User Guide
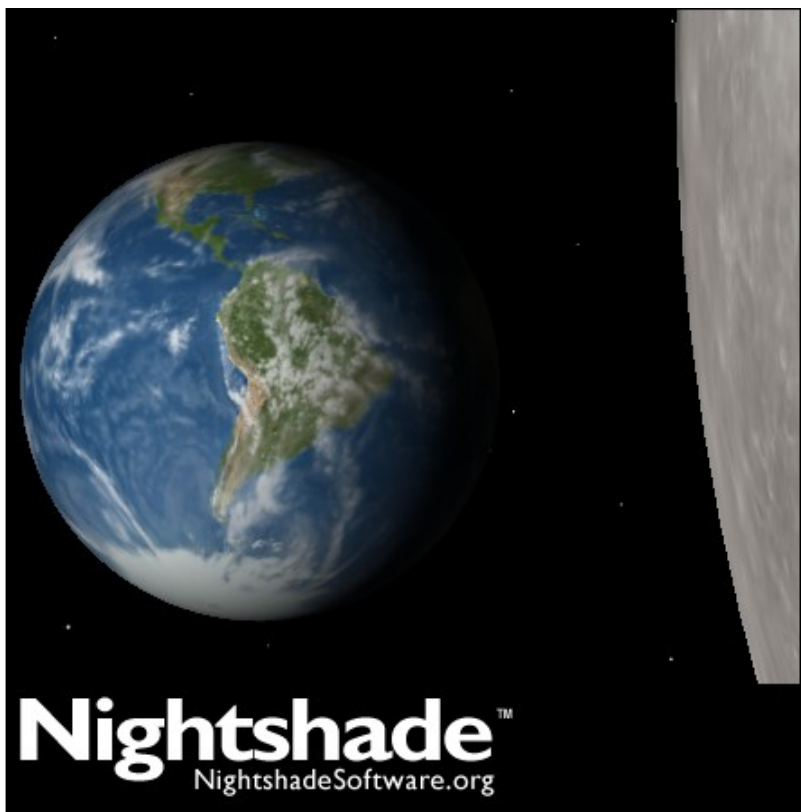
Nightshade™ Astronomy Simulator

Community Edition

Version 1.3 — September 3, 2010

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Trademarks

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Technical Support

To download the latest version, report bugs, request features, get help from the community, or assist others, visit:

http://www.NightshadeSoftware.org

If you are using a vendor-specific version of Nightshade, such as on a planetarium system, please contact your vendor for technical support.

Introduction

Nightshade™ is free, open source astronomy simulation and visualization software. It is an outstanding tool for teaching and exploring astronomy, Earth science, and related topics. Nightshade is used in professional planetarium systems, displaying the sky over a full hemisphere. It can also be used on desktop computers by amateur astronomers to plan observing sessions, by teachers presenting astronomy topics to their students, and by the general public at home for simple enjoyment of the night sky.

Nightshade simulates the sky from any point on Earth or from other bodies within the solar system, and it can be set for dates within approximately +/- 100,000 years. It automatically calculates the positions of all celestial objects as seen from the observer's location and sky time. Nightshade also draws the constellations of several cultures and simulates phenomena such as meteor showers, transits/occultations, and solar or lunar eclipses.

Nightshade is a fork of the award-winning Stellarium software by one of the early Stellarium developers. It has been tailored specifically for planetarium and educator use. The emphasis is on usability, realism, feature stability, and performance. It is backward compatible with scripts for Stellarium 0.8.2 and earlier using the StratoScript™ language developed and maintained by Digitalis Education Solutions, Inc.

Digitalis' Digitarium® planetarium systems run Nightshade software, and Digitalis manages the development of this software. Digitalis' lesson plans written for use with Digitarium systems are freely available at: http://digitaliseducation.com/curricula.html Many of the activities in the lesson plans can be modified for use on a desktop computer.

