

# User work guide

## with the graphical interface

### Lua Universal Tools v5.0 beta 2

The Lua Universal Tools v5.0 beta 2 GUI (LUT-5.2 suite) has been designed for Celestia, for which the **Celestia User Guide** exists for version 1.6.1 (author Frank Gregorio, Russian translation: Sergey Leonov). Celestia is managed using keyboard commands:



Green color: 77 direct controls  
 Blue color: 29 controls combined with the Shift key  
 Yellow color: 20 controls combined with the Ctrl key  
 Purple color: 3 controls combined with the Alt key.  
 Total keyboard controls : 129.

Some functions have no shortcuts. Control of these functions is provided using Celestia's menu. Some functions have dual control by menu and keyboard. The large number of controls is a big disadvantage for working in Celestia.

The programmers Vincent Giangiulio and Hank Ramsey 2007 designed the **GUI Lua Edu Tools v1.2 beta 8**. Lua Edu Tools (LET suite) was designed primarily for use in educational institutions (schools, institutes, universities) and was intended to facilitate the user's work with the Celestia program. Over time, this supplement to Celestia quickly gained popularity among ordinary users, adding additional features that did not exist in the official version.

As of 2013, LET has been upgraded to a new name, **Lua Universal Tools**. In the following procedure, you will be able to compare step by step the characteristics of the LET and LUT-5.2 graphical interfaces.

#### General view (left LET and right LUT-5.2):



*Fixed part graphical interface LUT-5 is 5 times smaller than LET!*

*Color lines on the left and color marks on the right indicate the location identical tools and functions.*

*Due to the tight arrangement in LUT-5 posted 10 additional items management.*

*The bottom line of LUT-5 buttons that are enable / disable panels the control panel. It moving parts of LUT-5. Control panels can turn on / off all simultaneously or each individually!*

#### Lua Edu Tools consists of the following:

- setting the date / time, setting the time (acceleration, deceleration);
- adjustment of ambient light;
- adjustment of the brightness of galaxies;
- adjustment of FOV (viewing angle);
- magnitude adjustment;
- navigation buttons;
- customization of the display parameters;
- distance markers:
  - . distance marker, square, in the plane of the observer
  - . distance marker in the orbital plane (ecliptic) of the selected object
- extension selection panel (add-ons);
- catalog of the Solar System with a classification of objects according to their type (planets, satellites, asteroids, etc.);
- information board;

- media panel;
- the zoom function, designed for educational purposes, displays the solar system at the desired scale;
- diagram of Hertzsprung-Russell (HR)
- compass: (you can change its position on the screen, by clicking on):
  - . longitude / Latitude or Azimuth / Direct declination
  - . Planetarium and Navigation modes
  - . movement direction control buttons
  - . coordinates
- and others ...

**More about the components listed in Lua Universal Tools (v4.0 and further):**

**1. The first 5 components are combined in Control Panel # 7.**

- setting the date / time, setting the time (acceleration, deceleration);
- adjustment of ambient light;
- adjustment of the brightness of galaxies;
- adjustment of FOV (viewing angle);
- magnitude adjustment;

**2. Navigation buttons:**



*Navigation buttons in LET*



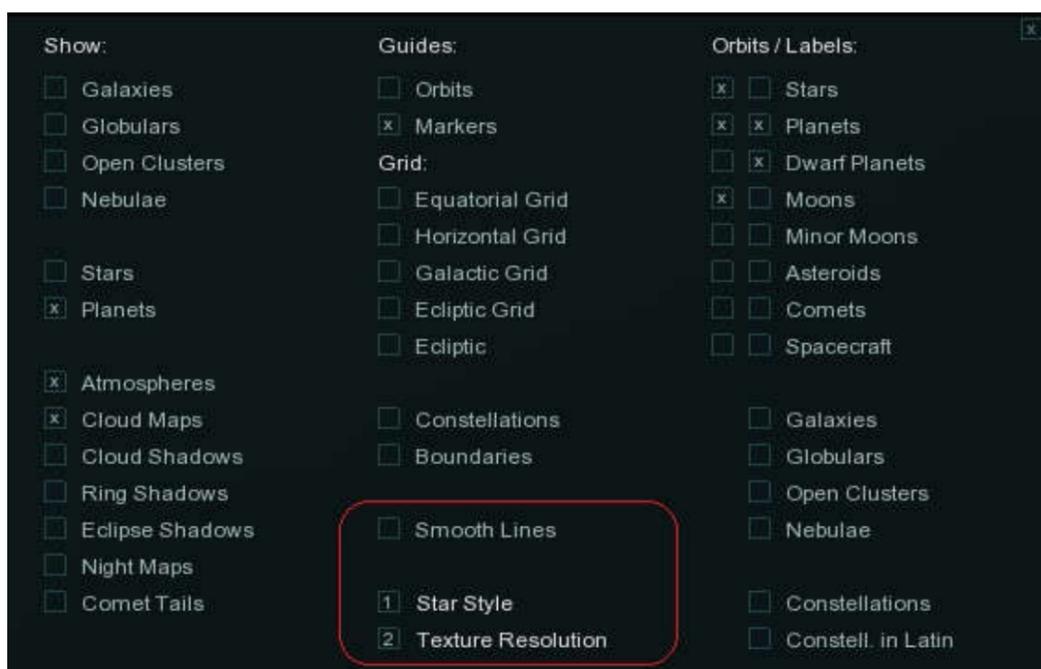
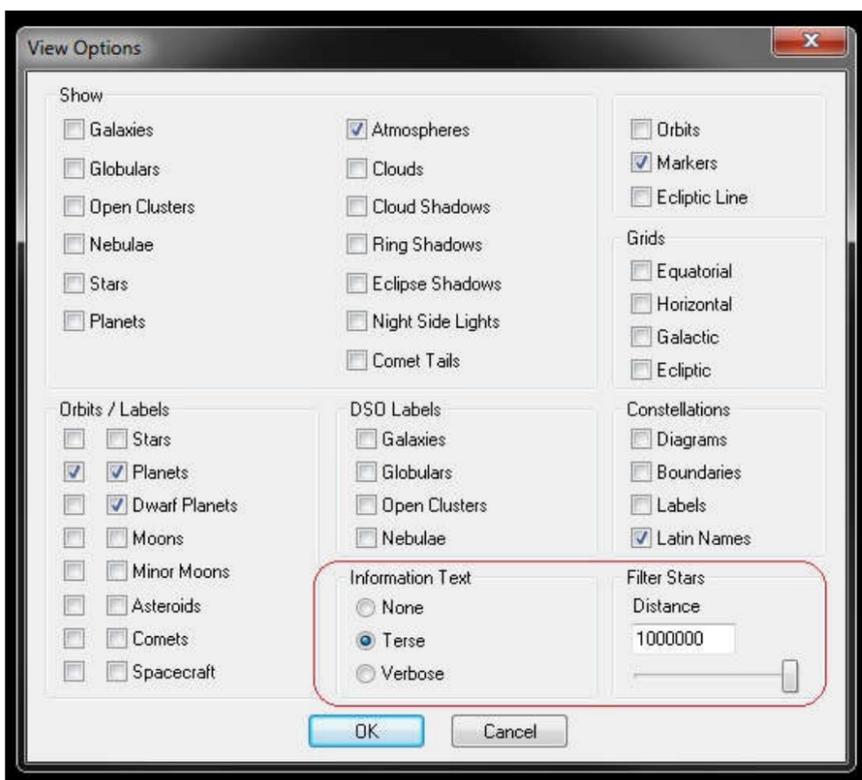
*LUT-5 Control panel Panel No.1. Space navigation.*

*Layout:  
Navigation Buttons  
Buttons for movement  
Boards of the Solar System  
Dwarf planets  
Other.*

**Compare button commands with keyboard commands:**

- [T] - Tracking the selected object.
- [F] - Monitoring the selected object (follow the object).
- [Y] - Synchronous rotation around the selected object.
- [Shift + “] - Accompanying the selected object.
- [Shift +:] - Capture the selected object.

**3. Display settings in Celestia, LET and LUT:**



The difference of the panels display settings:

- presentation of visualization elements.
- panel availability (Celestia - 2 clicks, LET - 1 click)
- possibility to move the window (in Celestia yes, LET no).

The Display Settings panel in LUT v4.0 / v5.2:

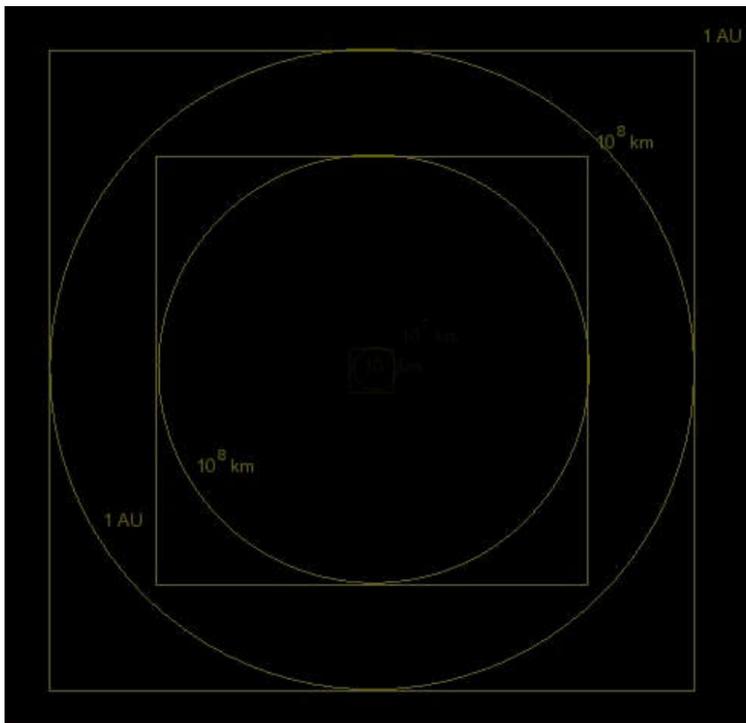


Differences:

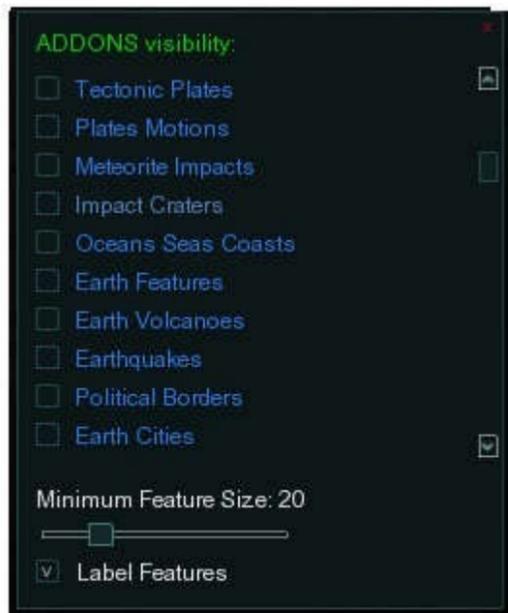
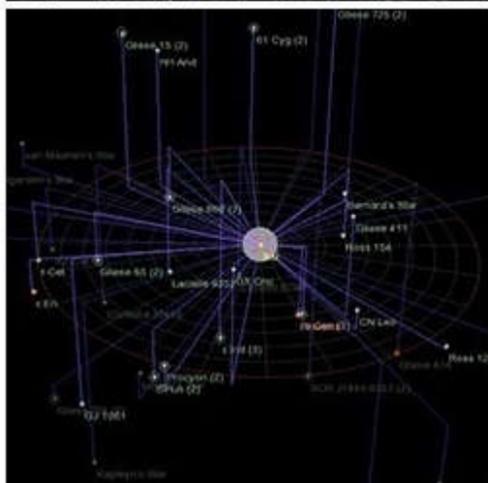
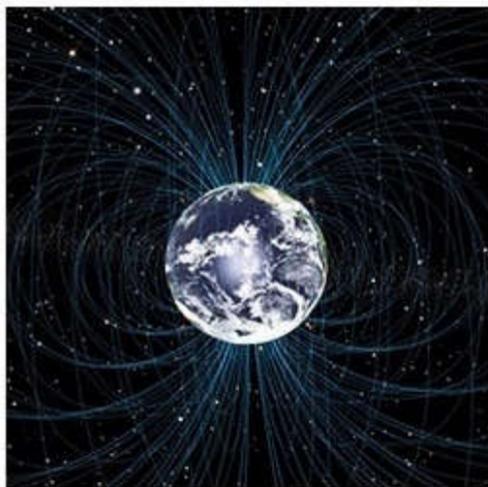
- in star filter has been restored in LUT-5,
- in LUT-5.2 new checkboxes for on / off. 3 classes of objects.

