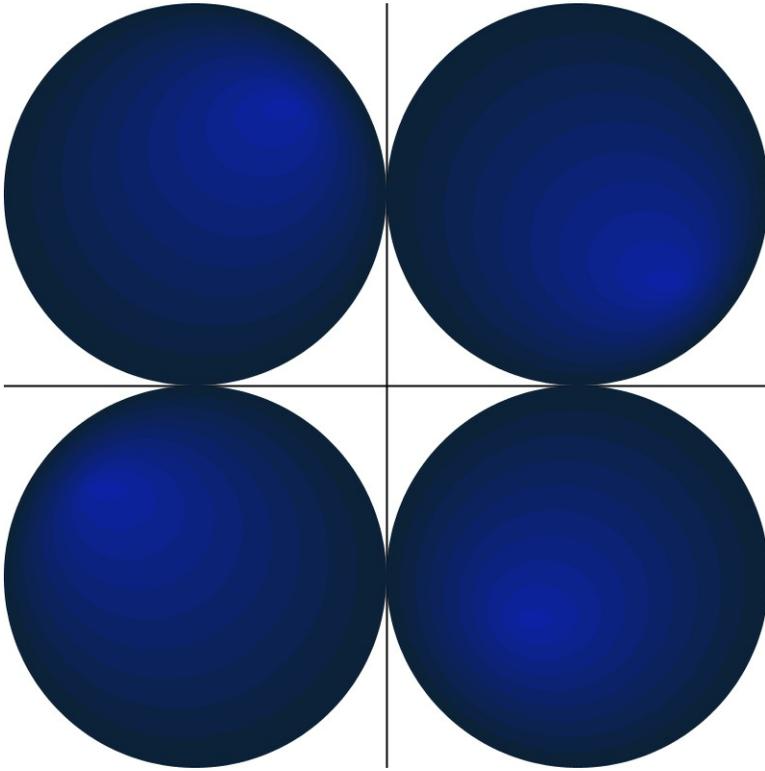


Figure 1: Example output of four different 'spheres' each with the light from a slightly different direction.output demonstrating the shapes used to convey this shape.

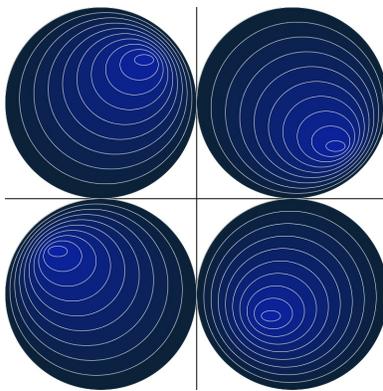
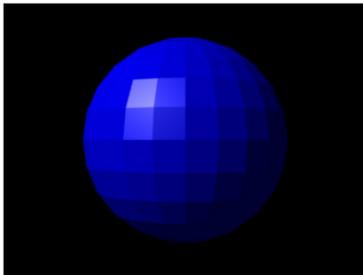
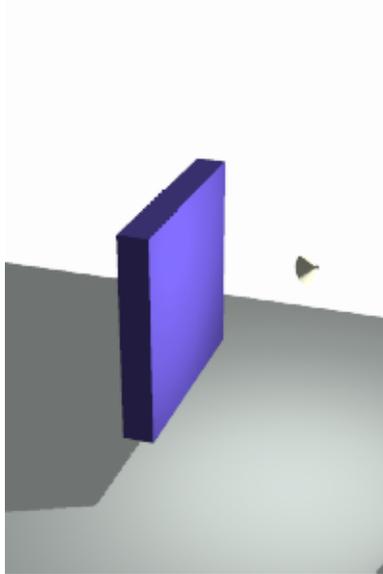
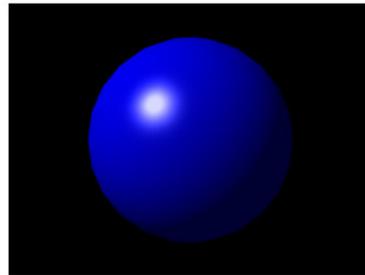


Figure 2: Example output that includes outlines to more readily see the ellipse' shape



FLAT SHADING



PHONG SHADING

Figure 3: Some (non-Processing) examples of shading used in computer graphics. Licensed under Public domain via Wikimedia Commons - <https://commons.wikimedia.org>. Top 'flood light' image shows that each face of the shape is shaded a different color based on its direction relative to the light. On the bottom are examples of shading models used in computer graphics 'flat' shading versus 'Phong', both of which illustrate the same concept as this lab, i.e. the variation in shading helps us perceive shape.