

An astronomical ephemeris for Linux

# LINUX REACHES FOR THE STARS

XEphem is an interactive astronomical ephemeris or planetarium that has been developed over a period of ten years by Elwood Charles Downey. Originally written for Unix systems, it runs under Linux too. And it's one of the best programs of its type you can get on any platform. If you have any interest in astronomy at all, it's well worth trying.

The program comes in two versions. There's a free version in source code form or a ready-to-run CD-ROM with printed manual for \$69.95 (plus \$12

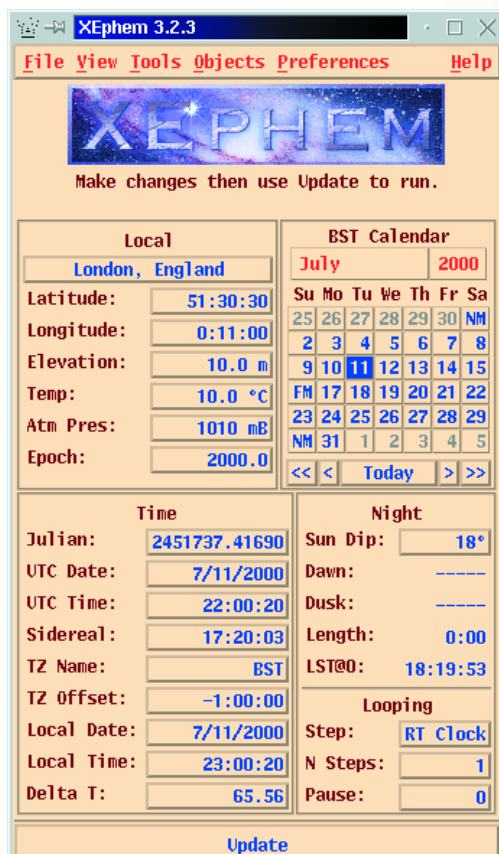


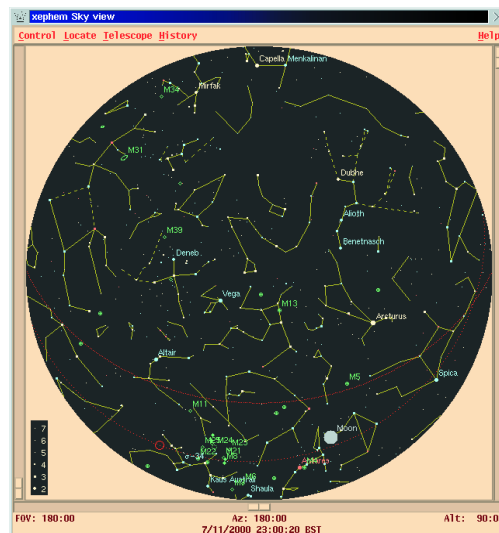
Fig1: The main dialog allows you to set the date, time and location for observations.

air mail.) The CD-ROM holds 240MB of data including catalogues of deep sky objects, asteroids and the Hubble Guide Star Catalogue of stars down to magnitude 15. It would take a day or so to download all this data making the CD-ROM an attractive buy. However, the free version is fine for casual stargazers or as a way of trying the program out before buying it. Pre-built binaries for Intel, Sun Sparc and PowerPC systems can be found on the Web for those who aren't happy about compiling the program from source code.

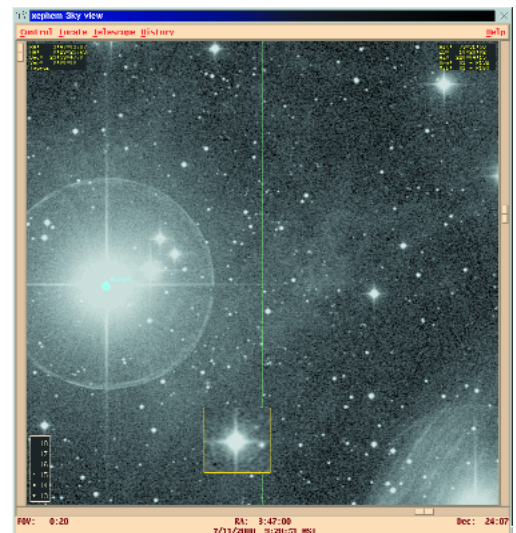
XEphem starts up with a dialog (Fig. 1) that lets you set the date, time and location. The start-up location is fixed and can't be changed - at least, not in the free version - unless you change it in the source code. It's quite easy to change the settings interactively, though. If you aren't sure about a setting you just point at it and a tool-tip pops up with some more explanatory information. The calendar usefully displays the dates of new moon and full moon to help you pick the best times for observing.

Whether you're a casual stargazer or a serious amateur astronomer, you'll get a lot of enjoyment from this charting program.