Accessibility panels - 1 click. Panel are relocatable.

#### 4. Distance markers (square and round distance markers):



#### 5. Extensions selection panel (add-ons)



*Illustrations*

*Belt of asteroids*

*Magnetosphere of the Earth*

*The nearest stars*

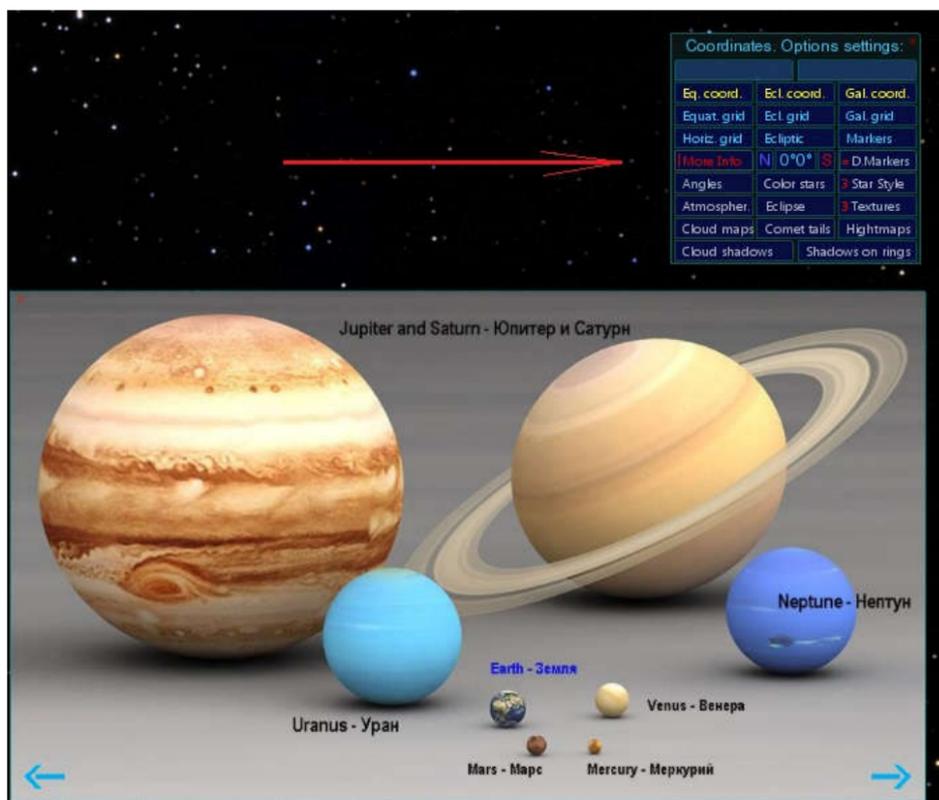
## 6. Solar System Catalog in LET / LUT:



Lua Universal Tools v4.0 / v.5.0 catalog (without asteroids or comets !)



## 7. Text and media information panel:

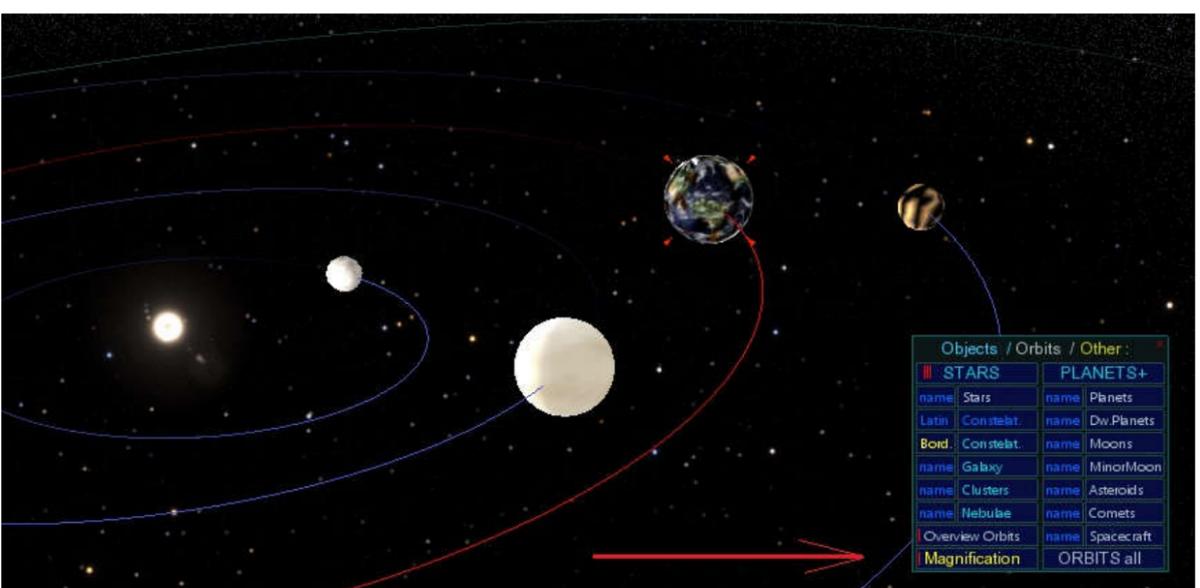


List of albums for LUT v4.0 / v5.2:

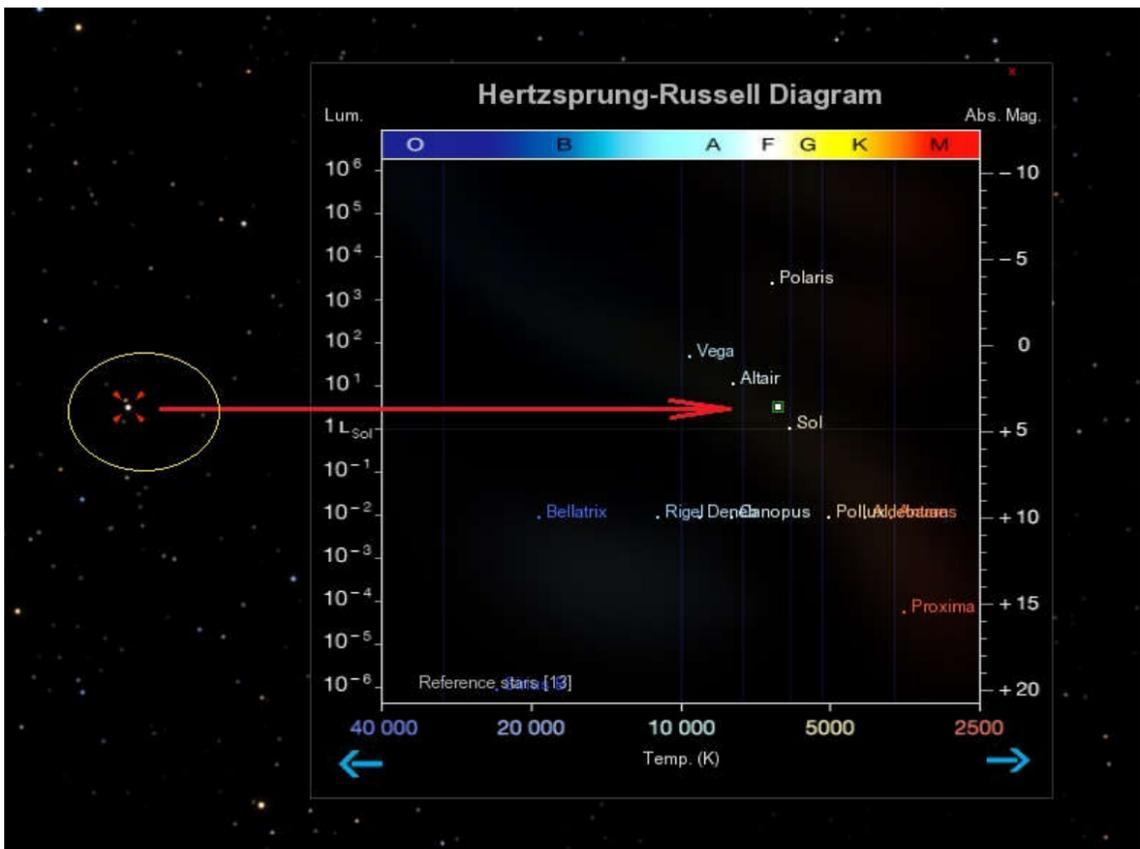
1. illustration of the planets - 61 pictures
2. illustration of galaxies - 300 pictures
3. illustration of nebulae - 119 pictures
4. star cluster picture - 180 pictures
5. other illustrations - 9 pictures

## 8. Zoom function of planets and other objects:

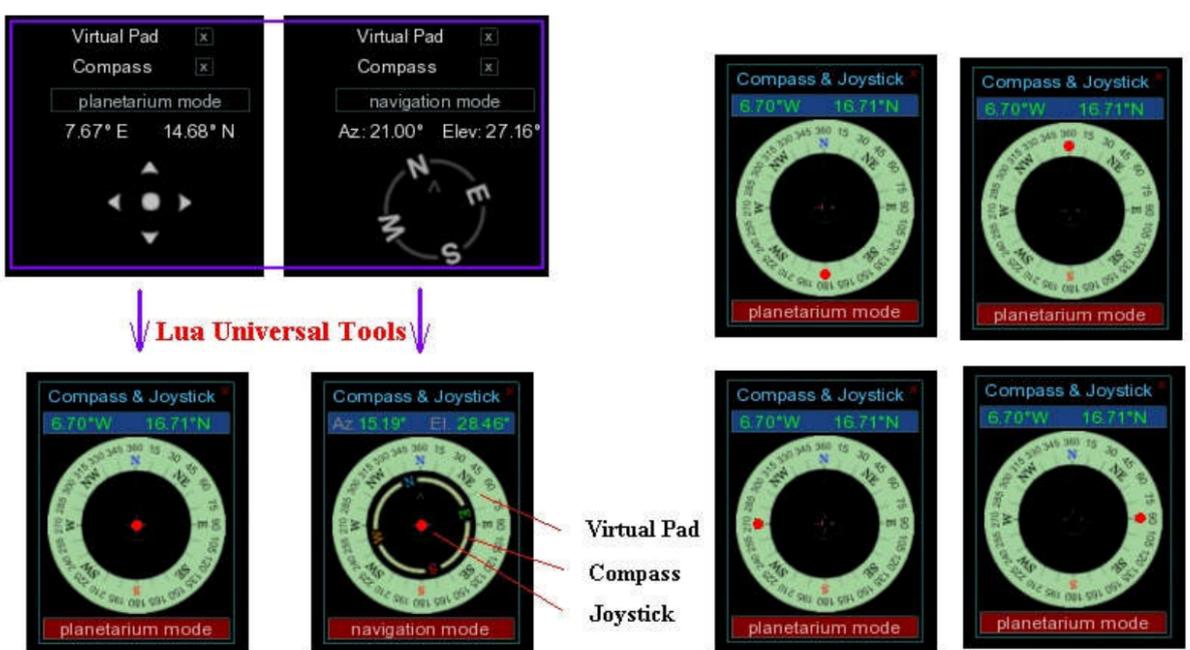
Increase function (designed for educational purposes and displays the solar system on a scale)



9. **Hertzsprung-Russell diagram** shows the relationship between the magnitude of the spectral luminance of the class and the temperature of the surface of the star.

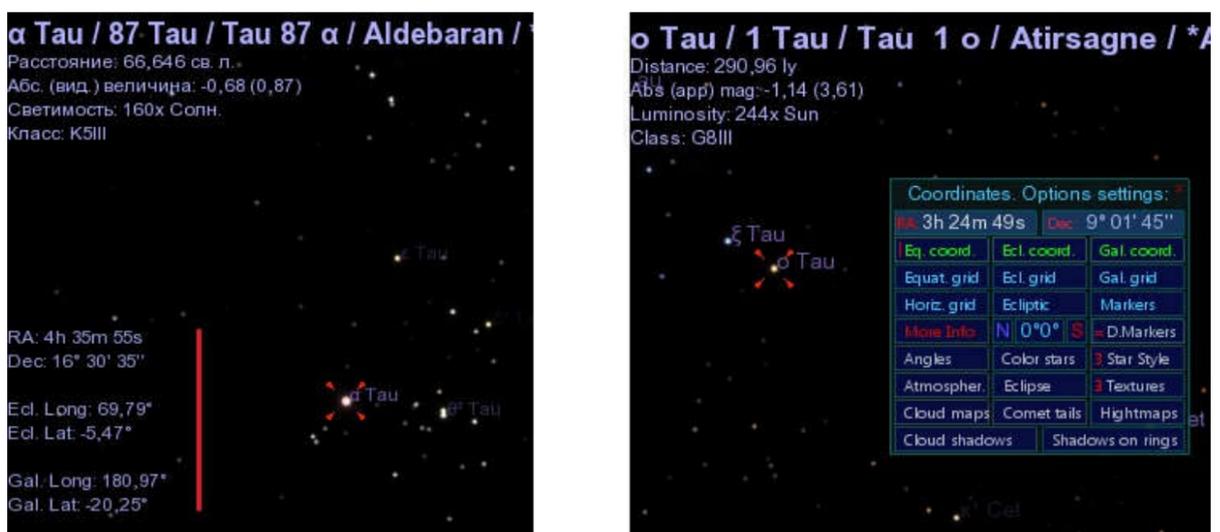


10. **Compass LET / LUT v4.**



Note: For LUT-5 the compass is completed with the autopilot tool.