To download Nightshade, see http://www.nightshadesoftware.org/

How to Get Started

When you run Nightshade for the first time, it will use your computer's system clock to determine the current time. You must now set your location. To do this:

- Press the "1" key to show the configuration settings.
- If you need to localize the program for your language, click on the "Language" tab. The "Program Language" affects the user interface and the "Sky Language" affects sky labels. Languages are listed by their locale code. Click the button "Save as default" and then quit (CTRL-Q) and restart the program for the changes to take effect.
- Click on the tab for "Location."
- Click your location on the map.
- Save your setting, then exit the configuration window by pressing 1 or by clicking in the square to the top right of the configuration window.

Adjusting Sky Time

You may want to use Nightshade to explore dates in the future or the past. The following keys are used to adjust your sky time:

|	
6	Pause/continue movement of time.
7	Stop time.
8	Set sky time to current time.
J	Accelerate time rate in a negative (backward) direction. Can be pressed multiple times for faster rates. If the time rate is positive, this will act to decrease your time rate.
K	Move forward in real time.
L	Accelerate time rate in a positive (forward) direction. Can be pressed multiple times for faster rates. If time is moving backward, will reduce the backward rate.
-	Move backward in time one Earth calendar day (or local sidereal day if you configured this is in menu item 2.3, described below).
=	Move forward in time one Earth calendar day (or local sidereal day).
[	Move backward in time seven Earth calendar days (or local sidereal days).
]	Move forward in time seven Earth calendar days (or local sidereal days).

Navigating the Night Sky

Nightshade has a cursor that you can move around the sky to select an object. Use the mouse to position the cursor over the desired object, then click on that object. After you select an object, you will receive some information about it in the upper left corner of your screen.

Selecting an object enables you to center the sky on that object in order to track it, or to zoom in on it for a closer look. See the table below for information on key functions.

You can choose between Alt/Az and RA/Dec coordinate systems mounts (see icons at the bottom). By default is RA/Dec. If you would like to have a view center in a particular point of the sky, for a zoomed in look, press the mount icons for altacimuthat mount, move around the sky, up or down with the arrow keys and do a zoom in with PAGE UP as much as you like. With that you will have a partial view for the sky instead all the sky, but with bigger scale.
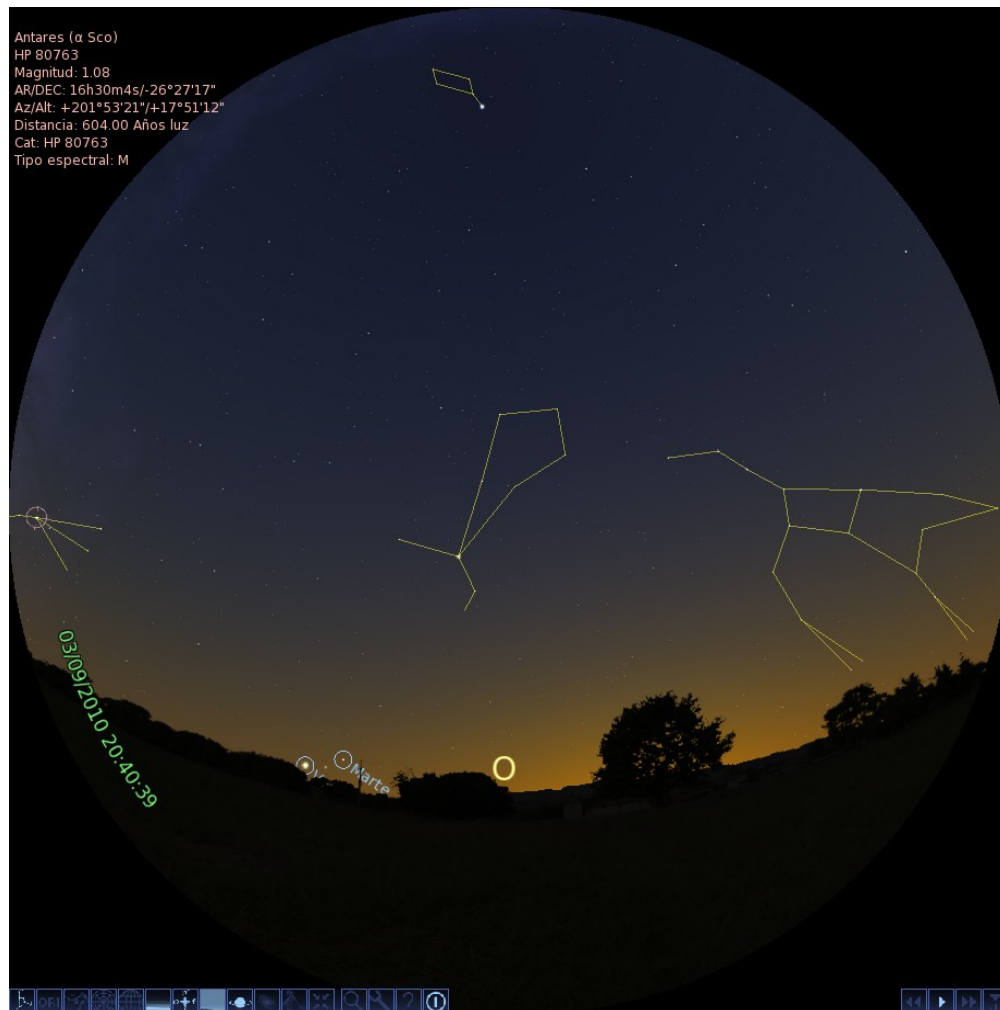
Nightshade Interface Guide