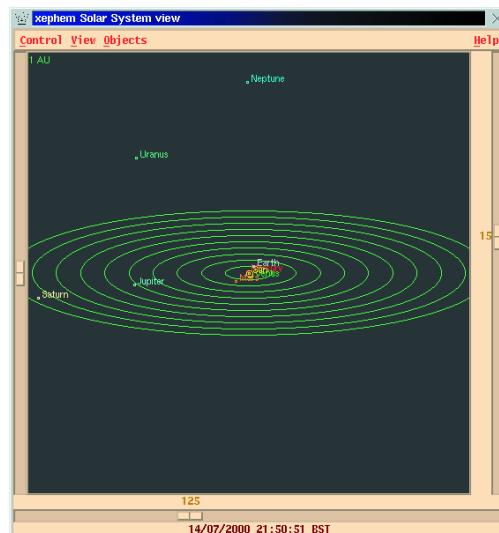
[left]  
Fig2: The Sky View shows the night sky for the chosen location at the selected time and date, as if in a planetarium.



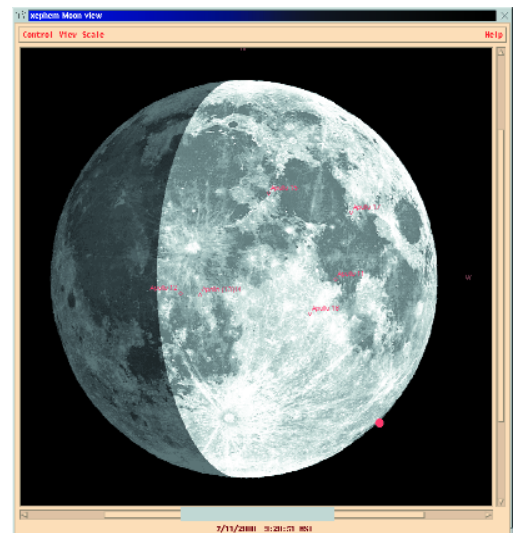
[right]  
Fig3: Digitised Sky Survey images for an area of interest can be downloaded from the Internet and displayed.



[left]  
Fig4: A view of the Solar System can be animated to show the movement of the planets.



[right]  
Fig5: The Moon view shows the exact phase, with Apollo landing sites labelled.



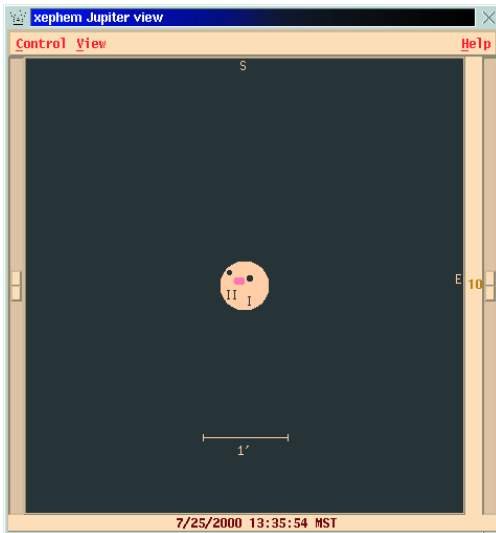
The main feature of the program is the Sky View. When you select this from the main menu, XEphem displays a 360 degree planetarium view of the sky as seen from the chosen location at the time selected if you were lying on the ground with your feet pointed south looking straight up (Fig. 2). Using the scroll bars you can change both the angle of view and the direction. Left-clicking on the map causes information such as the right ascension and declination, altitude, azimuth and constellation containing the selected point to be displayed. Right-clicking on a star or other celestial object causes a pop-up menu to appear showing all this information plus a description of the object, its size and magnitude, rising and setting time and a lot more. From this pop-up menu you can centre the display on the selected point or centre and zoom to that location to see more detail.

Options on the Sky View menu let you control the appearance of the display. You can choose whether constellation lines or boundaries are shown, the proportion of objects that should be labelled, the magnitude scale and much more. You can flip the image left to right or top to bottom so that it matches the view seen in an astronomical

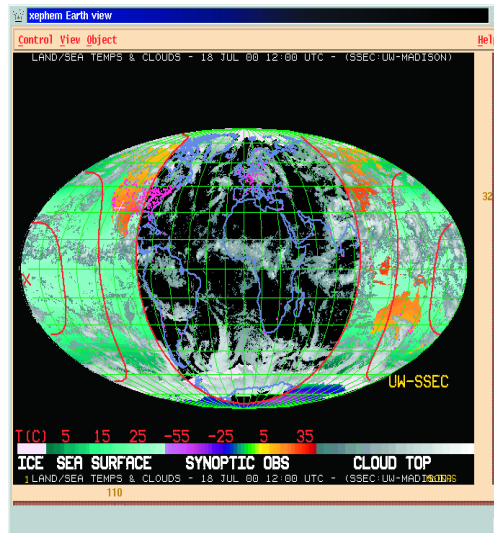
telescope. You can create a list of all the objects shown in the current view and you can print out a map. XEphem is better than a printed star atlas.

