Group Names:

Lab 3 - Observation Planning

September 19, 2018

This lab is a bit different from the other labs that we'll be doing this semester in that we won't be using Python. The goals of this lab are that:

1) You will be introduced to the observational planning software iObserve
2) You will learn how to use the astronomical database Simbad to find out more about objects and find references to them.
3) You will use iObserve to identify potential targets for your final project and will write a brief observing proposal as homework for next week.

Starting Up iObserve

- Open iObserve and click on "New Observatory". In the window that appears, enter "Smith Observatory" for Short Name and "Smith College Observatory" for Full Name.

- Using the values below for the latitude, longitude and altitude of Smith College, enter this information in the iObserve fields:
    - Longitude: -72 deg, 38 min, 13.9 sec (West)
    - Latitude: +42 deg, 19 min, 05 sec (North)
    - Altitude: 57 meters

- Enter the Country and Continent information, and under Time Zone Name, select "America/New York" (it will auto-fill to GMT-5:00).

- You don't need to send an e-mail to the creator of iObserve about the Smith Observatory, so when you're done and that screen comes up, click "Cancel". When the new observatory has been added, a map will appear. Check to ensure that the location is correct in Northampton.

- Now click on "New Object" in the top center menu bar.

- In the field marked "Object Name", type "M22" and then "Resolve". This queries the online database Simbad for the object coordinates. Then click "Add New Object". What appears will be the standard iObserve interface, with an orange curve labeled "M22".
  Important Note: *Make sure that the observatory selected is Smith Observatory, by selecting from the drop-down list of observatories in the lower left by the dome icon.*

- Repeat the process for a new object, "M13". Both should now appear in the lefthand iObserve menu marked "OBJECTS". When you click on each one, the curve for that object will show, but if you click on one and then command⌘ + click on the other, both curves will show at once.

Exercises to Turn In

For the following questions 1- 12, please type up your answers and submit as a .docx or PDF file (one per group) on Moodle. **Be sure to include your group members' names on the document!**

First, play around with the iObserve interface for a while to familiarize yourselves with it, and then answer the following questions:

1. What are the axes on the main iObserve plot (note that there are two x and two y axes)? Define each term in your own words.

2. Click on the label "Local Mean Sidereal Time" at the top of the plot and "Universal Time" at the bottom of the plot several times to see all of the options (there should be three). Which two do you think will be most useful to you when you're conducting observations and why? Set the axes to these.

3. Play with the two sliding bars on the bottom right and bottom left of the plot (with the shaded icons) until you understand what each of them does, and then write an explanation for each.

4. The three shades of blue on the plot mark civil, nautical and astronomical twilight, respectively. How long does each phase of twilight last? How long between sunset (the start of civil twilight) and the end of astronomical twilight?

5. At the very bottom center of a plot is a slider with "today" marked and two arrows on either side. Drag the slider forward, and many things will change. What is changing?

6. Use your answer to Question 5 to record on your lab worksheet to record at what times of year M22 can be observed. Do the same for M13. In a sentence or two, explain your rationale for what makes the clusters observable at these times of the year.

   On the center slider, click the forward arrow twice until you see the date in the form MM/DD/YYYY. Set the date to today's date, then click on DD and toggle the date between yesterday and today until you see a black vertical line appear on the iObserve plot. This is the current time (*iObserve is a little buggy for this one thing, which is why we have to do this)*.

7. Drag your cursor into the iObserve window and you'll see a red crosshair following your cursor. (You may need to click the "Curve Tracking" checkbox in the lower right.) If you hover near an object curve, two types of boxes appear near the object curves when you do this. The most

relevant quantities in these boxes are hour angle (HA), airmass (AM) and the UT/LST time of the cursor.

   a. Define in your own words the hour angle quantity.

   b. Along the object curve, there is a minimum airmass value. Where does this value reach a minimum along the curve, and what is the significance of this minimum?

   c. Why might the minimum airmass not be equal to 1.00?

8. Another useful feature of iObserve is the ability to get so-called “finding charts”. Select M22 and then click on the tab at the top labeled “Charts”. Then click “Download all Charts”. This will pull images centered at the appropriate RA and Dec from a bunch of all-sky surveys. “DSS” charts are from the optical wavelength Digital Sky Survey and the “2MASS” charts are from an infrared wavelength all sky survey called the 2 Micron All Sky Survey, which was a collaboration between UMass and JPL/Caltech.
   a. If you click and drag inside any of these images, you’ll create a triangle with the angular distance along each side labeled. Do this in one of the DSS images and use it to get the field of view (FOV) of the image. How big is it?

   b. How big is the FOV of one of the 2MASS images?

   Check that you got (a) and (b) correct by clicking on the menu at top that says “All Charts” and selecting one of the images you were looking at. The FOV will be printed as a label.

9. Going back to our airmass charts, why are neither M13 nor M22 good targets for us to observe this semester? Which cluster would be difficult to observe any time of year from the Smith Observatory, and why?

10. Write down the “ideal” RA range of targets that we can observe this time of year.

11. Write down the “ideal” Dec range of targets that we can observe from Smith.

12. Using Google to find the best Northern hemisphere candidates, add globular and open clusters to iObserve as targets, using the ideal RA/Dec ranges you gave in Questions 10 & 11 to select clusters observable from Smith. I suggest creating folders - one for open clusters and one for globular - and adding at least 5 potential targets to each. If you mouse over the OBJECTS label at the top left, there will be a little folder icon. Clicking it creates a new folder that you can name.
   a. Command⌘ + click to highlight all of the open clusters at once to see all of the object curves simultaneously. Take a screenshot of the window (Command⌘+Shift+4, then press spacebar, hover over the iObserve window and click). Attach this screenshot to your write-up.

   b. Repeat the process in part (a) for your globular clusters, take a screenshot, and attach to your write-up.