AST101: Our Corner of the Universe
Lab 4: Parallax Prelab

Name:

Student number (SUID):

Lab section:

Group Members:

1 Introduction

Recall that one of the issues that lead to the development of the celestial sphere model was the notion that stars do not exhibit parallax; that is, to the naked eye, the position of stars relative to one another never appear to alter in even the slightest. If the stars are not all the same distance away, then they ought to at times appear closer together or farther apart. This lab will explore the concept of parallax, and culminate with the realization that even though the stars ARE different distances away, we never could've found this with the tools available at the time.

Materials

You will need a computer that is able to run flash, and to at least briefly go out on the quad outside the physics building.

Objective

To prepare yourself to measure the effect of parallax on what we observe.

2 Outdoor Demo

Stand in front of the Hall of Engineering on the quad, and face Hendricks Chapel. Your view should be the same as the picture above.

Note: If weather prohibits doing this outdoors, you may complete this exercise somewhere indoors. If you do this, include with your prelab a description of what you observed instead of the Chapel!

Question 1. Hold your index finger directly in front of your nose, and close your left eye while keeping your right eye open. As you look at your index finger, does it appear to be in line with Hendricks, to the left of Hendricks, or to the right of Hendricks?

Question 2. Now close your right eye and keep your left eye open. Does your index finger appear to be in line with Hendricks, to the left of Hendricks, or to the right of Hendricks?

Question 3. Why does your finger appear to change sides?

This is the notion of **parallax**!

Question 4. Now, hold your index finger farther away from your face, and repeat the exercise, observing your finger with just your left and just your right eye. Does your index finger still appear to move? Does it still move by the same amount?

Question 5. Do objects that are closer or farther away exhibit more or less parallax?

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3 A Parallax Simulator

On your computer, go to the following link

http://astro.unl.edu/naap/distance/animations/parallaxExplorer.html

And, if necessary, enable flash. You may need to use the Firefox browser to get the simulator to work.

For Mac Users: Mac does not support flash. You will need to use a computer in one of the labs across campus. One such lab is in the physics building, on the opposite end of the building from Stolkin Auditorium where you have class, on the side of the building facing the quad!

Question 6. This page simulates a boat visible on a lake, and an observer driving along a road, looking at the boat. In the upper right corner, a panel shows the view of the observer.

Click the red X along the bottom of the main panel, and drag it along the road. As you do, descibe what happen in the view in the upper right panel. How do the objects behind the boat appear to change?

Question 7. In the "Controls" panel is a button labeled "take measurement". Click this button. You should observe that it draws a straight line between the observer's position and the boat.

Set your observer to a second position along the road, and hit the "take measurement" button again. There should now be two red lines on the Map. The point where these two red lines is where the boat is located. If the boat were **not** shown, could you tell exactly where the boat is?

Question 8. Hit the "clear measurements" button to remove the two red lines. Look in the "Controls" panel to find the slider labeled "error". As the name suggests, this slider increases the error in your measurement. No measurement can ever be perfect, so we should set this number to something other than 0. Increase the slider to an error of about 4.0.

Repeat the procedure in question 7 by hitting the "take measurement" button at two different locations. Now, would you be able to tell exactly where the boat is if it weren't already shown?

Question 9. Hit the "clear measurements" button again. Take two more measurements, but this time, make sure your two observation points are close together, and near the right end of the screen.

How well can you tell how **close to the shore** the boat is? That is, how long vertically is the overlap region between your two observations?

Question 10. One final time, clear your previous measurements, and take two more measurements. This time, choose your observation points to be as far apart as possible. Now, how well can you tell how far away the boat is?

Question 11. The line between your observation points is called your **baseline**. To accurately determine distance, is it better to have a shorter or a longer baseline?

Question 12. If we didn't account for the error in our measurements, would we correctly find how far away the boat was from the shore?

Question 13. In the space below, draw a sketch of this exercise with the boat. In your sketch, be sure to include and label

- The boat
- Two observation points
- The baseline connect the two observation points
- Two background objects on the opposite shore (trees)
- Lines showing your line of sight on the boat

In your sketch, be sure to NOT focus on artistic details. This should be a schematic diagram, not an art project!