Feature	Tool bar icon	Key	Description
Constellation lines		C	Draws the constellation lines
Constellation names		V	Draws the constellation names
Constellation artwork		R	Superimposes artistic representations of the constellations over the stars
Azimuthal grid		Z	Draws grid lines for the Alt/Az coordinate system
Equatorial grid		E	Draws grid lines for the RA/Dec coordinate system
Toggle ground		G	Toggles drawing of the ground. Turn this off to see objects below the horizon.
Toggle cardinal points		Q	Toggles marking of the North, South, East, and West points on the horizon
Toggle atmosphere		A	Toggles atmospheric effects.
Planet (solar system object) names		P	Draws the names of the planets, moons, dwarf planets, etc.
Nebula (deep space object) names		N	Marks the positions of nebulae and galaxies when the FOV is too wide to see them
Coordinate system		ENTER	Toggles between Alt/Az and RA/Dec coordinate systems
Track		SPACE	Centers the view on the selected object
Search		CTRL + F	Toggle the display of the object search window
Configuration window		1 (DIGIT ONE)	Toggle the display of the configuration window
Help		H	Toggle the display of the help window
Quit		CTRL + Q	Close Nightshade

Feature	Tool bar icon	Key	Description
Rewind		J	Accelerate time rate in a negative (backward) direction. Can be pressed multiple times for faster rates. If the time rate is positive, this will act to decrease your time rate.
Play		K	Move forward in real time
Fast-forward		L	Accelerate time rate in a positive (forward) direction. Can be pressed multiple times for faster rates. If time is moving backward, pressing this key will reduce the backward rate.
Current time		8	Set time to current time

Key Commands by Function

Movement and selection

ARROW KEYS	Change viewing RA/Dec
PAGE UP	Zoom in on selected object (manual zoom)
PAGE DOWN	Zoom out from selected object (manual zoom)
CTRL + UP ARROW	Zoom in on selected object (manual zoom)
CTRL + DOWN ARROW	Zoom out from selected object (manual zoom)
LEFT CLICK	Select object
RIGHT CLICK	Unselect object
\	Zoom out from selected object (auto zoom)
/	Zoom in on selected object (auto zoom)
SPACE	Center on selected object

Display options

ENTER	Equatorial/altazimuthal mount
F11	Toggle full screen, if possible (not possible on Windows)
C	Constellation lines
V	Constellation labels
B	Constellation boundaries
R	Constellation artwork
E	Equatorial grid
Z	Meridian
N	Nebula labels

P	Planet labels
D	Star labels
S	Stars
G	Ground
A	Atmosphere
F	Fog
Q	Cardinal points
O	Toggle moon scaling
4 OR , (COMMA)	Ecliptic line
5 OR . (PERIOD)	Equator line
X	Toggle time and selected object information display.