The free version of XEphem is limited in the number of objects it displays by what most people would consider a reasonable size of file to download. But the program isn't restricted to using the star catalogues it comes with. Perl scripts are provided to convert various astronomical database files available on the Internet into XEphem's own format and you can set paths to the directories where these databases are held. XEphem can also read Hubble Guide Star Catalogue data from various sources. A C program is included that can convert GSC data from CD-ROM to a more compact form for permanent hard disk storage. XEphem is supposed to be able to read GSC CDs directly (though it didn't like my rather old set for some reason.) If you don't have the GSC CDs XEphem will pick up GSC data for the area covered by the map from an Internet source. GSC data downloaded from the Internet is cached so it can be reused later.

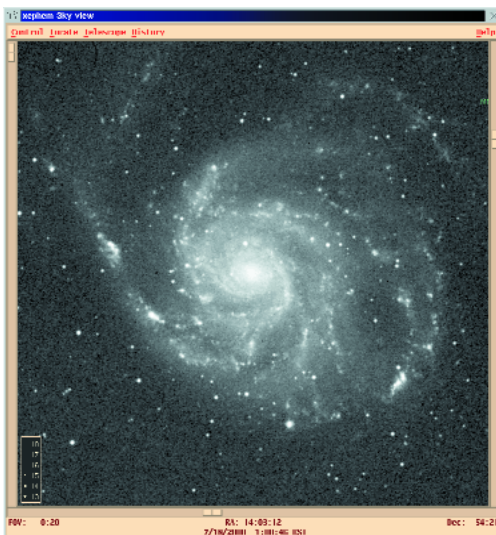
XEphem also has the ability to display Digitised Sky Survey Images. Armchair astronomers will love this feature! To use it you just zoom in on an inter-



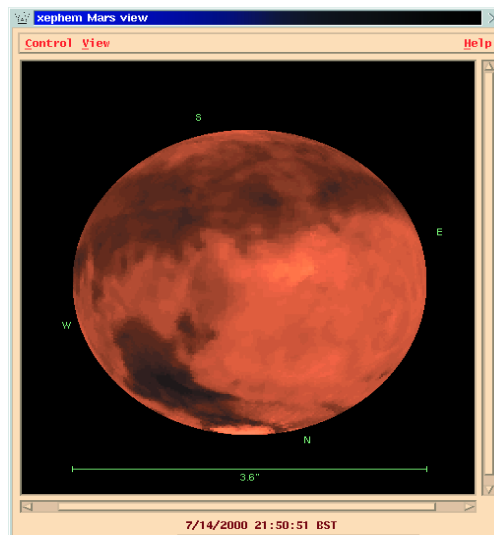
[left]  
Fig6: A view of Jupiter showing the Red Spot, with two moons in transit.



[right]  
Fig7: Cloud cover, sea temperature and synoptic data are plotted on a map of the world.



[left]  
The M101 Spiral Galaxy, from the Digitised Sky Survey



[right]  
The Mars view displays a digitised image of the red planet.

esting part of the sky and select Image from the Control menu. This will bring up the Sky FITS dialog. Digitised images in FITS format are available online from both the Space Telescope Science Institute (STScI) or the European Southern Observatory (ESO). From the UK, the ESO is nearer, so you just click the ESO button and XEphem connects to the Internet and downloads an image which is then displayed in the Sky View window. The results can be stunning (Fig. 3). Again, the FITS files you download can be saved to hard disk for viewing whenever you want them.

If you are interested in the objects in the Solar System, XEphem has even more to offer. The Solar System view displays an orrery which you can view from any angle and animate to show the relative motion of the planets (Fig. 4). The Moon view shows an image of the moon, shaded to show the exact phase. Points of interest such as the Apollo landing sites are marked, and you can find out the names of lunar features by clicking on them (Fig. 5). There's a similar option for Mars showing an image of the red planet. The views of Jupiter, Saturn and Uranus don't attempt to show any surface detail, although a red dot on Jupiter (Fig. 6) shows where

the Red Spot should be at that particular time. The major planets' moons are shown in their correct positions and the display can be animated which is a handy tool for finding the times of transits and occultations.

The Earth view probably won't be of much interest to astronomers. It shows a map of the Earth in either a cylindrical or spherical projection. Various locations can be shown, and identified by right-clicking on them, and the part of the Earth that is in daylight can be highlighted. Perhaps most interesting is the weather map display (Fig. 7). When you select it, an Internet connection is started and the program downloads up-to-date cloud cover, sea surface temperature and synoptic weather data and displays it on a map of the world.

XEphem can be used to control a telescope. If this option is selected you can click on the Sky View with the mouse and the program will send the coordinates to a remote process via a fifo. This should make it relatively easy to interface the program to any telescope control system.

Whether you are a dedicated amateur observer, a casual stargazer or an armchair astronomer, you will find XEphem to be a program with much to offer. ■

## Links

*Clear Sky Institute:*  
<http://www.clearskyinstitute.com/xephem/> *Craig Kulesa's web page:* <http://loke.as.arizona.edu/%7Eckulesa/xephem> *Bob Brose (NOQBJ) home page:* <http://homepage.mac.com/rbrose/xephem.html>