11. **Coordinates (left LET, right LUT-5.2)**



12. **Lua Edu Tools** allows you to add new functions and commands. For teachers, it's huge opportunities to create interesting astronomy courses and incredible trips into the world of Celestia's program. There is also the possibility to activate the cockpit display, reproducing NASA's space shuttle dashboard with a view through the front window. It gives the impression of being on board a spaceship, and provides the user with an unforgettable experience when traveling through the Celestia universe. (Celestia Manual for version 1.6).



It was while looking at this cockpit, that was born the idea of the horizontal integration of the 'remote control' which was put in LUT-2:



**New tools in Lua Universal Tools (v4.0 and further) :**

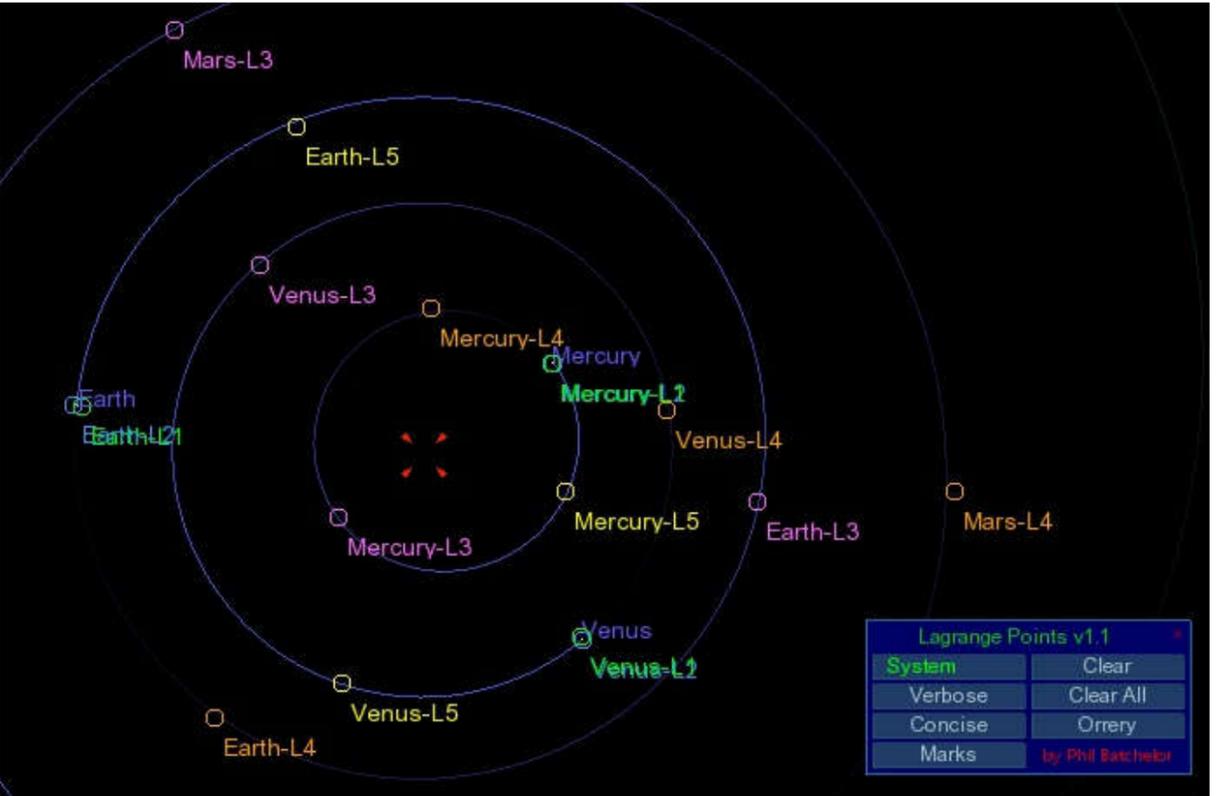
1. Virtual Discrete Base (asteroids and comets),
2. Lagrange points (addon),
3. Space elevator (addon) ,
4. New outlines of the old constellations (Bonus !!!),
5. Help - information panel on the interface.

**More about the new tools:**

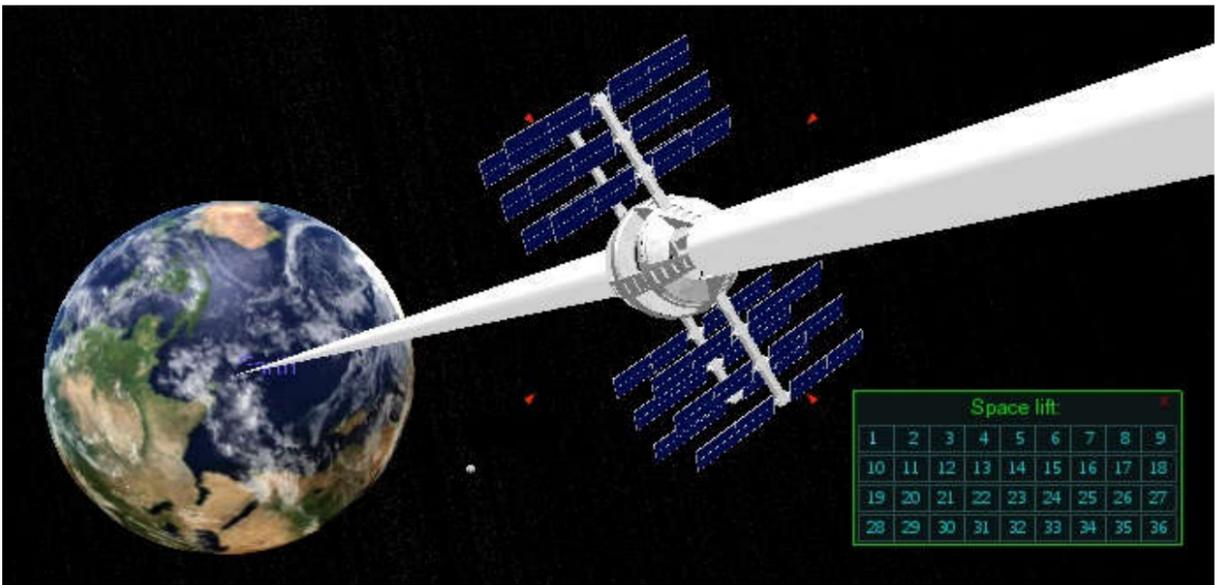
1. Virtual Discrete Base:

A detailed description of the illustration, see below.

2. Lagrange points (by Phil Batchelor ):



3. Space lift (by Thomas Guilpan):



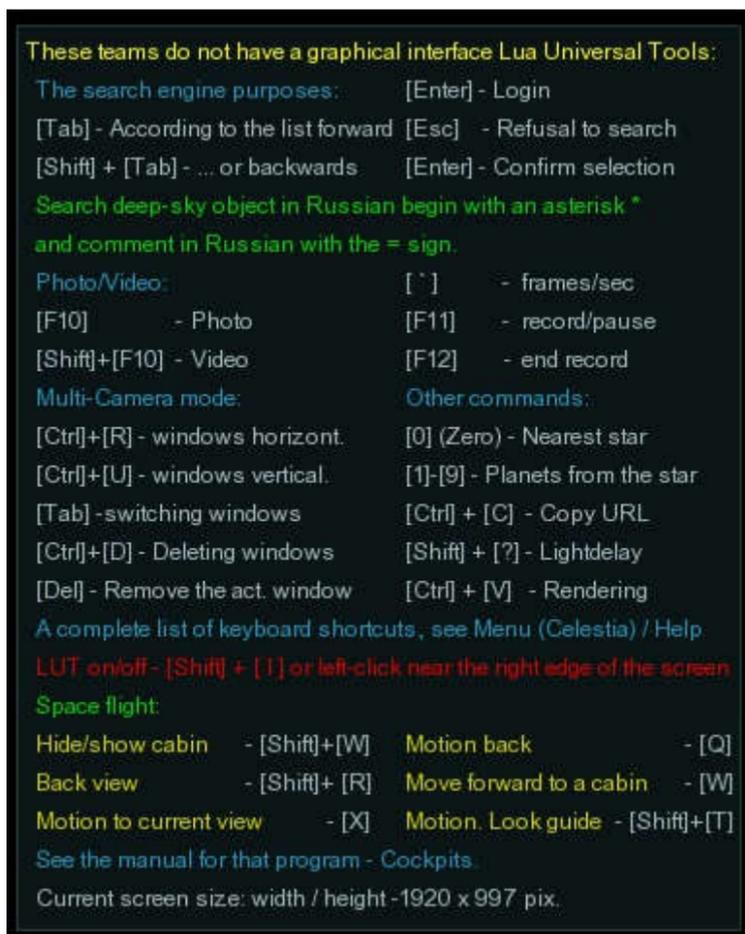
With this addon, we can see the Earth at an altitude of 1000, 2000, 3000 ... 36000 km, (by jumps of 1000 km)

4. New outlines of the old constellations (Bonus !!!)



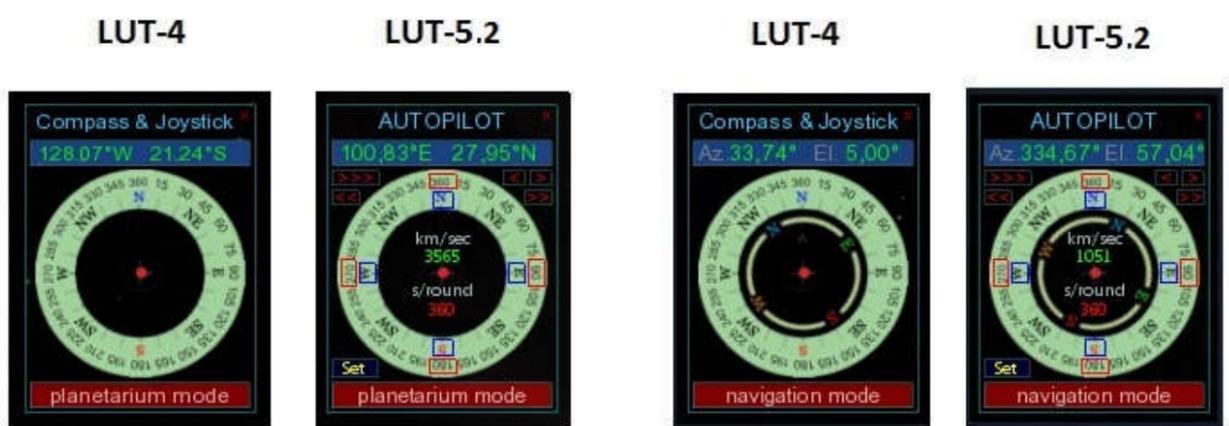
The author of the contour of the constellation Gemini - Hans Augusto Ray - children's writer and illustrator, see the book "The Stars: A New Way to See Them". See the back of this manual for details.

