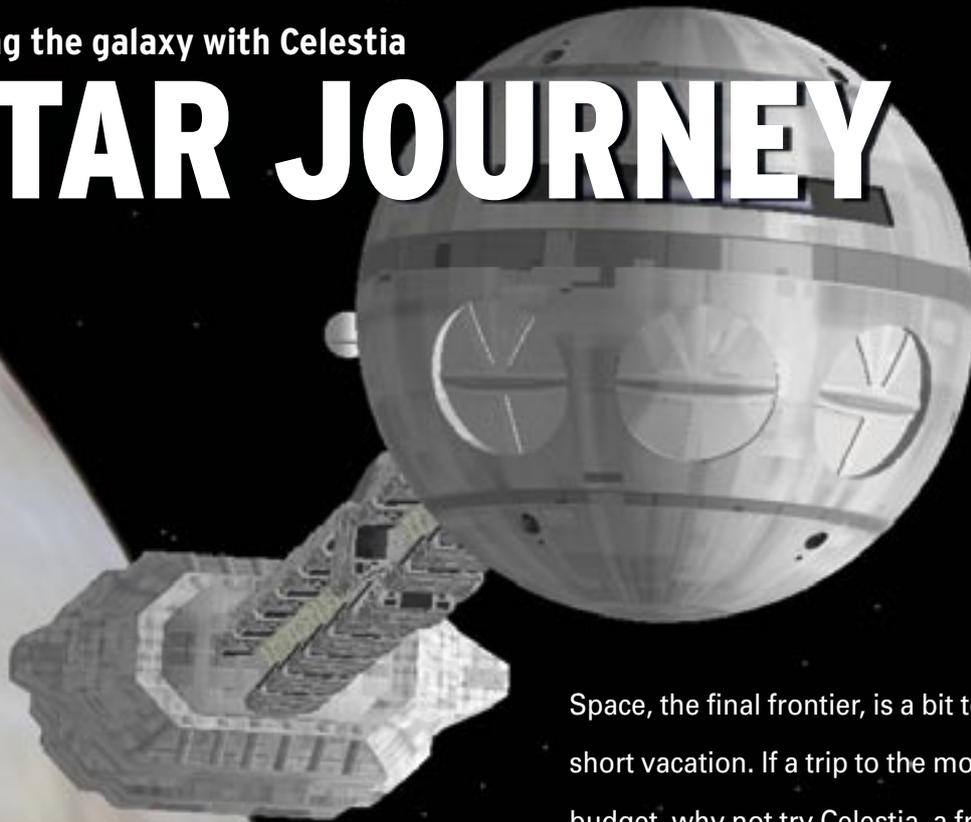


Touring the galaxy with Celestia

STAR JOURNEY



Space, the final frontier, is a bit too expensive for a short vacation. If a trip to the moon is beyond your budget, why not try Celestia, a free program that brings the galaxy to the comfort of your home.

BY KRISTIAN KISSLING

Hover above the ISS space station watching the earth slowly rotate below you. Be an eye witness as the Cassini probe passes the rings of Saturn. Visit the outer limits of the galaxy, or pay a visit to Klingon territory (Figure 1). Celestia will take you there!

Touring Tool

Chris Laurel developed Celestia [1] in 2001 to traverse and explore the galaxy in 3D. In the years that followed, countless volunteers on the Internet have helped to enhance Celestia. Now, Celestia is one of those rare examples of a program that is not only valuable from an educational point of view, but is entertaining at the same time. Celestia really is fun, and it just keeps on growing. The standard package comes with a huge collection of space objects, and you can add additional probes, remote solar systems, and alien space ships, simply by downloading add-ons off the web. Among other things, the complete space fleet from *2001 -- A Space Odyssey* is

available as a download. Advanced users can design their own planets and fictional solar systems. You can use Celestia for classroom work or work out routes through the galaxy that you can then replay in demo mode.

T Minus 10 and Counting...

Celestia comes with a few provisos. The program is not much fun without 3D acceleration. Planets hop and jump across the screen and space stations look pale. You will need a fairly powerful processor, and 512MB RAM and a graphics adapter with at least 64MB memory are recommended. Also, make sure you have a working 3D driver for your graphics adapter; this can be a non-trivial issue, but you will find a number of howtos on the web.

Users with Suse, Mandrake, and Fedora can use their distribution's download manager to install the Celestia version 1.3.2 packages. Check out the RPM search engine (<http://rpm.pbone.net>) for the RPMs. Fedora users additionally

need the *gtkglext-1.0.6* package.

