

Physics 629 Exercise 1 “The Sky”

Due September 15, 2004

Purpose: The Serin Observatory’s 0.5m telescope is controlled by a computer program — dubbed “The Sky” — which runs on a PC (Blanco) that is located inside the dome. As with any observatory, it is a good idea to familiarize yourself with the software that controls the telescope and instruments *before arriving at the telescope*. To allow you to do so, there are a number of PCs in Room 401 which, like Blanco, run The Sky (but do not talk to the telescope). The purpose of this tutorial is for you to gain experience with this program.

Procedure:

(1) Login to a PC and start The Sky by clicking on the icon.

(2) Using the Data menu at the top of the window, select Site info and Date-Time. Note the coordinates of the telescope, particularly the observatory latitude (which is always useful for planning an observing program). Check the computer clock to make sure that it has the correct time and date.

(3) Move the cursor over the buttons at the top of the screen. Labels will appear, giving (sometimes cryptic) information as to the purpose of the various buttons. You will probably see three rows of buttons. You can drag blocks of buttons with the mouse. Arrange the blocks into just two rows where the top row has three blocks whose left-hand buttons are, from left to right: New (file), 3D Solar System Mode, and Move Up. The second row should have four blocks whose left-hand buttons are, from left to right: Skip Increment (box), Establish Link, Find, and Image Link Setup.

(4) If they are not already visible, turn on the constellation outlines with the 13th button from the left on the first row. Set the time skip increment in the second row of buttons to 1 hour, and toggle forward in time until it is just after sunset (in the program!). Make a note of what constellations will be overhead at that time. Continue to advance the time until it is midnight local time. Again, make a note of what constellations will be best placed for observing (i.e., on the observer’s meridian) at that time.

(5) Change the date to sometime near the middle of the semester: say, October 20th. Now repeat the above exercise, noting the constellations which are well placed for observing then.

(6) Reset the date and time (the button just to the right of the skip increment box does this), and note which bright (i.e., 1st magnitude) stars are visible this evening. As you’ll later discover, it is necessary to “calibrate” the pointing of the 0.5m telescope each night you observe, and this is most easily done by pointing towards a bright star (or planet) that is visible shortly after twilight. Thus, it is wise to know the best available targets beforehand.

(7) Turn off the equatorial grid (if it is on), and switch to the horizon grid. Does it make sense that the pattern converges at the center of the screen? Experiment with the NESWZ buttons and note how the horizon grid changes.

(8) Try zooming in and out with the zoom buttons. Go from a view that shows the whole sky to a view of a very small area. Note that at a few points during the zoom, the program will add more faint stars to the display. The computers in Rm 401 display

the Hipparcos/Tycho catalog. What is the approximate V_t magnitude of the faintest stars visible. Blanco (in the dome) has the Guide Star Catalog I installed and will display stars as faint as magnitude 15.0.

(9) Make a note of the various symbols on the display. Using the left button on the mouse, click on the various symbols; an information panel will appear. Try this with a few objects. To get more (or less) information on a specific object, click on the double up/down arrows at the bottom of the panel.

(10) Using the View menu at the top of the window, select Filters and note how changing the minimum magnitude affects the display.

(11) Locate the ecliptic and, after turning off all of the stars using the appropriate button, identify the planets that are now visible in the evening sky. Step the display forward in time to about one hour before sunrise. What planets are visible at that time?

(12) A very useful feature of this program is its ability to locate objects by name. Click on the Find button, and locate some familiar objects. In particular, note the location of M31: this is a target for our observing this semester. What is the best time to observe this object? What factors need to be considered when deciding upon the optimal date and time?

(13) Go back to the full-sky display (Z button), if you are not there. Use the Telescope menu at the top of the display to select Setup and then set the name of the telescope to "Simulator". This will simulate communicating with a telescope. To initiate the communication, press the Establish Link button (a green telescope). A circle containing a cross will appear showing where the telescope is pointing (usually 0 hours right ascension and 0 deg declination to start with). The Sky will also go into "Night Vision" mode by turning the periphery of the display red. I find buttons hard to see in this mode and turn it off (the button with red goggles on it).

(14) Click the left button on a bright star near the zenith and select the Telescope tab in the box that pops up. Push the Sync button and note how the telescope indicator jumps to the star. At the beginning of every observing session at the Serin Observatory, we need to point the telescope at a known object and then tell The Sky where the telescope is pointing because the mounting has no encoders. I usually select the General tab after Syncing so I will not do so again by accident. Click on another star near the zenith and click on the Slew button (another green telescope) at the bottom of the window that pops up. Note how the telescope indicator moves to this new star. What happens (if we were running the real telescope instead of a simulator) is that The Sky issues a command to the telescope controller to go to the right ascension and declination of the star and the controller moves the telescope to the correct location by counting the steps sent to the stepper motors.

(15) Zoom in the display and note how The Sky keeps the location of the telescope in the field of view. Use the Telescope menu at the top of the display to turn on the Motion Controls. In the Motion Controls box, push the RA-Dec radio button and set the jog to 5 minutes. Note how pushing the NESW buttons then slews the telescopes by 5 arcminutes. This tool is very useful for centering objects in the field of view of our CCD camera.

(16) When you are done, push the Terminate Link button (red telescope in the second row of buttons – or use the Telescope menu) and then exit the program. Answer "no" to the query about saving the changes that you have made.