5. Help Information Panel:



New tools in Lua Universal Tools v5.0:

6. Autopilot (Modernization of the Compass & Joystick):



7. The LUT-5 / LUT-5.2 menu (for the [Obj.VIEW] / [Obj.HIDE] button, see below):



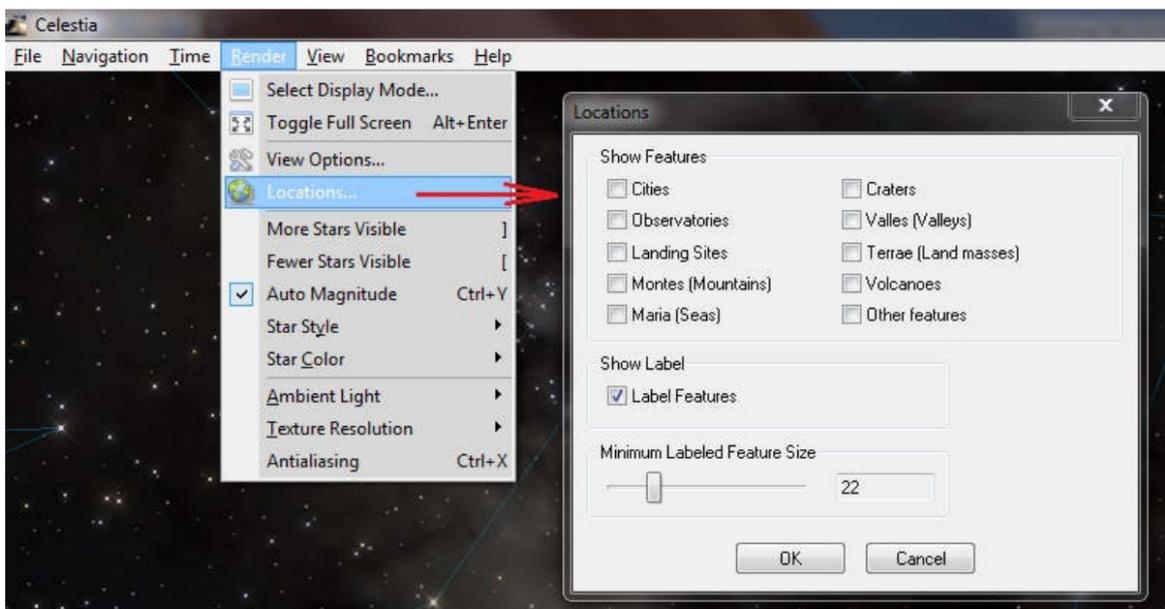
8. Planetography (Celestia) / Planetary Nomenclature (LUT-5.0 and further):

The Planetary Nomenclature panel contains 80 checkboxes, so 80 types of locations.



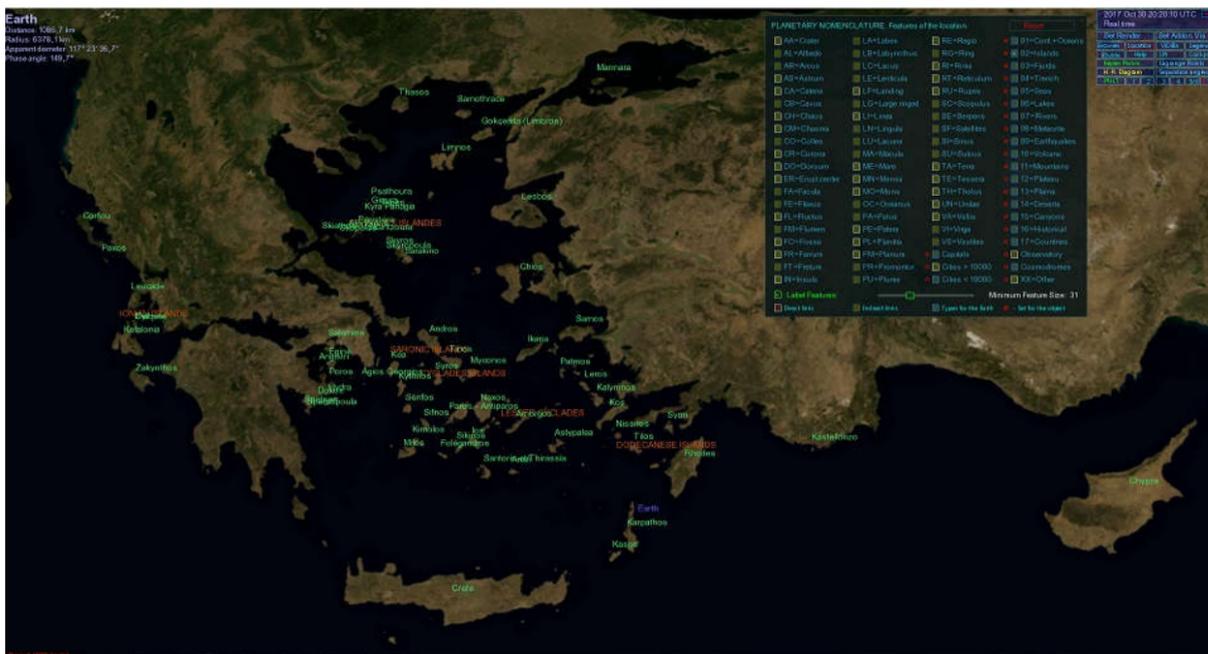
It allows each type of place to be activated / deactivated separately.

The Planetography panel (locations) contains 10 checkboxes so 10 types of locations:



Panel PLANET NOMENCLATURE.

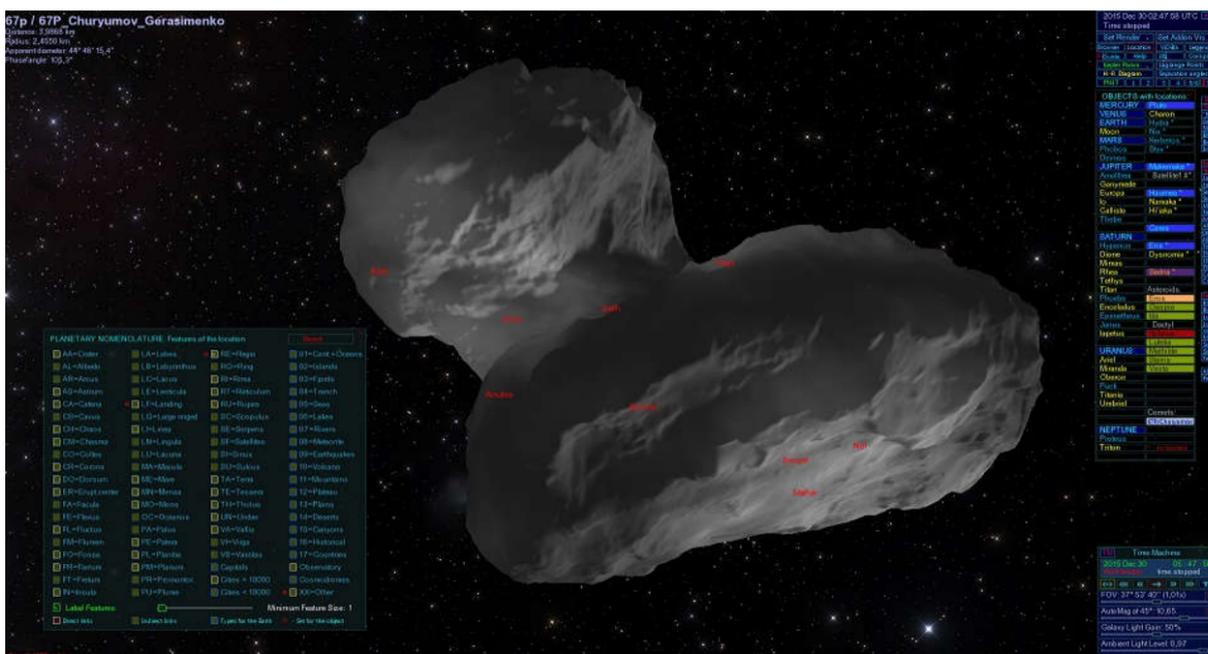
Type of location - the island. "Islands in the Mediterranean region"



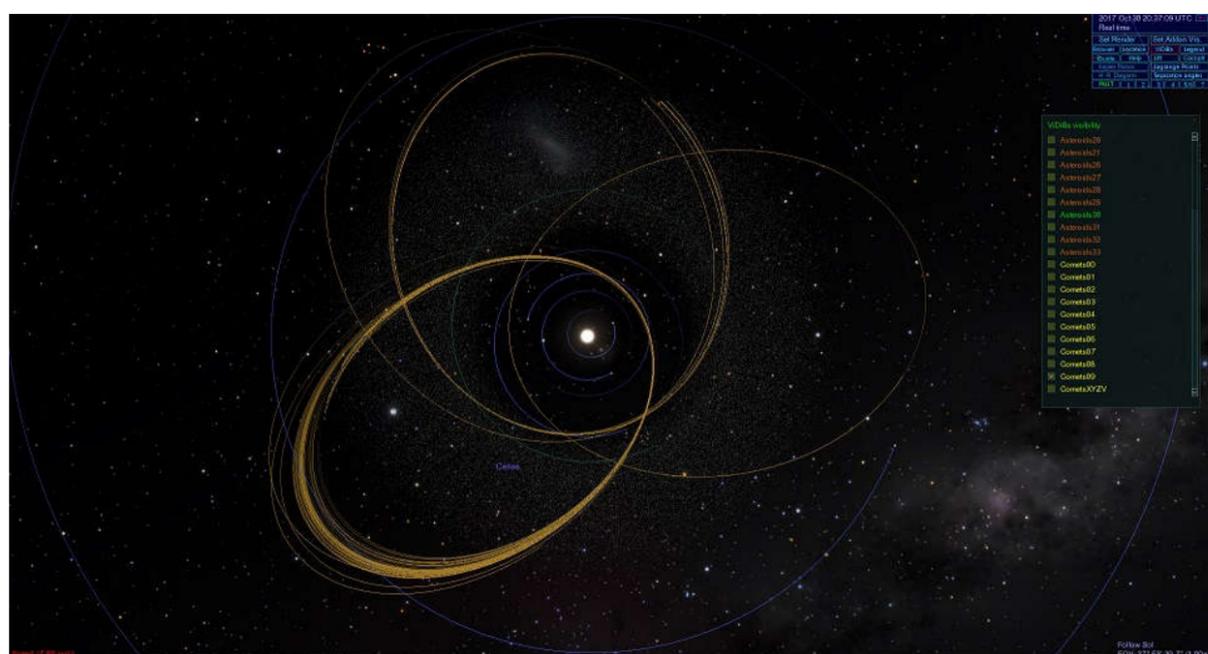
Type of location - the river. "Rivers of South America"



Selective visualization of real objects, for example comet 67P (author of John Van Vliet's model)

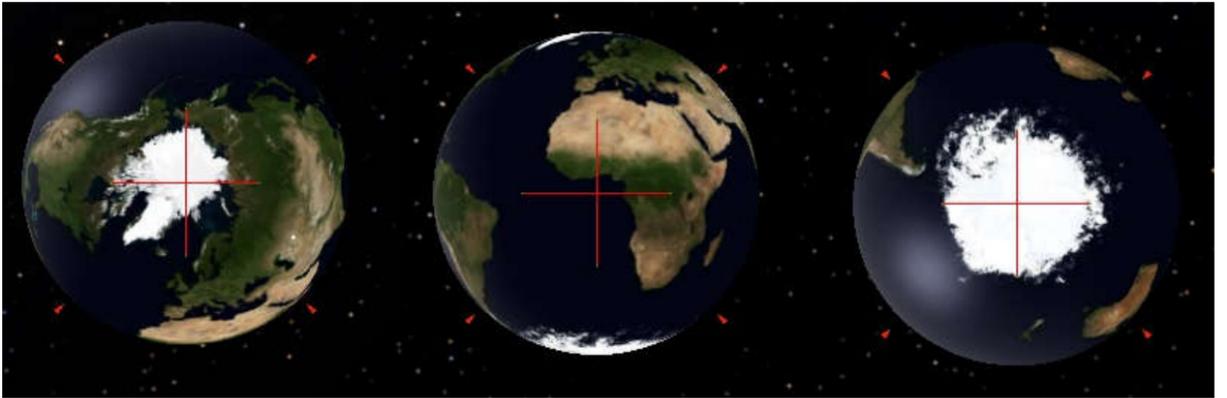


Simulation based on ViDiBa, for example, comet fragments 73P, 1993 F2, 332P:

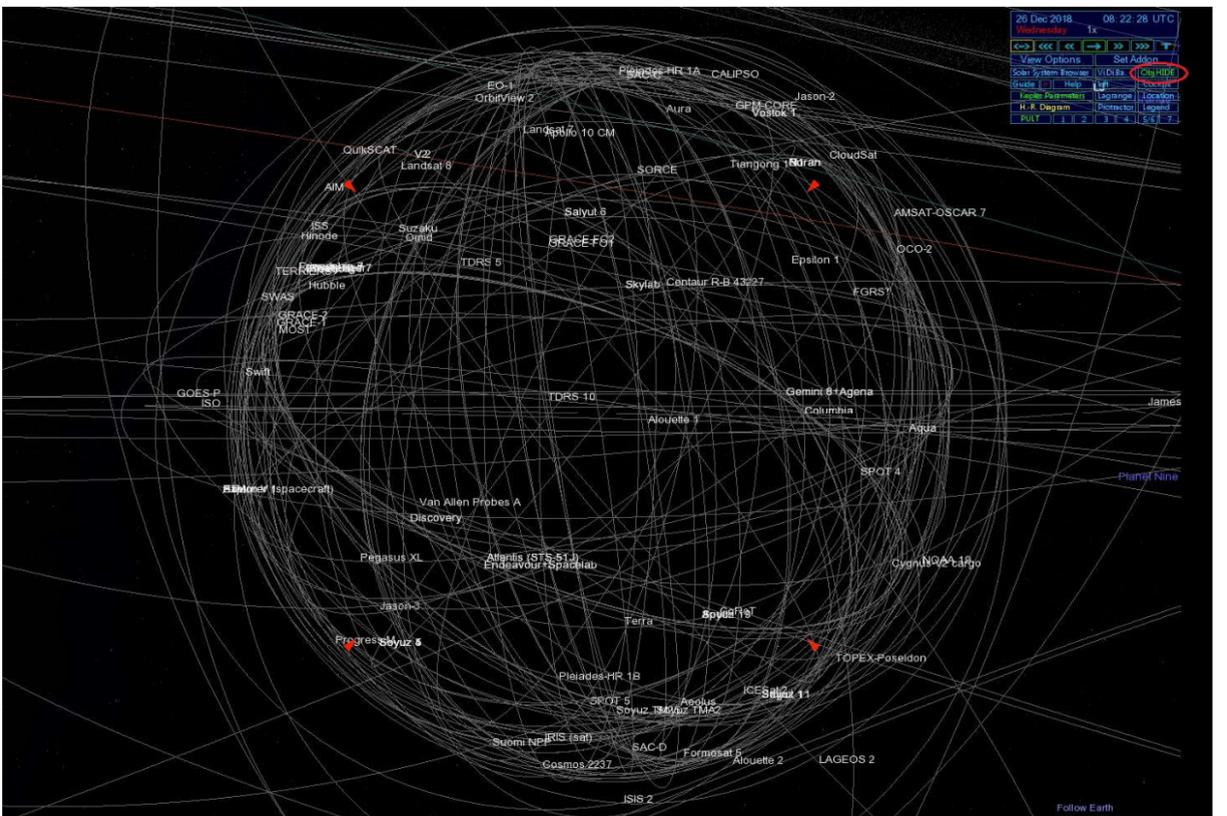
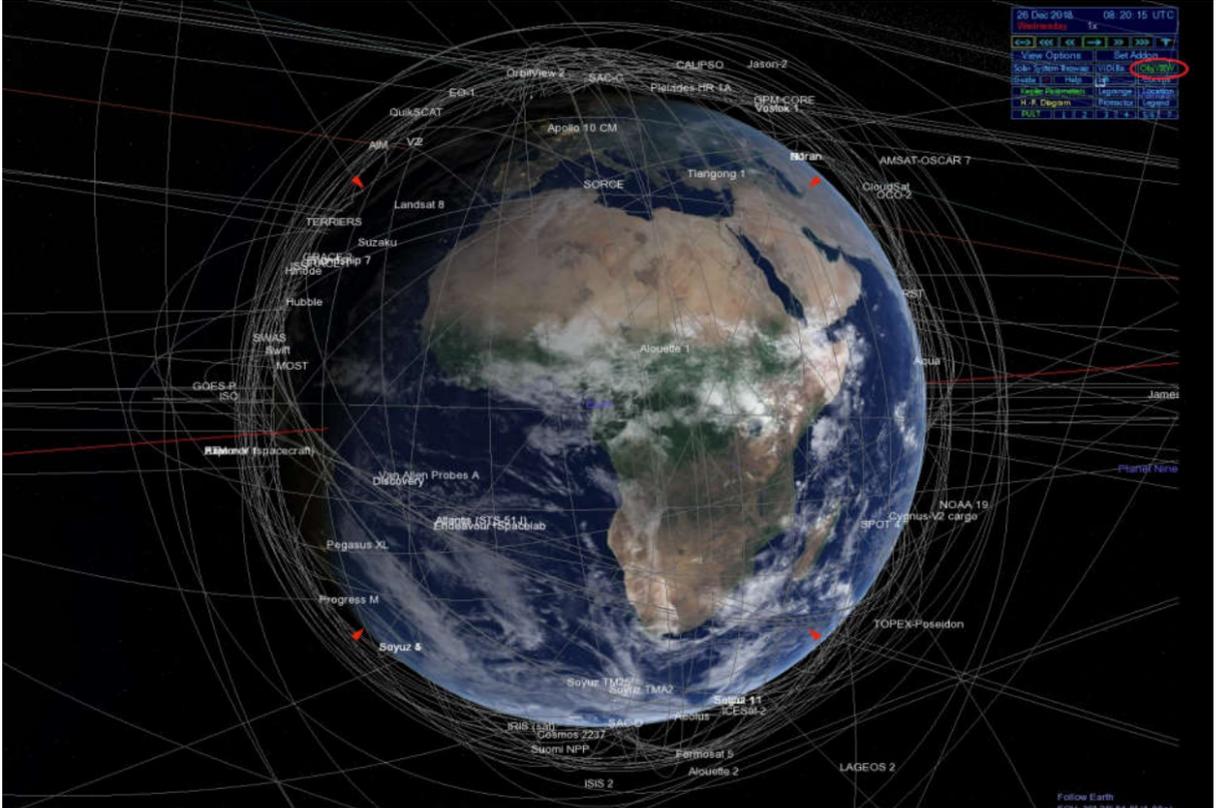


9. Button [N] [0°0'] [S] positioning above:

- North Pole
- from the equator, on the zero point of longitude,
- South Pole



10. Button [Obj.VIEW] / [Obj.HIDE] в LUT-5.2



This tool disables the selected object without disabling orbits and / or object names.

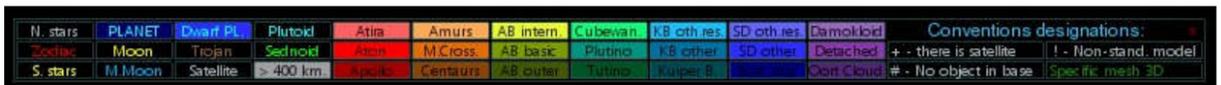
11. New time format accurate to 1/100 second.



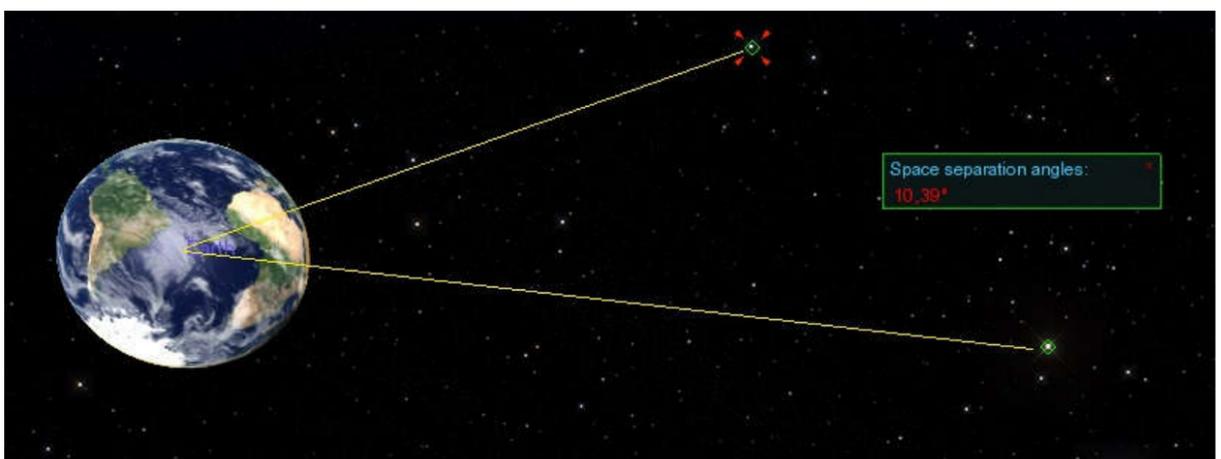


The time difference between the two screenshots is 0.01 seconds! This service is not available in Celestia 1.6.1.

12. Legend of the information bar of the guides. (color palette to indicate planets and asteroids):



13. Angle of separation:



14. Control panel in LUT-5 / LUT-5.2:

### LUT-5 Control panel, panels #1, #2, #3



All buttons (except those enclosed in the frame) on Panels # 1, # 2, # 3 of the Control Panel replace the corresponding keyboard commands or duplicate the options of the Celestia 1.6.1 Menu.

The buttons [Equ. Comm.], [Eq. Coord.], [Gal. coordinate.] - modification of the "Coordinates" tool of Lua Edu Tools.

Button [Browse Orbits] - service from addon cc\_lagrange.

The [cross] button is a service from the cockpits addon.

Buttons [N] [0° 0°] [S] buttons - see description above.

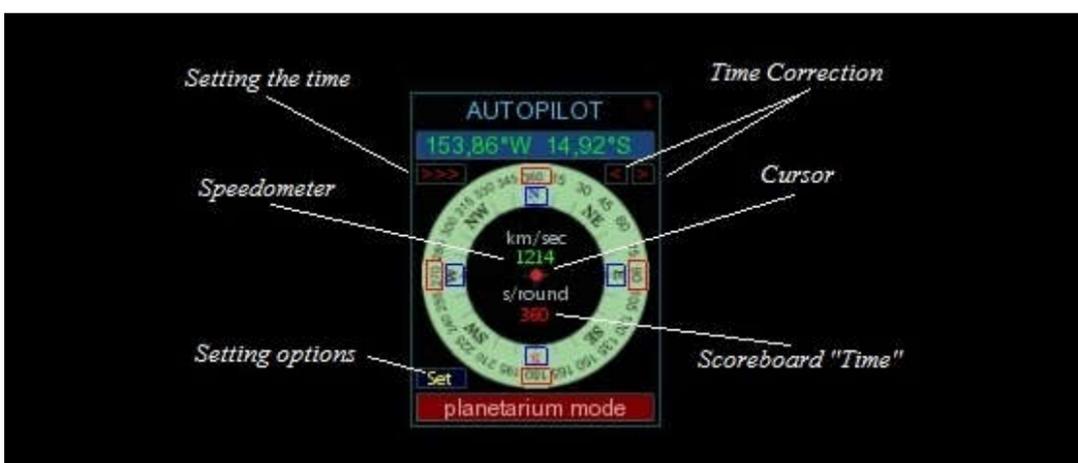
Buttons [Milky Way], [Sun] + 14 more - links to objects in the solar system.

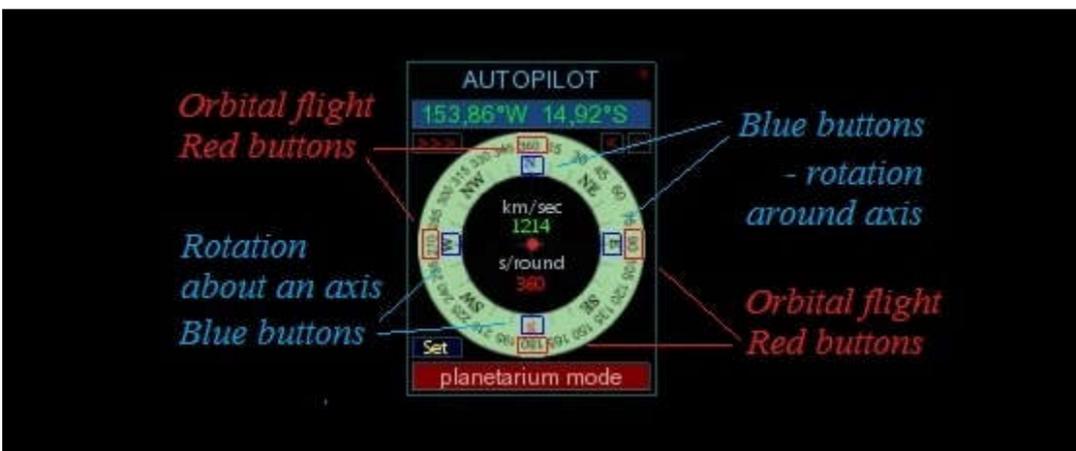
The [Ninth] button is a link to the hypothetical Ninth Planet.

The buttons [Avatar], [TOR] - to demonstrate the fictional Avatar system and the spacecraft TOR.