Although all of these Celestia versions have the same release number, there are slight differences between the distributions. The toolbar on Fedora Core 3 looks different from the Suse version, although the keyboard shortcuts are identical. Debian users will have to make do with an older Celestia version (1.2.2), which does not have all the features mentioned in this article. To get Celestia, add the following lines to your */etc/apt/sources.list*:

```
deb http://ftp.debian.org/ 2
debian woody main
```

You can add the following FTP server to your sources list to get a brand new, but unstable version 1.3.3:

```
deb http://3demi.net/2
debian debs/ ./
```

In our lab, the menu bars turned out to be unusable for the most part, although



Figure 1: Celestia's galaxy is extensible. Don't be surprised to meet favorite TV aliens like Klingons or the Borg in remote solar systems.

keyboard shortcuts worked without any restrictions. This version is tailored for Sarge and Sid users and also needs 3D acceleration.

The install location for Celestia also differs depending on your distribution. Debian and Fedora Core 3 store the Celestia files in `/usr/share/celestia`, whereas Mandrake 10.2 uses `/usr/share/apps/celestia`, and Suse uses `/opt/kde3/share/apps/celestia`.

Beam Us Up!

After completing the install, press [Alt] and [F2], and type `celestia` to launch the program. Celestia starts by sweeping past the sun to the earth. You can use the menus or keyboard shortcuts to control the program – the keyboard shortcuts are more convenient. Use *Configure Shortcuts* in the *Settings* menu to set up your personal keyboard shortcuts. For a quick first impression of Celestia, press [D]. This launches a demo that gives you an impressive overview of Celestia's -features. Lean back and enjoy the trip through the solar system. Of course, interaction is possible. If you feel that you are too close to, or too far away from, a planet, you can modify the FOV (Field of View) by pressing [.] and [,] to zoom in to or away from the planet. If space is too dark for your liking, pressing [{} will brighten up the universe – you can press [}] to restore the dark. Of

course, the latter is more realistic: space really is pitch black.

Fly Me to the Moon...

At the end of the trip, you return to earth orbit. Time to take the controls. Fancy a quick trip to the moon? Press [Enter]. A transparent field pops up in the main window. Start typing `Mo` and you will note that a few alternatives are displayed. The list of options shrinks with

each letter you type. Now press [Tab] to auto-complete the word `Moon`. Confirm your selection by again pressing [Enter]. The word `Moon` is then displayed in the top left with additional details about your destination below: the distance, the radius of the celestial body, the number of hours in a day. But how do you get to the moon? Simple: press [G], the keyboard shortcut for *Goto*, and off you go. The display on the lower right now reads *Follow Moon*, which means you are in orbit above the moon.

You may think the moon looks like it's rooted to the spot. Shouldn't it be rotating? Actually, the moon is rotating, but it turns so slowly that you might not notice the difference. The time scale is displayed below the date in the top right portion of the screen. (See the setting labeled: *Real Time*.) Fortunately, Celestia allows you to warp time to suit your own needs. Press [L] multiple times, and you will notice that the moon starts to rotate slowly. The *Real Time* display changes to reflect this, and if you are lucky, you might catch a glimpse of the earth and the sun moving slowly in their orbits. You can press [K] repeatedly to slow things down again. Feel like a trip to the dark side of the moon? Grab your mouse, and hold down the right mouse button while dragging the mouse up or down. This takes you round the moon in either direction, a feature that you can