Dialogs and Other Controls

H	Help
I	About
M	Text menu
1	Configuration
CTRL + S	Take a screenshot
CTRL + R	Toggle script recording
CTRL + F	Toggle object finder
CTRL + G	Go to selected planet
CTRL + V	Toggle record video frames to disk

Shift Functions -- After pressing and releasing the ` (backtick) key:

P	Toggle planet and moon orbit lines
4 or , (COMMA)	Toggle planet trails
Z	Azimuthal grid
8	Load default configuration
K	Replay last script
5 or . (PERIOD)	Toggle celestial tropic lines
A	Toggle the cloud rendering when viewing planets (currently just the Earth)

During Script Playback

6	Pause script
7	End script
K	Resume script
L	Fast-forward script

Miscellaneous

CTRL + D	Play demo script
9	Cycle through meteor shower rates
CTRL + Q	Quit

Changing Your Point of View

Nightshade allows you to simulate the sky from any point on Earth or from other planets or moons. To show the sky from a location other than your default location, you have three options:

1) Follow the directions in the "How to Get Started" section above, but DO NOT save your new location as default.
2) To move to a different body, select that body in the sky, then press CTRL + G. You may wish to edit your latitude and longitude on this new body to affect your view of the sky.
3) Press the "m" key to bring up a text menu, and if necessary, navigate to section 1, "Location." See below for information on navigating the text menu.

Navigating the Text User Interface (TUI)

Nightshade uses a text-based menu system to modify most configuration settings, although many are also accessible through the graphical configuration window discussed later. Bring up or exit the TUI by hitting the 'm' key. Note that other command keystrokes will not work while the TUI is in use.

The TUI configuration settings are organized into categories. Browse categories with the up and down arrows. Press the right arrow or the ENTER key to enter a category. Once within a category, browse the available configuration settings in that category with the up and down arrows. Use the right arrow or the ENTER key to begin editing the currently displayed setting.

While editing, the setting value you are editing is displayed in white. Use the number buttons 0-9 and "." or "-" to enter a number directly or use to change gradually. To finish your edit, press the ENTER key. To leave the menu, press "m" again.

Note: Be sure to save your settings as default if want them to be used the next time you start up your system. See the "Administration" menu category.

Menu Tree
1. **Set location**
   1.1 **Latitude:** Use + for north and – for south.
   1.2 **Longitude:** Use + for east, - for west.
   1.3 **Altitude:** In meters. At very high altitudes you can look down on your home planet (your home planet is the solar system body from which you are observing).
   1.4 **Solar System Body:** Change your viewpoint to any planet or moon, or to a point above the solar system.
   1.5 **Heading:** Rotate the sky simulation.
2. **Set time**
   2.1 **Sky Time:** Set your sky for a different time.

2.2 **Set Time Zone:** Select continent, then city in your time zone. These account for daylight savings, if any. Be sure to update the time zone if you change longitude, or the time will not correspond to the sky.

2.3 **Day Keys:** Choose between calendar days or sidereal days for time steps with the -, =, [, and] buttons. A sidereal day will vary in length depending on the planet or moon from which you are viewing the sky. Sidereal days are great for demonstrating planetary motion.

2.4 **Preset Sky Time:** Only used if startup time is set to "preset."

2.5 **Sky Time at Start-up:** Use the actual clock time when you start up, or use a preset time you have chosen.