### LUT-5. The control panel, panel # 4 (AUTOPILOT)

Operating diagram of the autopilot tool:

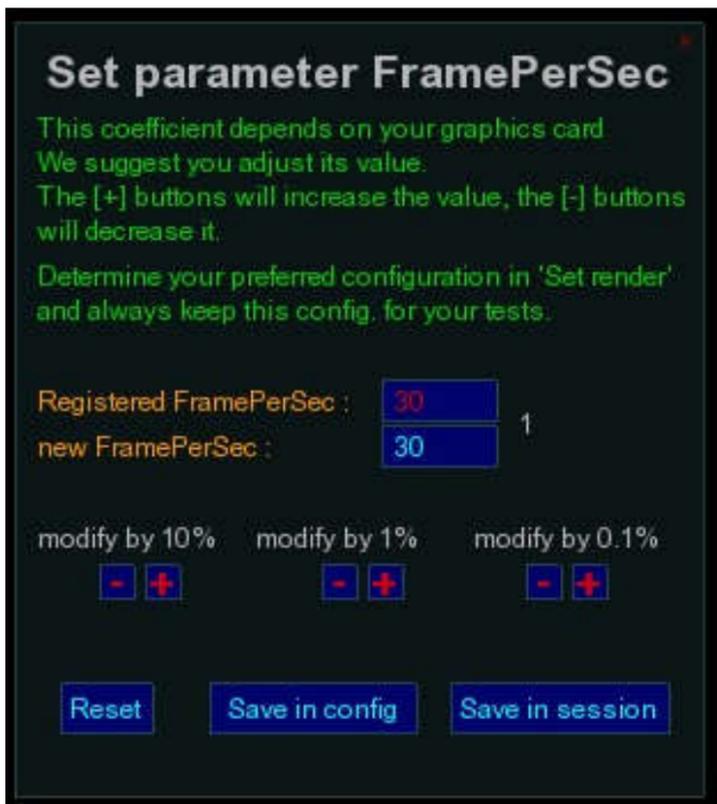




Description of functions:

- Buttons with blue edging - an analogue of keyboard commands - rotation of the observer. The indicator appears on the button as a blue circle. The Autopilot cursor (red dot) is set on the selected button.
- Buttons with a red border - an analogue of the Shift + arrow keys - an orbital flight around a planet (or other object). . The indicator appears on the button as a blue circle..
- The [>>>] button sets the time required for an orbital revolution in seconds.
- The [<] / [>] buttons are designed with an intermediate correction of -10 / + 10 sec. in the interval of 60 sec. and more, -5 / + 5 in an interval of less than 30 sec.
- The [<<], [>>] buttons increase / decrease the value by 20%.
- The orbital speed is indicated above this same red dot (in km / s).

This panel is designed to calibrate the flight time around the planet:



This panel is designed for calibration of flight time around the planet based on your video card. For example, if you set the revolution parameter to 360 seconds, it is better that the real time is exactly 360 seconds. The different video cards react differently, which affects the speed of rotation. To do this, you can calibrate the automatic DRIVER. The result you may want to save config.lua or simply used locally. A simple advice, always keep a backup of your config.lua file and not just for this function!

**LUT-5** Control panel, panels #5, #6, #7



All buttons of panel # 5 (Space Flight to Stars block) replace the corresponding keyboard commands Celestia 1.6.1.

All buttons of the panel # 5 (Space Maneuvers block) - modification of add-on cockpits (by Joël aka Jogad):

Angle Programmer:

- The [90] button is the default rotation angle.
- Buttons [<] [1] [>] - angle set by.

Distance Programmer:

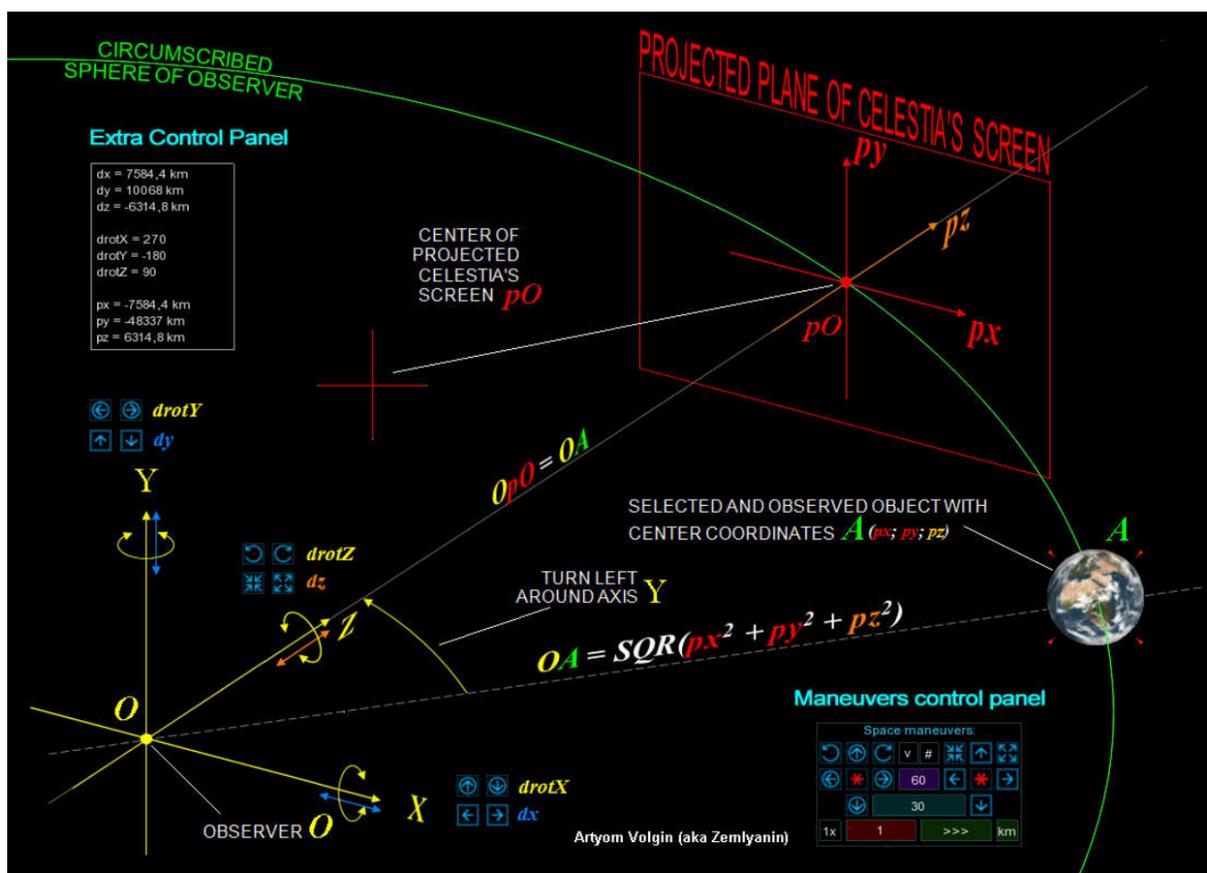
- Button [km] - select unit of change
- Button [>>>] - distance to move (value)

Speed programmer

- [1x] button - multiplicity
- Buttons [<] [1] [>] - set value

See cockpitsV3D -1\_ru.pdf for details.

Panel # 6. Pressing [Scheme] appears maneuvers control circuit:



Panel # 7. Time Machine - modification of the corresponding tools of the graphical interface Lua Edu Tools.



14-15. Add-ons and Virtual Discrete Base (ViDiBa)



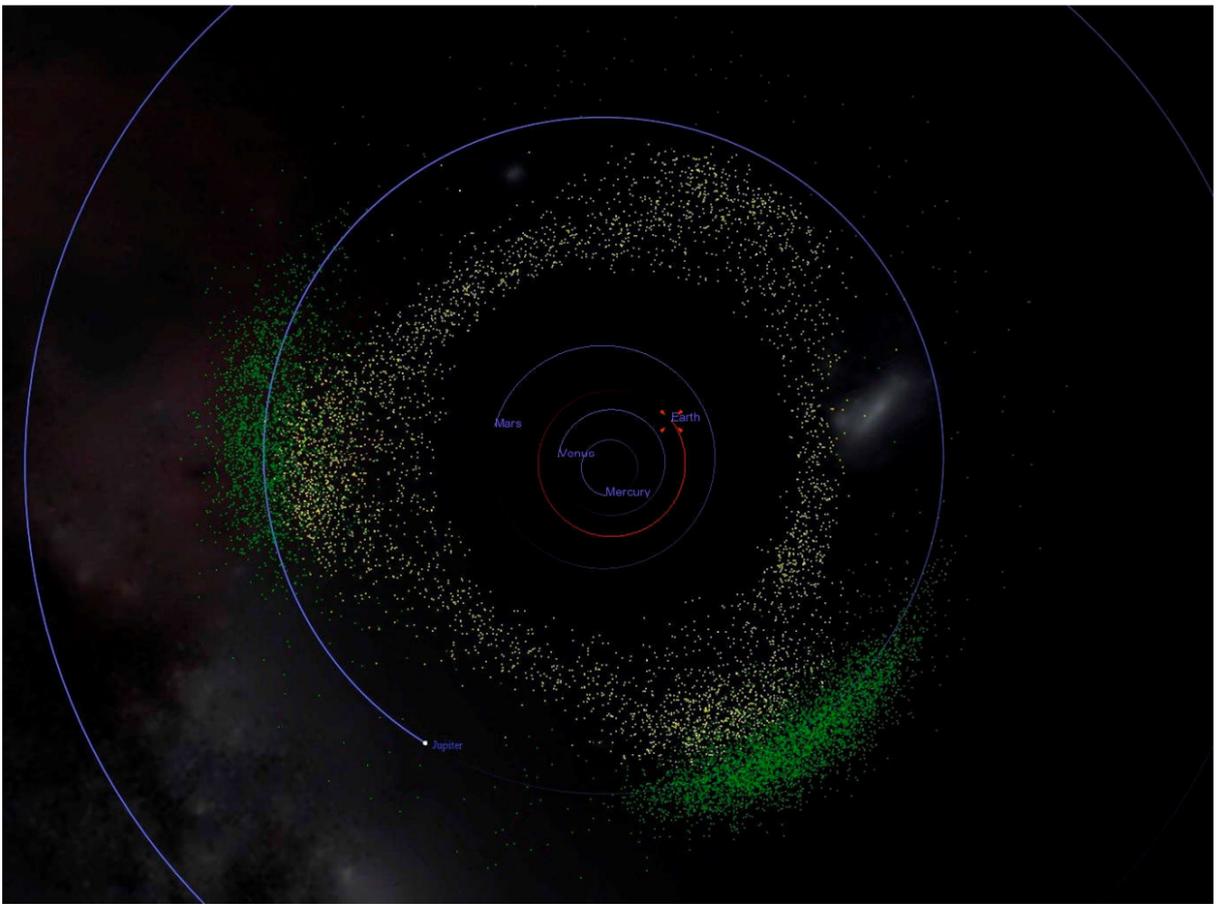
A collection of 19 addons collected Frank Gregorio. Completed the collection RGV1 and Croc, for details, see the file Adds\_Frank Gregorio.txt

Some add-ons are enabled by default (there is a tick in the check-box).

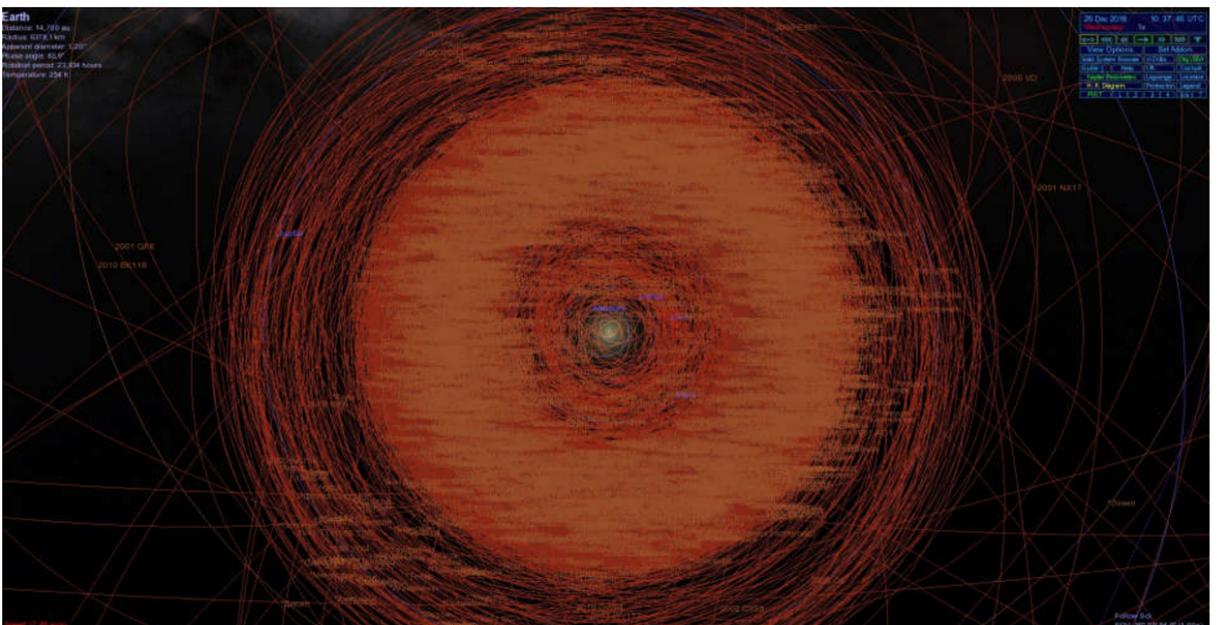
To enable the addon, you need to put a tick in the checkbox.