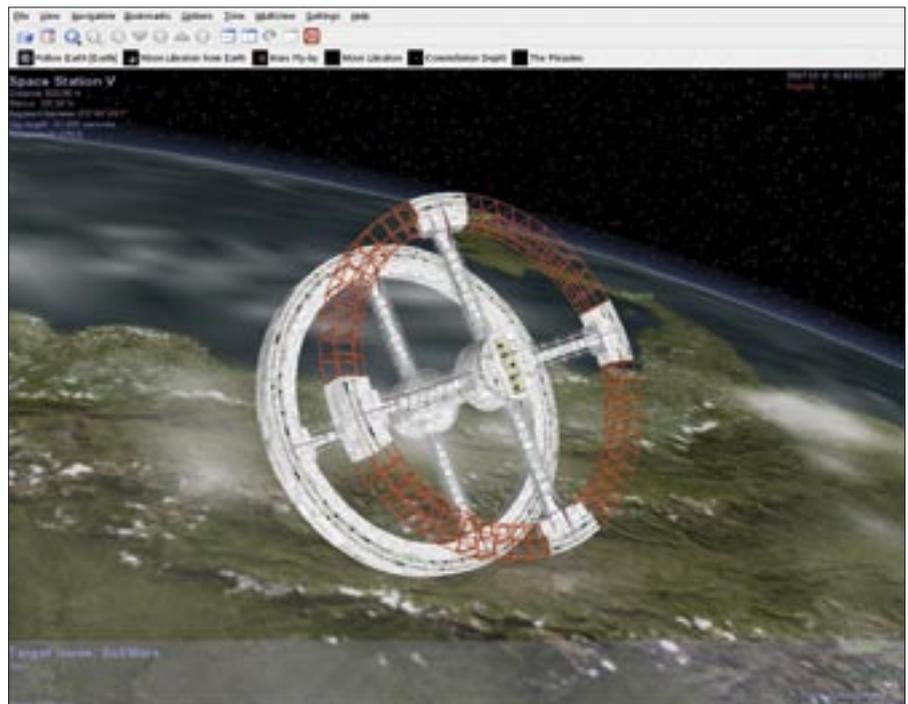


Figure 2: To change to a new location, enter the path to a new target object.

also apply to space probes and other heavenly bodies.

Is There Life on Mars?

Why not jump into your virtual spaceship and go see? Set the current time by pressing [Shift] and [!], and change to *Real Time* by pressing [K] and [L]. Now press [Enter], to define Mars as your destination, and take a trip under more or less “realistic” conditions to get a feeling for the vast distances in space. At the standard speed of today’s space vehicles (approximately 28,000 km/h) the flight would take seven months, so you might like to select light speed, instead. Just one more thing before you set your target destination. If you are in *Solar system A*, and you are looking for an object in *Solar system B*, you need to specify a path to the target object. For example, to go to Mars, you need to enter *Sol/Mars* (Figure 2). To view the Mars moon *Phobos*, type *Sol/Mars/Phobos* as the path.

Type *Ma* for *Mars*. Again, you will see a list of planets that start with these letters. Complete your selection by pressing [Tab], and confirm by pressing [Enter]. Then press [C] to center in on Mars, and [F] for *Follow*. The latter option helps you keep track of Mars in its orbit. The planet just keeps on moving. Blast off and press [F4] to go directly to light speed. You should see a *1.000 c* display on the lower left. Of course, you can accelerate gradually by pressing [A] mul-

tipple times. Pressing [Q] reverses your flight direction.

There is not a lot to see en route. Despite light speed, the flight takes about 20 minutes. The starts you are -flying towards do not change. A quick glance at the *Distance* display in *AU* (Astronomical Units) at the top left confirms that you really are on your way to Mars. Incidentally, an AU is about 150 million kilometers; this is the distance between the sun and the earth. During the flight, you can try out more *Celestia* features. [Shift] and [/] switches constellations on and off; [Shift] and [=] displays labels. Finally, [Shift] and [&] gives you the names of the Mars craters and the locations of cities on earth. [O] switches the orbits for planets, satellites, and comets on and off. You can use *-Configure Celestia* in *Settings* menu to specify the orbits you want to view.

In the Mars approach, you might like to press [Z] to reduce your speed at a distance of about 1,000,000 km, or press [S] to come to a dead stop, to avoid crashing into the planet. To orbit Mars at a fixed distance, press [Alt] and [L] and enter the desired *Altitude*. Then click *Apply* to send your space ship off into orbit at the specified altitude.

Probing Probes

Besides well and lesser known planets and asteroids, space is now full of man-made devices, such as the Saturn probe

Cassini-Huygens [2]. The probe was launched from earth October 15, 1997 and is now in orbit around Saturn. *Celestia* not only lets you visit the probe, you can even follow its complete flight path from launch to final destination. To do so, again press [Shift] and [!] to set the current date, press [Enter], and type *Cassini*. Confirm by pressing [Enter] and then press [G] to set off on a journey to the probe. The probe appears immediately, but where did Saturn go? To display the planet in the background, you either need to press the right mouse -button to rotate the probe to face Saturn, or load Saturn by pressing [Enter], and then pressing [Shift] and [C]. The planet appears in the background without you losing sight of the probe.