2.6 **Time Display Format:** 12 or 24 hour format.

2.7 **Date Display Format:** Choose between system default; yyyy/mm/dd; dd/mm/yyyy; and mm/dd/yyyy.

3. **General**

3.1 **Landscape:** Change the projected landscape.

3.2 **Sky Culture:** Select culture for constellations.

3.3 **Sky Language:** Select language for star, planet, and constellation labels.

4. **Stars**

4.1 **Show:** Display or hide the stars.

4.2 **Star Value Multiplier:** Modify brightness of stars to make more or fewer visible. 1 is the default; 0 is the minimum; 30 is the maximum. Increasing this value will reduce star coloration, so this is only recommended if object sizing is set to "Point" (see menu item 6.3).

4.3 **Maximum Magnitude to Label:** Increase or decrease number of stars labeled.

4.4 **Twinkling:** 0 equals no twinkle; 1 is the maximum.

4.5 **Limiting Magnitude:** Increase or decrease number of stars projected based on their apparent magnitude. Default value is 6.5. This only affects stars. Set the light pollution luminance for a more realistic and comprehensive effect (see menu item 6.1).

5. **Colors:** Adjust red, green, and blue color values independently from 0 to 1.

5.1 **Constellation Lines**

5.2 **Constellation Names**

5.3 **Constellation Art Intensity:** 0 is invisible; 1 is full intensity.

5.4 **Constellation Art**

5.5 **Constellation Boundaries**

5.6 **Cardinal Points**

5.7 **Planet Names**

5.8 **Planet Orbits**

5.9 **Satellite Orbits**

5.10 **Planet Trails**

5.11 **Meridian Line**

5.12 **Azimuthal Grid**

5.13 **Equatorial Grid**

5.14 **Equator Line**

5.15 **Ecliptic Line**

5.16 **Nebula Names**

5.17 **Nebula Circles**

6. **Effects**

6.1 **Light Pollution Luminance:** Simulate the effects of light pollution. Value is in units of candelas per square meter. 0 is the minimum; 30 is the maximum.

6.2 **Manual Zoom:** Zoom in or out on selected object in small steps rather than one large step.

6.3 **Object Sizing Rule:** To easily display magnitude differences between objects by using more than one pixel per star or planet in a full-sky view, select "Magnitude." If you select "Point" every object will be restricted to one pixel in size.

6.4 **Magnitude Scaling Multiplier:** When object sizing is based on magnitude, this allows you to adjust the final size and brightness range to your liking.

6.5 **Star Size Limit:** This will limit the size of bright stars to no more than this number of pixels in diameter. Use this option to get smaller stars at the expense of less magnitude differentiation.

6.6 **Planet Size Marginal limit:** This is similar to 6.5 above, but for planets. The final planet pixel size diameter limit is the value entered here plus the current star size limit.

6.7 **Milky Way Intensity:** Adjust the brightness of the Milky Way, from 0 to 100. Default intensity is 1.

6.8 **Maximum Nebula Magnitude to Label:** Increase or decrease number of deep sky objects labeled based on their visual magnitude, from 0 to 100. Please note: objects whose magnitude is unknown (such as the Hubble Ultra Deep Field) are assigned a magnitude of 99.

6.9 **Zoom Offset:** Adjust where objects are tracked or zoomed in on. 0 is the zenith, +/- 0.5 is halfway toward the North /South horizon. This can make zooming more comfortable for your audience, but can add some distortion.

6.10 **Zoom Duration:** Amount of time (in seconds) it takes to zoom in on an object.

6.11 **Cursor Timeout:** Amount of time (in seconds) pointer will remain visible in the sky, from 0 (no timeout) to 60. Moving cursor or selecting/deselecting the cursor will make it reappear in the sky in its last location.

6.12 **Correct for Light Travel Time:** Yes or No. If yes, planet and moon positions are adjusted to correct for the time it takes light from each to reach the viewer. If "no," light is assumed to travel instantaneously to the viewer. Unless you want to compare with telescope observations, set to "no" for the best performance.

6.13 **Antialias Lines:** Yes or No. With antialiasing lines appear smoother, but also thicker and fuzzier. Without antialiasing lines are very sharp, but can be jagged looking since pixels are only either on or off in this mode.

6.14 **Line Width:** Adjust the width of drawn lines from 0.125 to 5 pixels (default is 1). Non-integer values only have an effect when using antialiasing, discussed immediately above.

7. **Scripts**

7.1 **Local Script:** Select a built-in script to run. When you exit the menu, the selected script will run.

8. **Administration**

8.1 **Load default configuration:** Return all settings to your defaults.

8.2 **Save current configuration as default:** Option says "Do." Save all current settings as default. Includes state of all settings, such as latitude, longitude, planet labels on or off, etc.

8.5 **Set UI Locale:** Change menu language.

8.6 **Projector Offset (percent of dome radius):** Adjust the projection to correct for the lens being placed off-center in a dome.

8.9 **Info:** Displays the software version.

Configuration Window Settings

Some settings are edited exclusively through the configuration window, some only through the TUI, and others can be changed through either. Below are screenshots of the various sections of the configuration window.

Language Tab

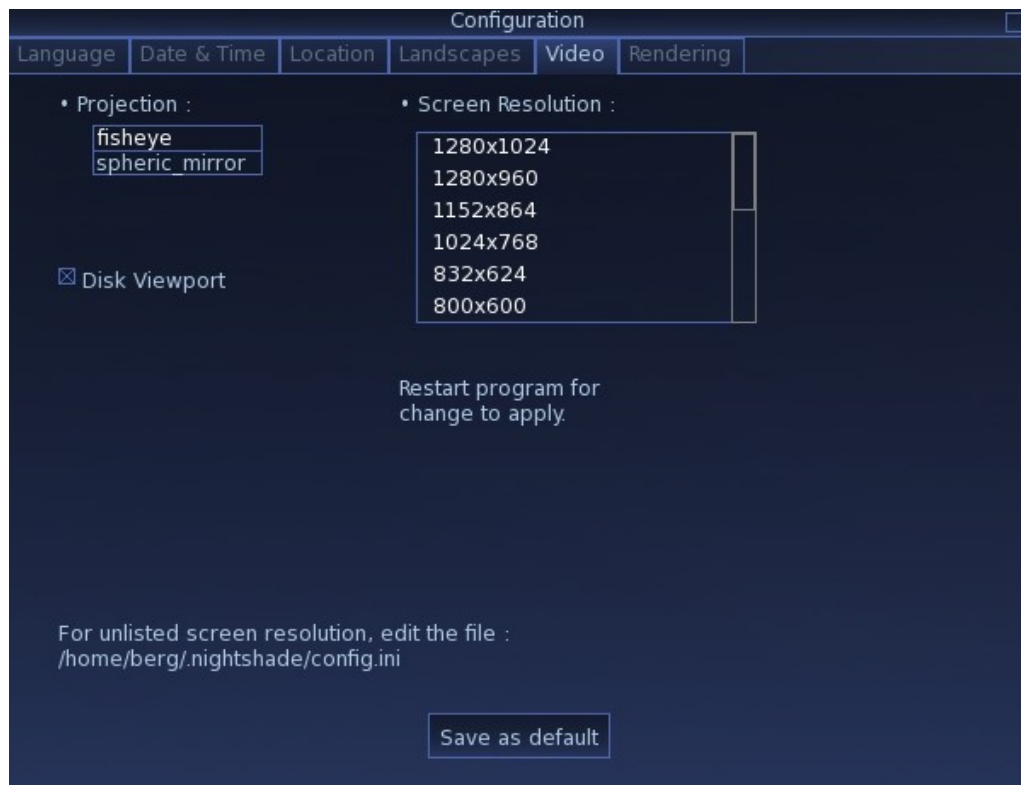**Date & Time Tab**

Location Tab

To choose a location on the map more accurate, do a zoom in to the map with the mouse's scroll and drag the map with the right mouse button down.
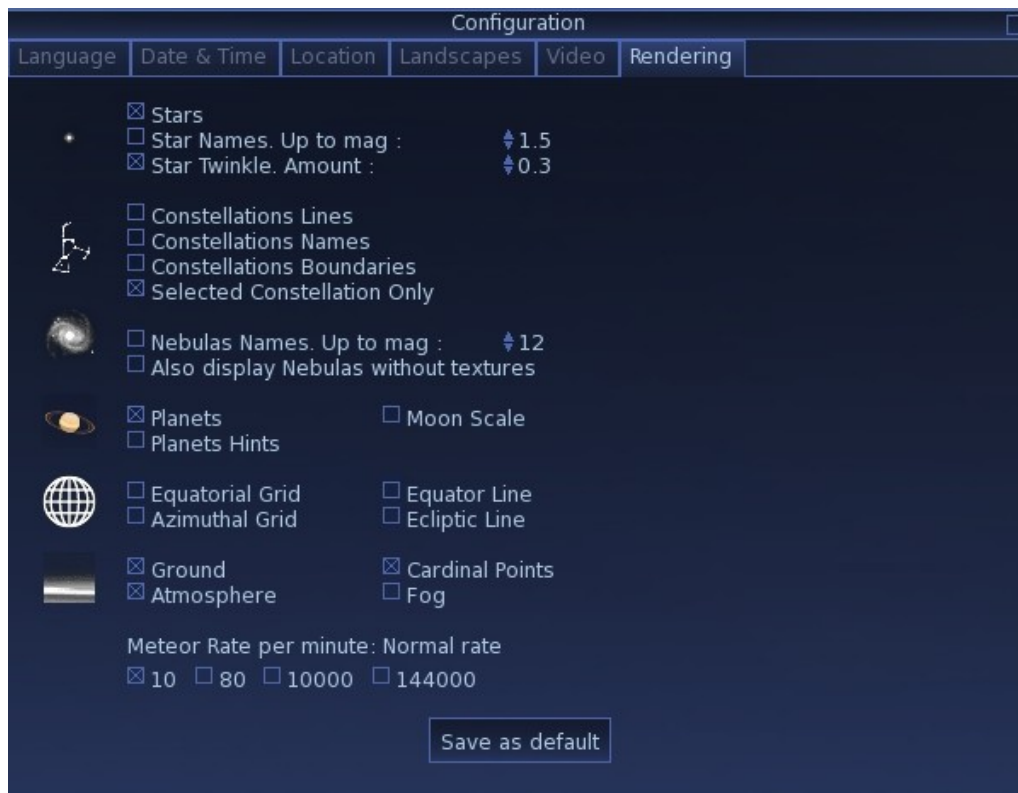
Landscapes Tab

Video Tab

Rendering Tab

Using Nightshade for Education

Since it accurately calculates the positions of all celestial objects based on your location and viewing time, you can use Nightshade to plan observing sessions. Astronomy clubs might also find it useful to project Nightshade if the weather does not cooperate for observing with actual telescopes.

Teachers are strongly encouraged to use Nightshade in their astronomy lessons. For teaching ideas, see Digitalis' webpage of open astronomy curricula:
http://digitaliseducation.com/curricula.html

Although lesson plans on the above webpage are primarily written for use in a planetarium, many of the activities can be modified for use on a flat screen. Nightshade users are encouraged to submit their own activities or full lesson plans for publication on the Nightshade website.

StratoScript™ Information

Nightshade has a powerful scripting function that enables you to create prerecorded segments or even entire planetarium shows, including image manipulation, video, and audio support. Visit http://www.nightshadesoftware.org/ to download the StratoScript command reference and a guide to getting started.