To disable the addon, you must remove the check mark in the checkbox.

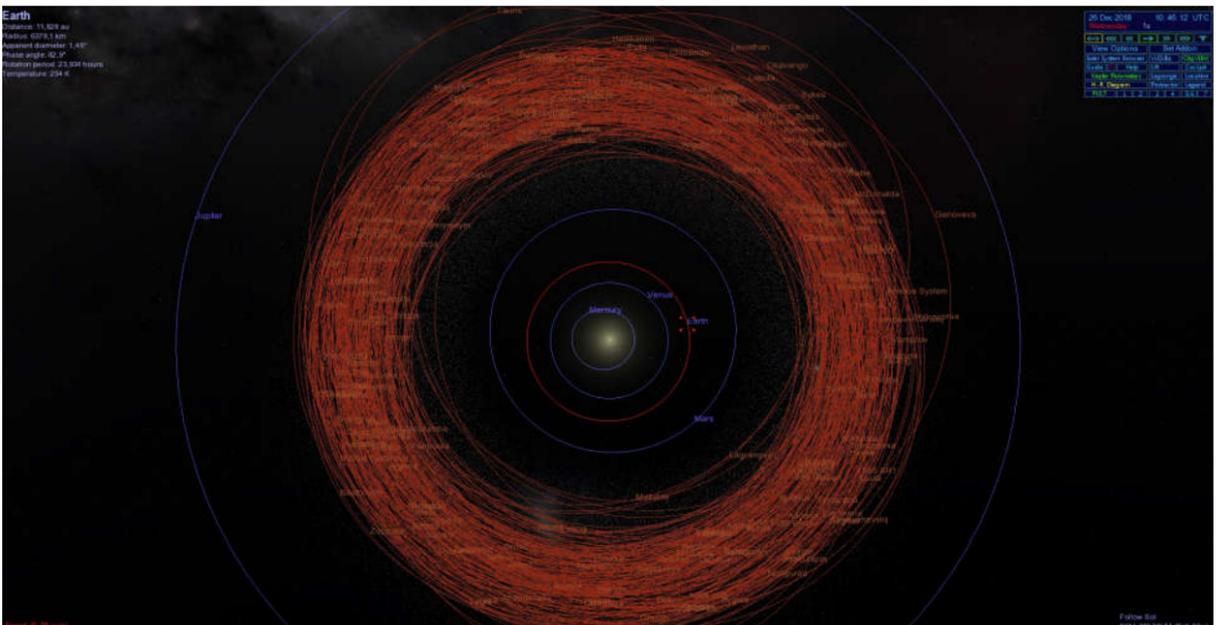
The triangle of the Hildas and the Trojans of Jupiter created from several thousands of asteroids. Visualization is done in the form of points without orbits and names:



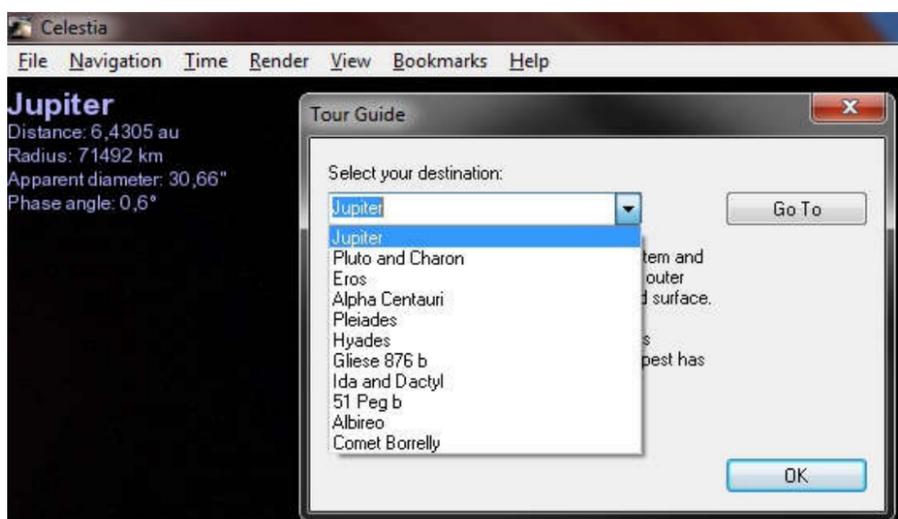
Show a separate group of asteroids would be impossible without database discretization, otherwise all asteroids and comets would be displayed on screen:



An example of visualization of a group of 200 asteroids with orbits and names:



## 16. Travel guides:



*For comparison:  
In the illustration on the left staff guide from Celestia 1.6.1*



The selected guide is turned on / off by pressing the mini-button.

When the guide is on, the red indicator on the left of the mini-button lights up.

An example of the visualization of two guides

Objects SATURN and Objects-2 SATURN:

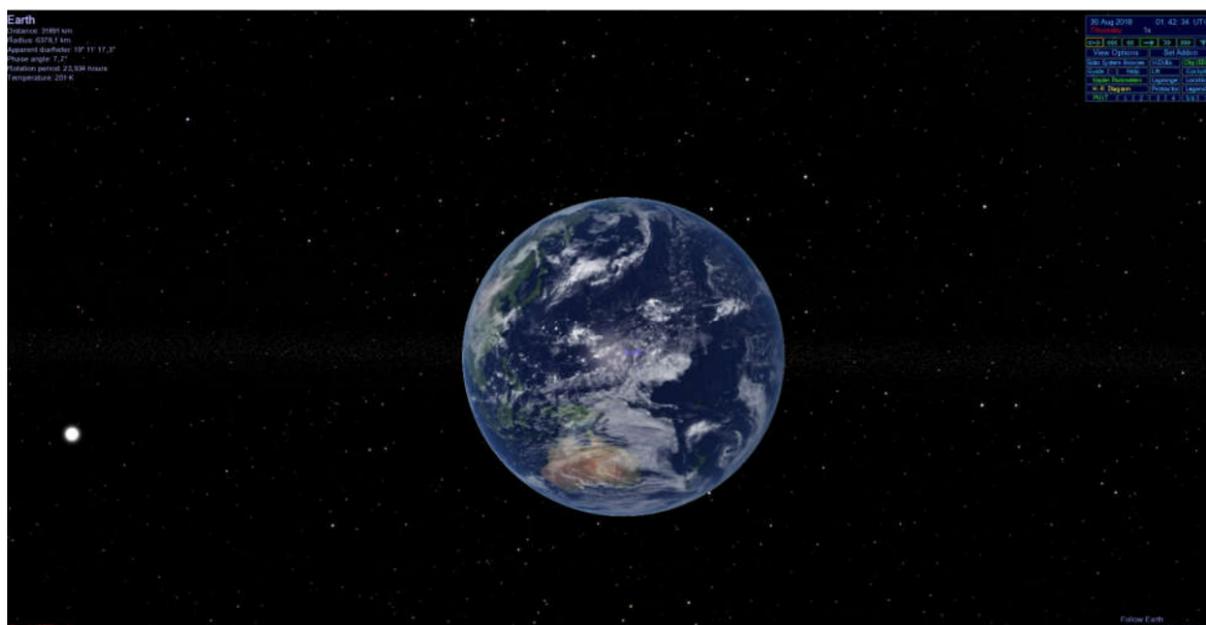


The user can disable / connect the Travel Guides, which are not necessary, in the config.lua file:

- Example of an activated guide:
  - "nebNamBox", -- NN - Noms des nébuleuses
  - "gap2Box", -- line break 2
- The same disabled guide:
  - "nebNamBox", -- NN - Nebulae names
  - "gap2Box", -- line break 2

# Conclusion:

The Lua Universal Tools v5.0 GUI takes the smallest screen size of all versions. When starting Celestia GUI is:



The graphical interface is located in the upper right corner of the screen. The control elements are on 9 lines. If after startup, the geometry of the stationary part of the LUT-5 (menu) is broken, it is a symptom of overloading the system.

A symptom of overcharging is the wrong color of the speedometer in the lower left corner of the screen after starting. The normal color is red.

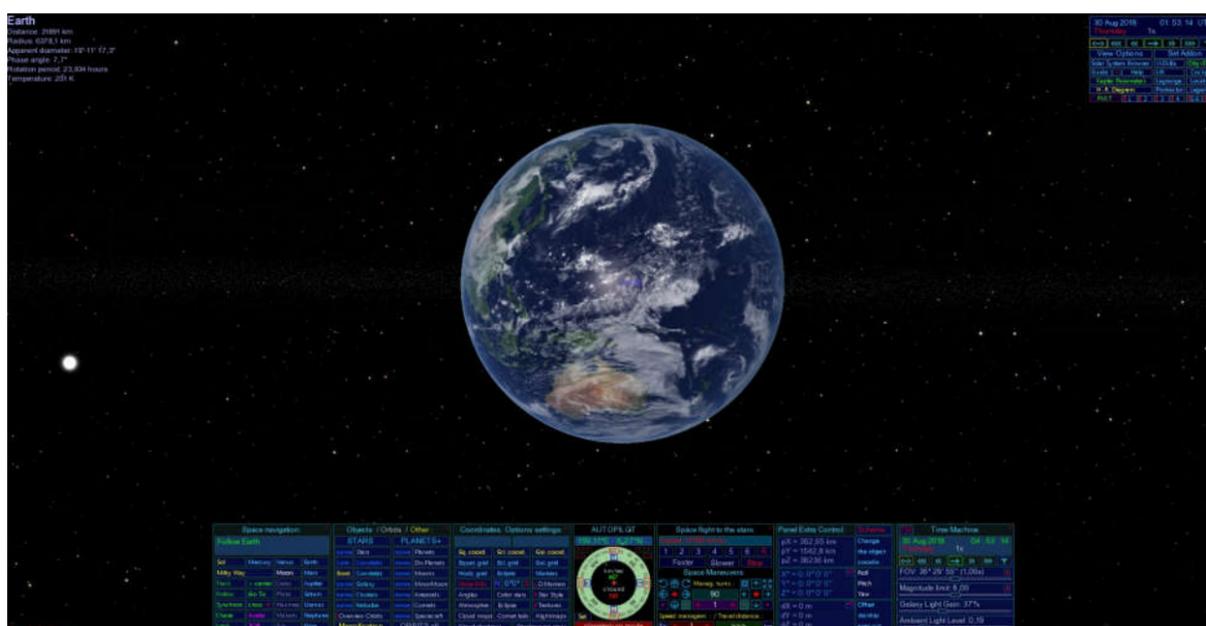
If these symptoms occur, check the system braking at run time. To check the operation of the program, activate panel # 7 on the remote control to increase the rhythm of the time and observe the rotation of the Earth. The rotation must be smooth, smoothly. If the motion is not smooth, it is a sign that your computer's settings are insufficient for use with the GUI, or the databases.

Note: When you run Celestia with LUT-5 again maybe these symptoms go away. If they occur too often, make sure to unload the maximum of other programs in memory: video programs, big websites, ... These are often greedy programs for the video card..