Time for another time warp. Press [L] to speed things up, and [J] to return to the normal time scale. A minus sign in the time display indicates that you are going backwards in time. Turn the clock back to 07.01.2004 and slow down. You can now see how the probe passes Saturn close up (Figure 3.) If you enjoyed the view and want to go back, you can press [Alt] and [B] to create a bookmark. The next time you call the bookmark, the exact same scenario will be replayed. Now go back to 10.15.1997, the date the probe took off. This takes you backwards through space at high speed, until the earth appears in the background just after the launch date. The probe then suddenly disappears. *Celestia* is quite realistic about only displaying probes for the duration of their journeys. The same thing applies to other objects such as the MIR or the ISS. If you get the time wrong, your search will get you nowhere. The probe suddenly appears in earth orbit from nowhere on 10.15.

Map to the Stars

While we are near earth, you may have been wondering where the International Space Station (ISS) is right now. The *Celestia* planetarium can help you find out. Just a few keyboard shortcuts will take you to earth or another object, where you can set up your private planetarium.

Right click on the earth and select *Follow*. Set the time to view the night sky, and press [Space] to freeze this point in time. Press [ALT] and [L] to specify the location of your planetarium,

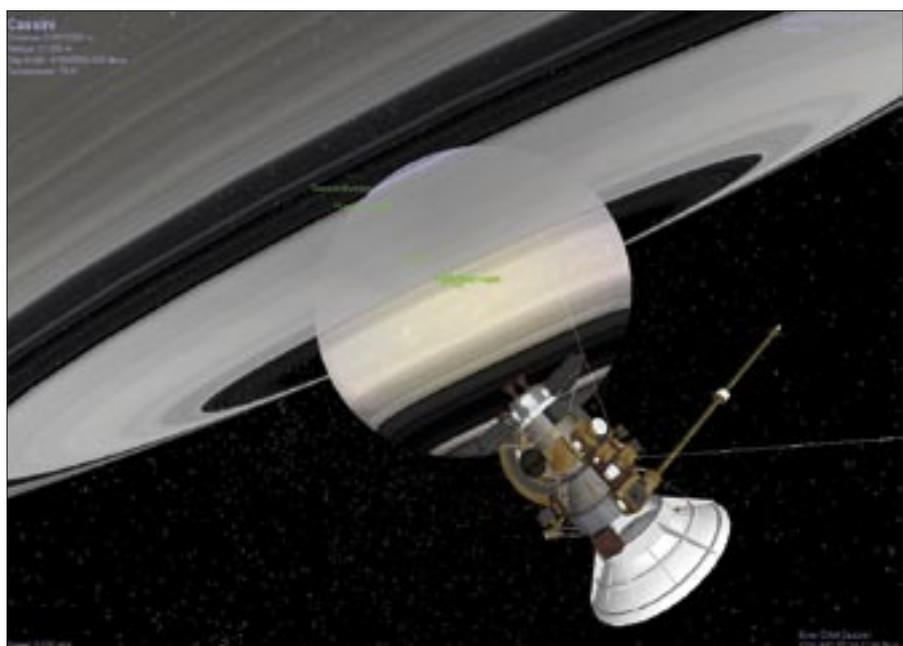


Figure 3: The Cassini-Huygens probe passed Saturn 07.01.2004. You can watch the show live with *Celestia*, traveling backwards and forwards through time at any speed you like.

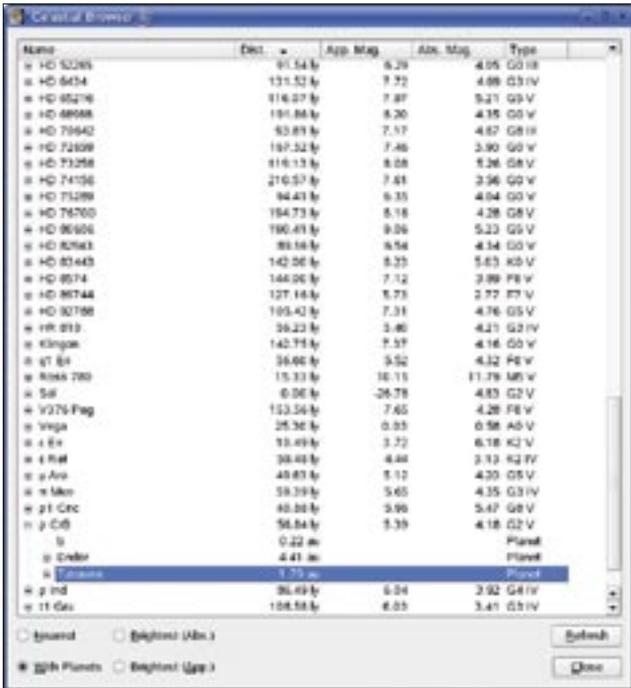


Figure 4: The Celestial browser helps you find space ships and planets installed with add-ons. The creators of some fictional space ships and planets put them in really obscure solar systems.

for example, *Berlin*. Then go to the Wikipedia entry for Berlin to find the coordinates, which are 52.3100 degrees North (N) and 13.2340 degrees East (E). Enter these values. Set the *Altitude* to, say, 3000 km and then click *Apply*; this takes your space ship to the coordinates you entered. Decide what direction you want to look in from the earth and turn your space ship to point in that direction. Press [Ctrl] and [G] to initiate the landing sequence. To see the stars, press [Ctrl] + [Shift] + [A] to remove the atmosphere, and [I] to hide the clouds. By comparing the night sky with the data from your planetarium, you can get to know the constellations and watch satellites pass by.

To add your home town, change to the Celestia *Data* directory. Become root and edit the *world-capitals.ssc* file. For instance, you could enter the following details for Munich:

```
Location "Munich" "Sol/Earth"
{
  LongLat [11.3428 48.0823 0]
  Importance 365.00
  Type "City"
}
```

The longitude and latitude data are taken from Wikipedia; *Importance* speci-

fies how visible a town should be from space. For example, Beijing is a big city that is visible from a long distance, but you need to fly closer to the planet to see Munich. The bigger the value, the more obvious the city is from space.

You'll find innumerable useful and entertaining add-ons for Celestia on the Internet. Tours are just like demos and display an animated sequence – typically for a single planet – while at the same time displaying text-based information in the background. To play a demo, unpack the files and move them to the right directories on your machine. This means putting files from the *Texture* folder in your own Celestia *Texture* folder; files with the *.cel extension, such as *demo.cel*, belong in the main Celestia directory. After installing a tour, you can select the *Open* menu item to take the tour.

Installing Add-ons

The Motherload page at [3] is the central repository for Celestia add-ons. The Motherload site gives you real and fictive planets, enhanced surface textures, futuristic space shuttles and probes, and general help. If you have a problem with an add-on, or just a question to ask about some Celestia topic, you could visit the Shatters forum at [4], where Celestia fans meet and exchange information.

Motherload add-ons typically install without any hitches. Let's look at an example. Download the *Tatooine*, *Endor*, and *first Death Star* add-on by Thomas Guilpain from the *Fictional/Star Wars* category, and unpack the files in a directory named after the add-on. Then give the *kdesu konqueror* command to open a second browser window in root mode. Navigate to the Celestia directory and

copy the unpacked files to that directory. You will need to copy the *ssc* file from the *Extras* folder to your Celestia *Extras* folder, and so on.

After relaunching Celestia, press [Enter], type *Rho CrB/Endor/Death Star*, and press *G* to take a trip to the Death Star. But beware of the death ray! If you are not sure where an object you have installed is hiding, you can press [ALT] and [C] to launch the Celestial browser and check *With Planets*. This setting allows you to manually search solar systems for planets or space ships (Figure 4). If you have the Celestia version for Fedora Core 3, you will have to search on the Internet. There is no way of discovering the whereabouts of Endor if you do not have the details. You might like to check the add-on *ssc* file for hints, or read the README file. Motherload has a lot more add-ons. Within the Motherload collection, you'll find special attractions such as the *Discovery* from Stanley Kubrick's movie *2001*, *Star Trek's* Enterprise, or the home planet of the Borg.

Back from the Future

The basic version of Celestia has "a mere" 100,000 stars, but you can download another two million stars from the Internet [5]. The stars in Celestia are not just dots; you can visit every single one of the Celestia stars. Right click any star and press [G] to take a visit. If you wish to save any really impressive views for posterity, you can take a snapshot of the screen. Pressing [F10] creates a screenshot and stores the results in a *png* file. And another tip before you launch your own galactic mission: if you happen to get lost in some remote reach of the galaxy, pressing [H] and [G] will take you home to our own friendly, little solar system. ■

INFO

- [1] Celestia home page: <http://www.shatters.net/celestia/>
- [2] Saturn probe Cassini: <http://en.wikipedia.org/wiki/Cassini-Huygens>
- [3] Motherload: <http://www.celestiamotherlode.net>
- [4] Celestia help: <http://www.shatters.net/forum>
- [5] Stars: http://www.celestiamotherlode.net/catalog/extrasolar_stars.php