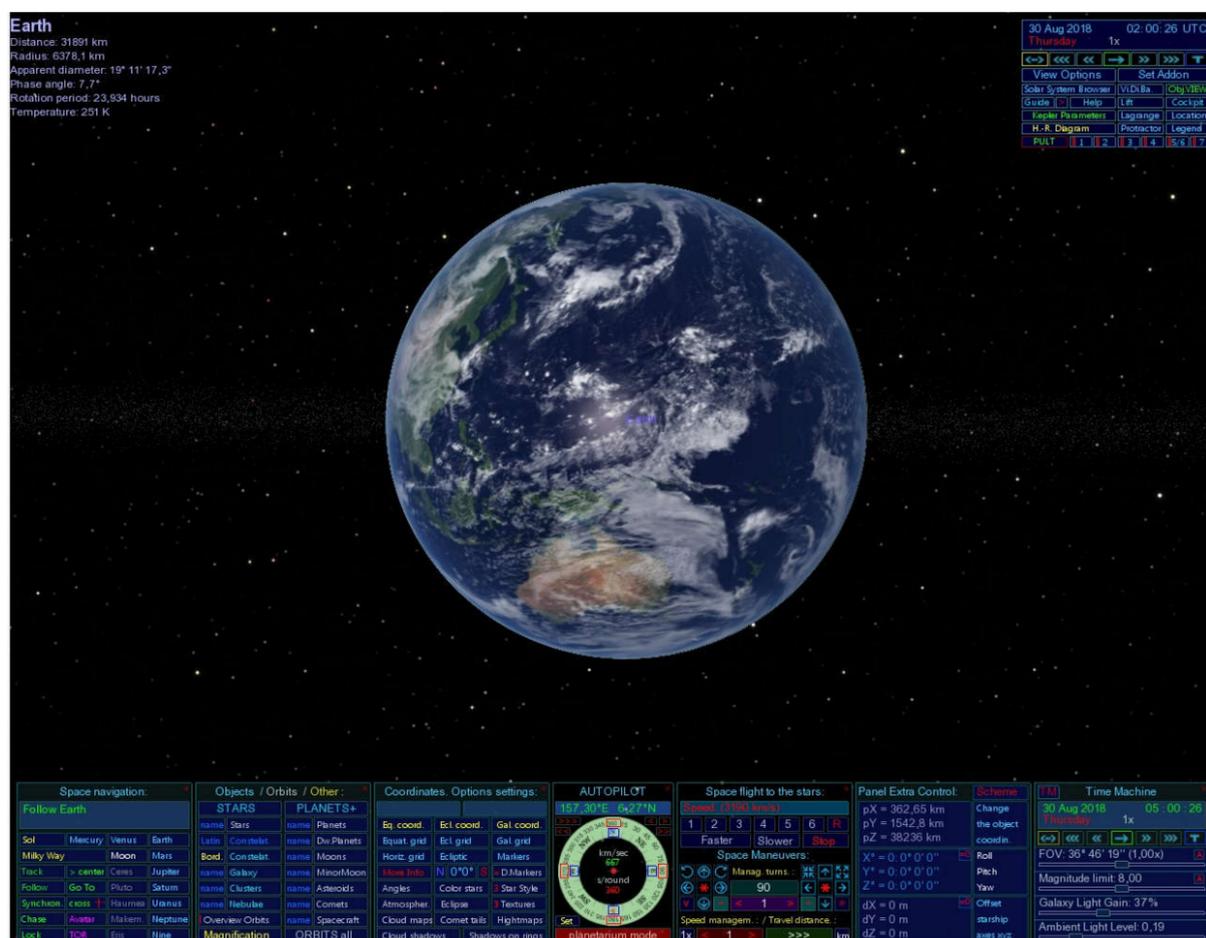
The beneficial effects on the system is a defragmentation of disk space, disabling programs, disabling the internet. It is also the deactivation of several or all guides using config.lua.

If all these measures are not enough, check the settings of your video card

View of the control panel (console width 1280. pix) on a screen 1920x1080 pixels:



On a monitor 1280 x1024:



The size of the window can be determined using the Help tool.

The width of the remote control panel is 1280 pixels. When used with a smaller monitor, the LUT-5 GUI enters the 'transformer' mode. The minimum size of the screen (window), where the geometry of the LUT-5 control bars is stored, is 900 x 750 pixels.

And in a window 900 x750:



All panels move on the screen using the mouse, the point of the mouse is the top of the panel. All panels can be turned on / off individually. If you minimize the window, the remote control is aligned at the bottom of the screen.

### The graphical interface has been tested on equipment, such as:

processor Inter(R) Core(TM)2 Duo CPU E6750 @ 2.66 GHz

installed memory (RAM) 4,00 GB

Windows 7 Professional operating system, Windows 8.1

Video card NVIDIA GeForce 7600 GS

Screen 1280 x1024 / 1920 x 1080

### And also as :

Intel® Pentium® D CPU 2.80 GHz

Installed memory (RAM) 2.00 GB

Windows 10 operating system

Video card NVIDIA GeForce 8400 GS

Screen 1920x1080

## Comparisons between LET and LUT-5.2:

Total controls = 129.

LET replaces 50 controls, that's ~ 40%.

LUT-5 replaces 112 controls ~ 90% !!!

In addition:

in LET there are 35 tools and features.

LUT-5 has 96 tools and functions - it's ~ 3 times more !!!

(For more information, see the features LET-4 and LUT-5 application)

**In this form, Celestia will be more accessible to astronomy enthusiasts from 7 years old to 70 years old and up !**



## Authors:

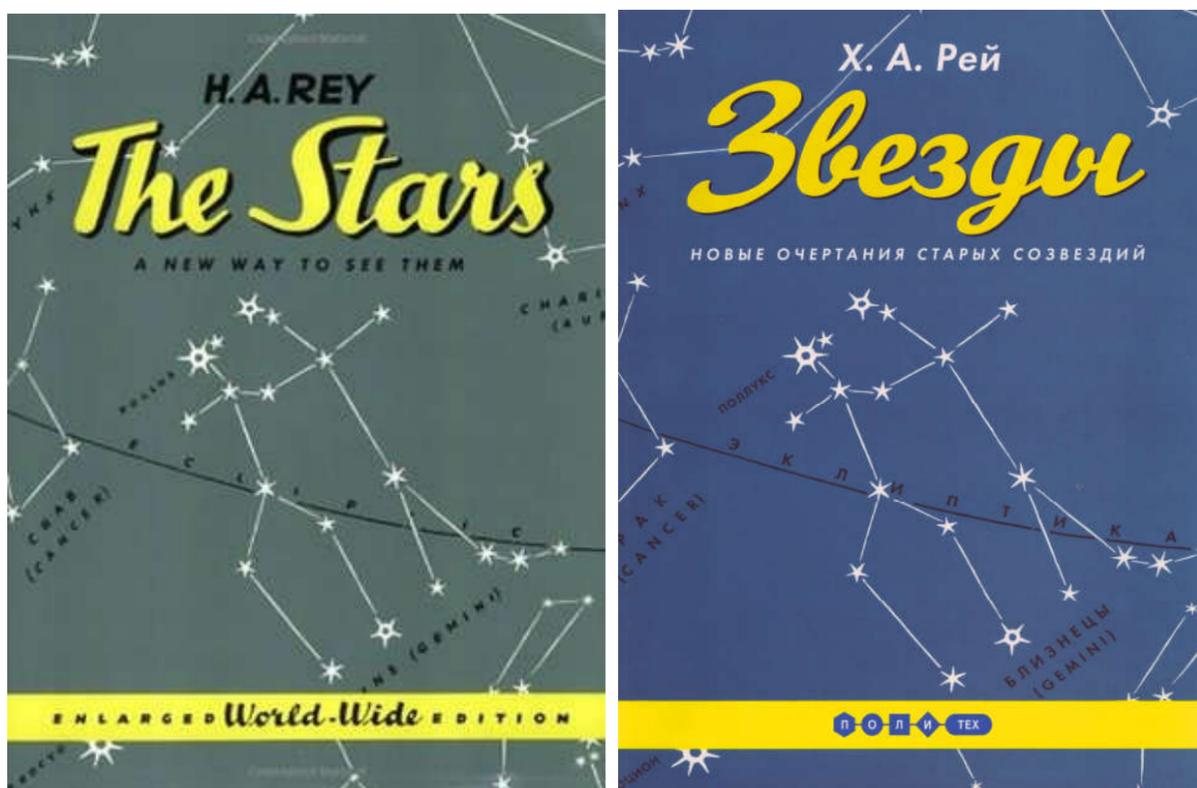
Author User work guide with the graphical interface Lua Universal Tools v5.0 - Gennady Lygin

Author of translation - Patrick Ziegler

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25.12. 2018.



Ray proposed new, imaginative and easily remembered constellation diagrams that were quickly adopted by the astronomical community and are now often used in astronomical literature...

Using the ideas of Hans Ray, I developed a new edition of the file asterisms.dat.

I will be glad if there are enthusiasts who will create the best outlines of the constellations based on the ideas of Hans Ray.

And what is the idea of Hans Ray? Ray writes: *"Constellations have very expressive names, and we expect that groups of stars will really resemble figures of a lion, a whale, a maiden, and so on. But that was not the case ..."*

*This book, we will try to correct the situation. In it, the constellations will be depicted in a new way - in the form of figures that correspond to their names: a group of stars, called the Ursa Major, will resemble the shape of a bear, Whale looks like a whale, the Eagle looks like an eagle, etc."*

File asterisms.dat created in text format. It is not difficult to edit.

Here is a small example :

*"Auriga"*

[

*["Iota Aur" "Eta Aur" "Alpha Aur" "Delta Aur" "Beta Aur" "Tet Aur" "Upsilon Aur" "Nu Aur"]*

*["Iota Aur" "14 Aur" "Chi Aur" "Nu Aur" "Beta Aur" "Alpha Aur" ]*

*["Alpha Aur" "Epsilon Aur" "Zeta Aur" "Eta Aur"]*

*["14 Aur" "Sigma Aur"]*

*["HIP 26546" "HIP 25064" "Rho Aur" "HIP 26592" "HIP 26546" ]*

]

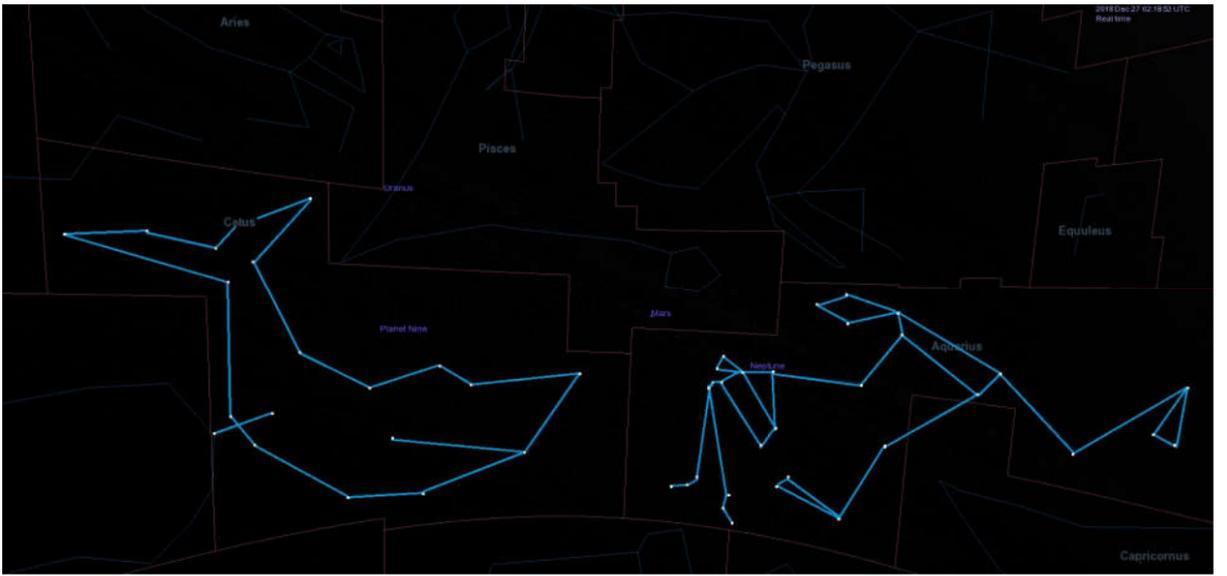
Each line of code begins and ends with a square bracket. The entire constellation code is also enclosed in square brackets.

The names of the stars are in quotes. A straight line is drawn between the two adjacent stars on the screen.

On the screenshots between the stars are drawn bold lines, which better distinguished the outlines of the constellations.

My version of the new outlines of some constellations:

Constellations Cetus and Aquarius:



Constellations Ursa Major, Camelopardalis, Lynx, Leo Minor:



Constellations Carina, Puppis, Vela (historical constellation Ship Argo):



Constellations Cancer, Gemini, Bootes:

