# User work guide
# with the graphical interface
# Lua Universal Tools v5.0

The Lua Universal Tools v5.0 GUI (LUT-5 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:
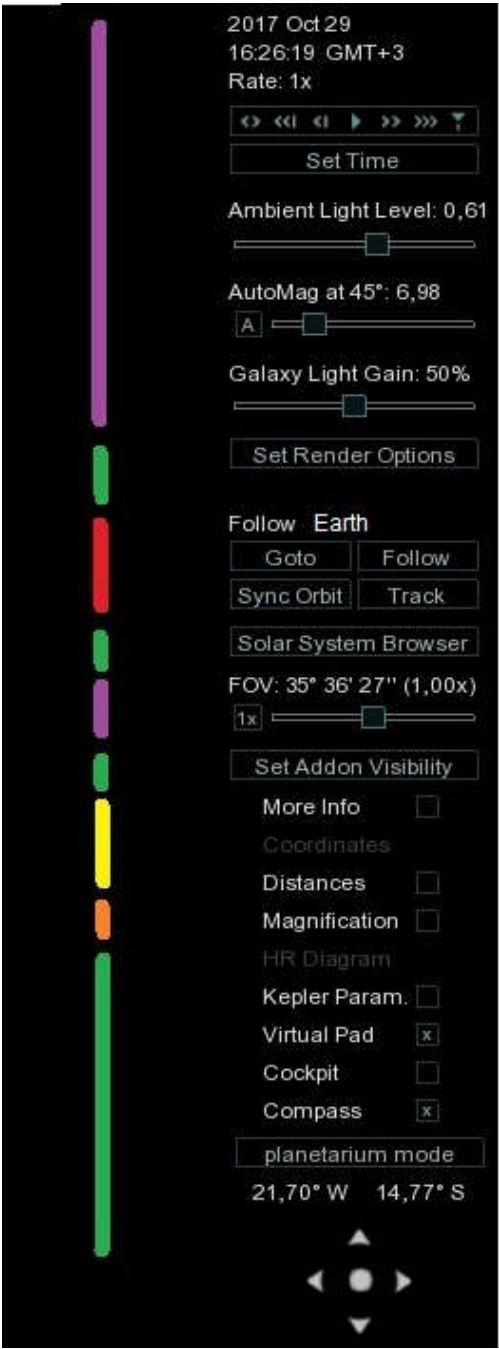


Green color: 77 direct controls
Blue color: 29 controls combined with the Shift key
Yellow color: 20 controls combined with the Ctrl key
Purple color: 3 controls combined with the Alt key.
Total keyboard controls : 129.

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 graphical interfaces.

**General view (left LET and right LUT-5):**



*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!*

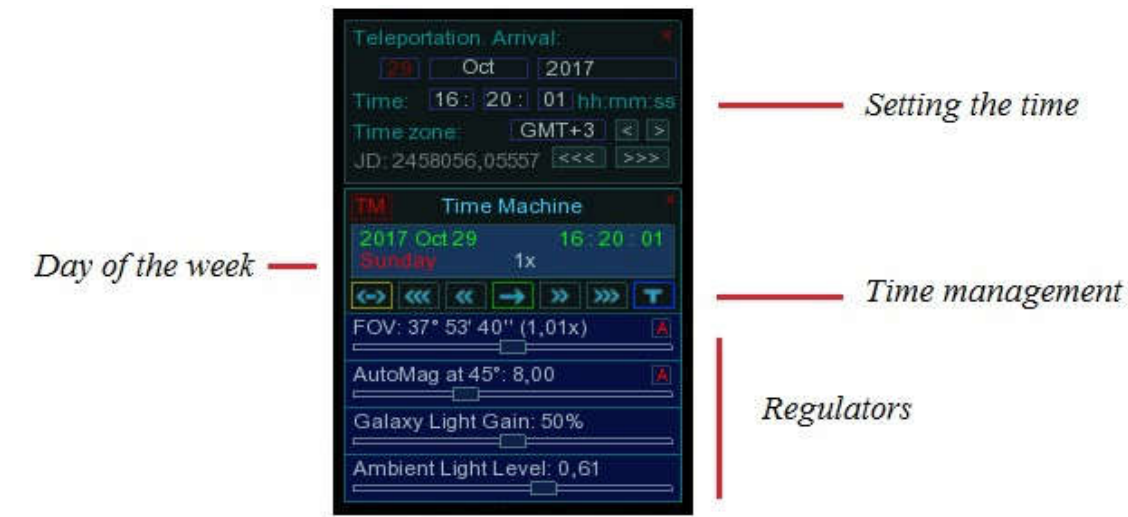**Lua Edu Tools consists of the following:**

- 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
  . coordonates

- and others ...

## More about the components listed in Lua Universal Tools v4.0:

**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;
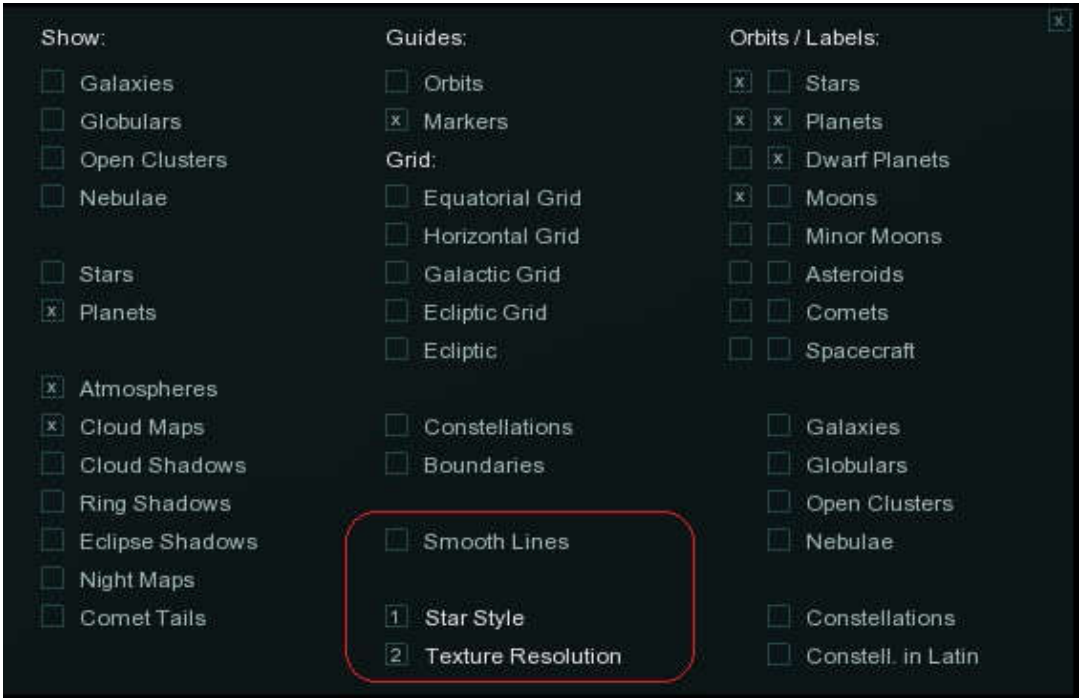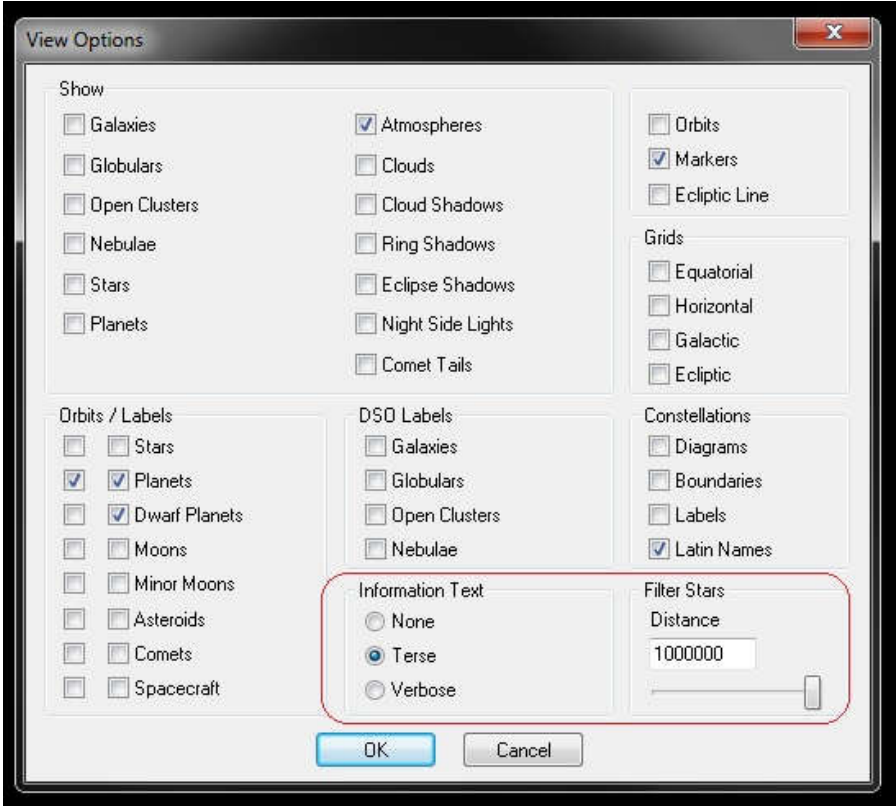


**2. Navigation buttons:**



*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.*

**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:
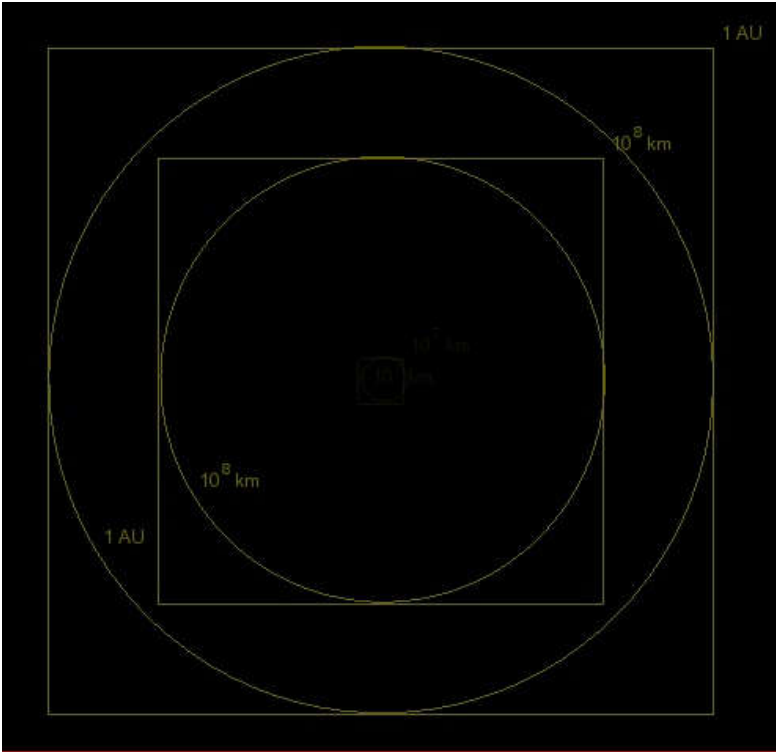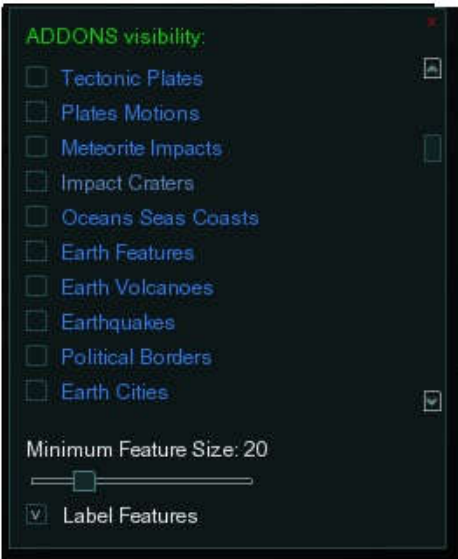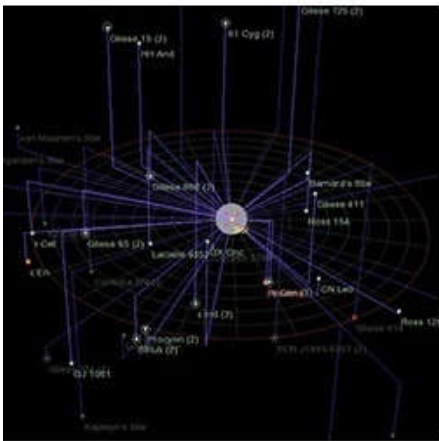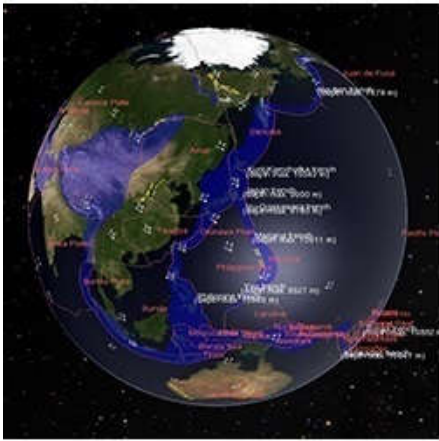
V4.0                                        V5.0



The main difference in LUT-5 is the addition of the star filter, the availability of  the panel in 1 click, and its floating position.



(Selection by successive clicks)

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



*Illustrations*

*Movement of lithospheric plates*

*Belt of asteroids*
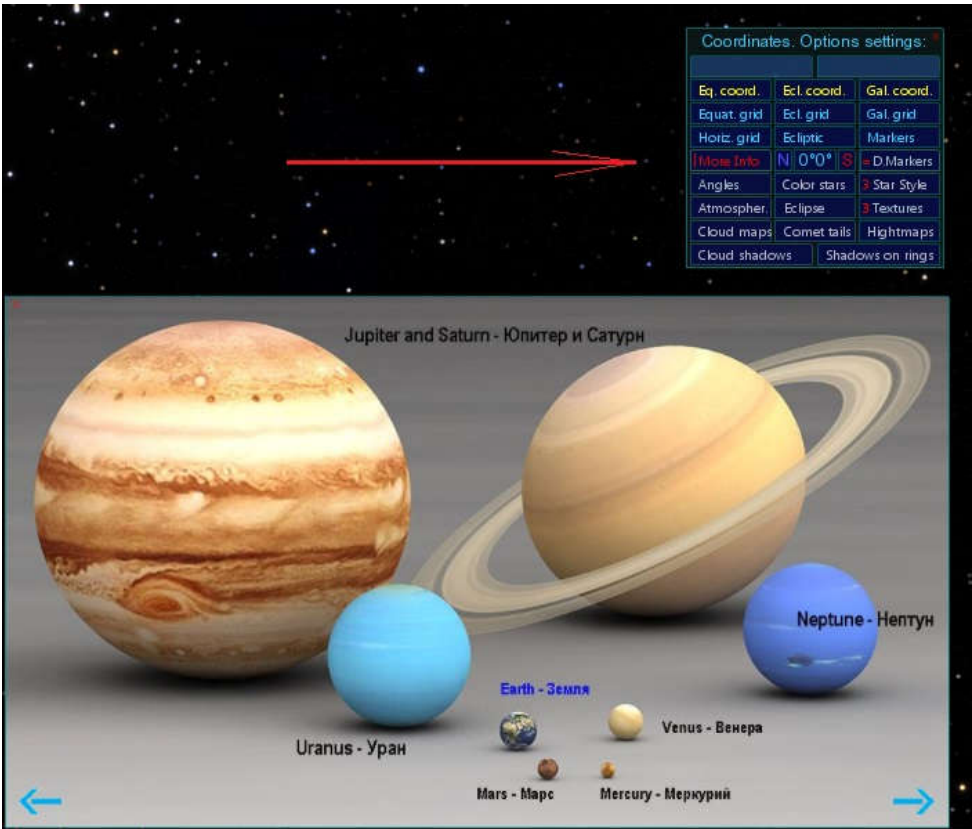
*Magnetosphere of the Earth*

*The nearest stars*

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



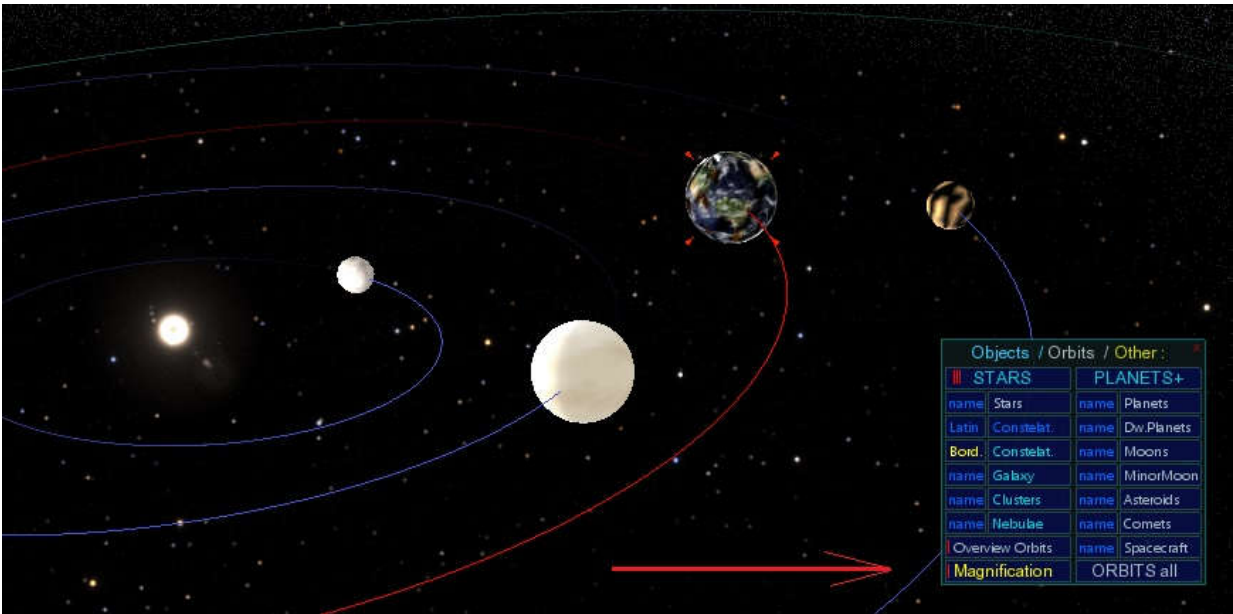Lua Universal Tools v4.0 / v.5.0 catalog (without asteroids or comets !)





## 7. Text and media information panel:



List of albums for LUT v4.0 / v5.0:
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
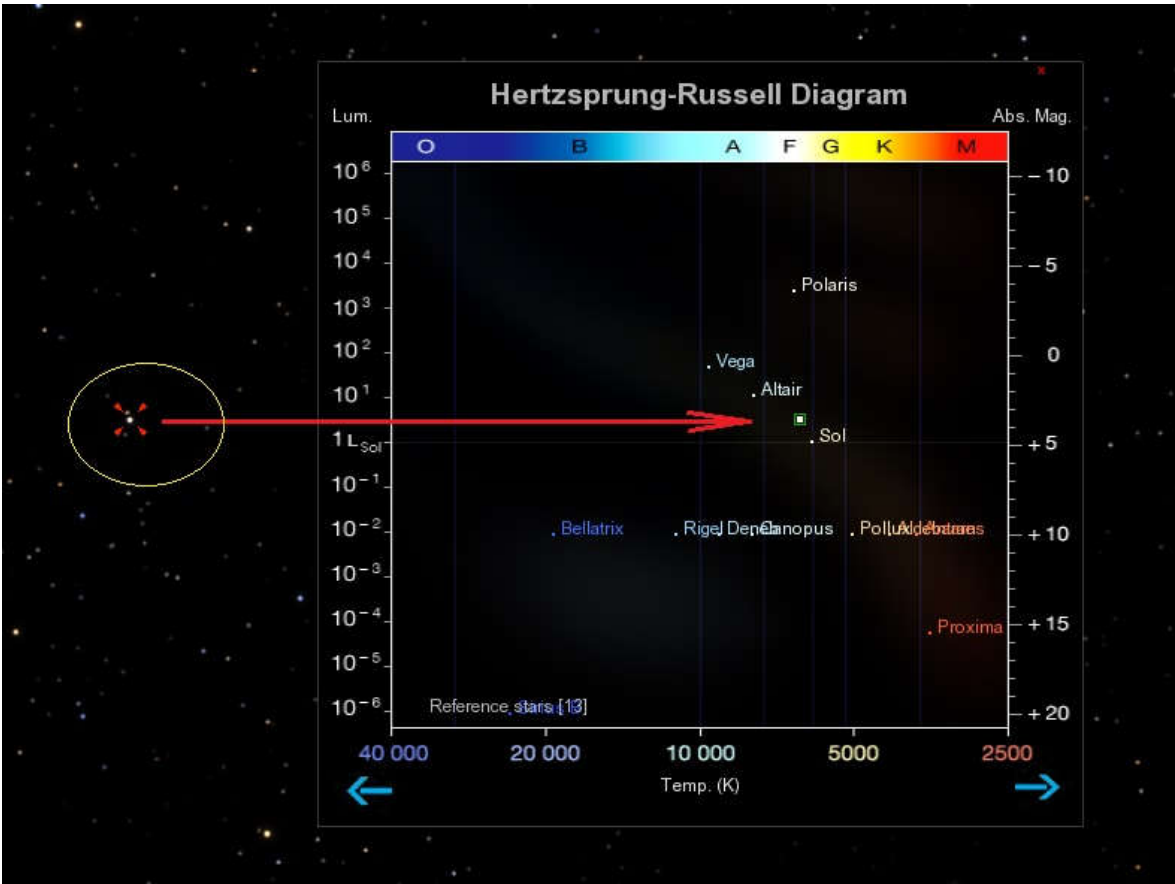5. other illustrations - 9 pictures

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

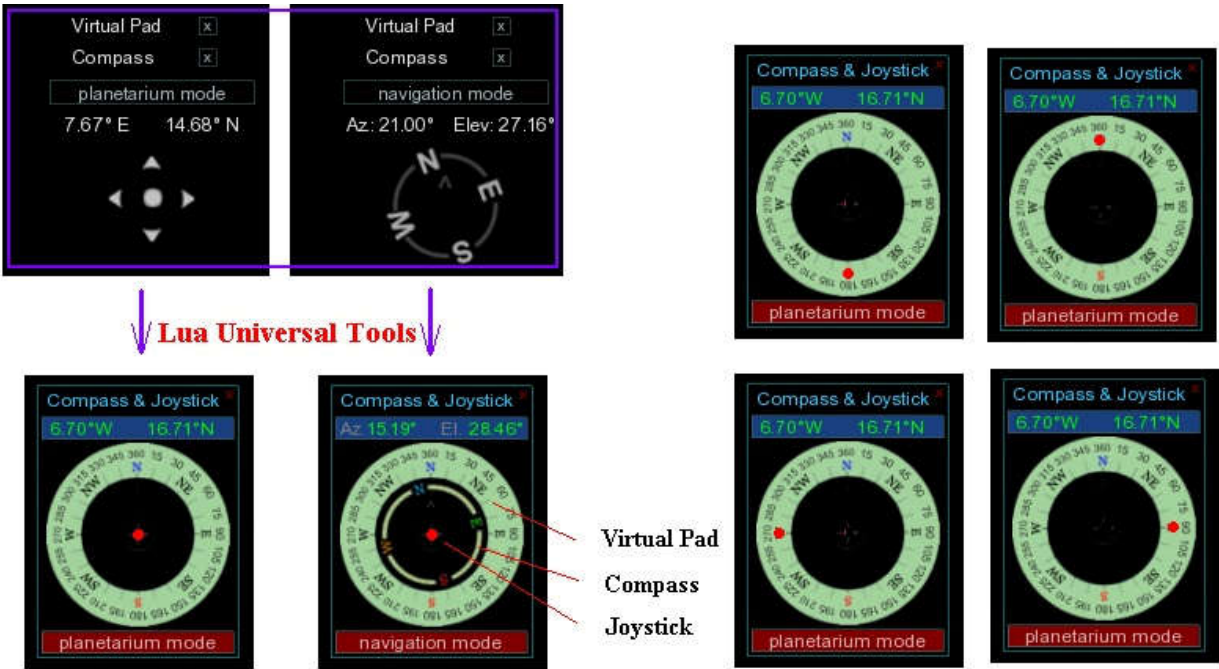Increase function (designed for educational purposes and displays the solar system on a scale)

**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)**



**12. Lua Edu Tools** allows you to add new functions and commands. For teachers, it's huge opportunities to create interresting 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 v2.0 - v4.0:**

1. Maneuvering  tools (addon) ,
2. Virtual Discrete Base (asteroids and comets),
3. Lagrange points (addon),
4. Travel guides - (42 guides),
5. Space elevator (addon) ,
6. Help - information panel on the interface,
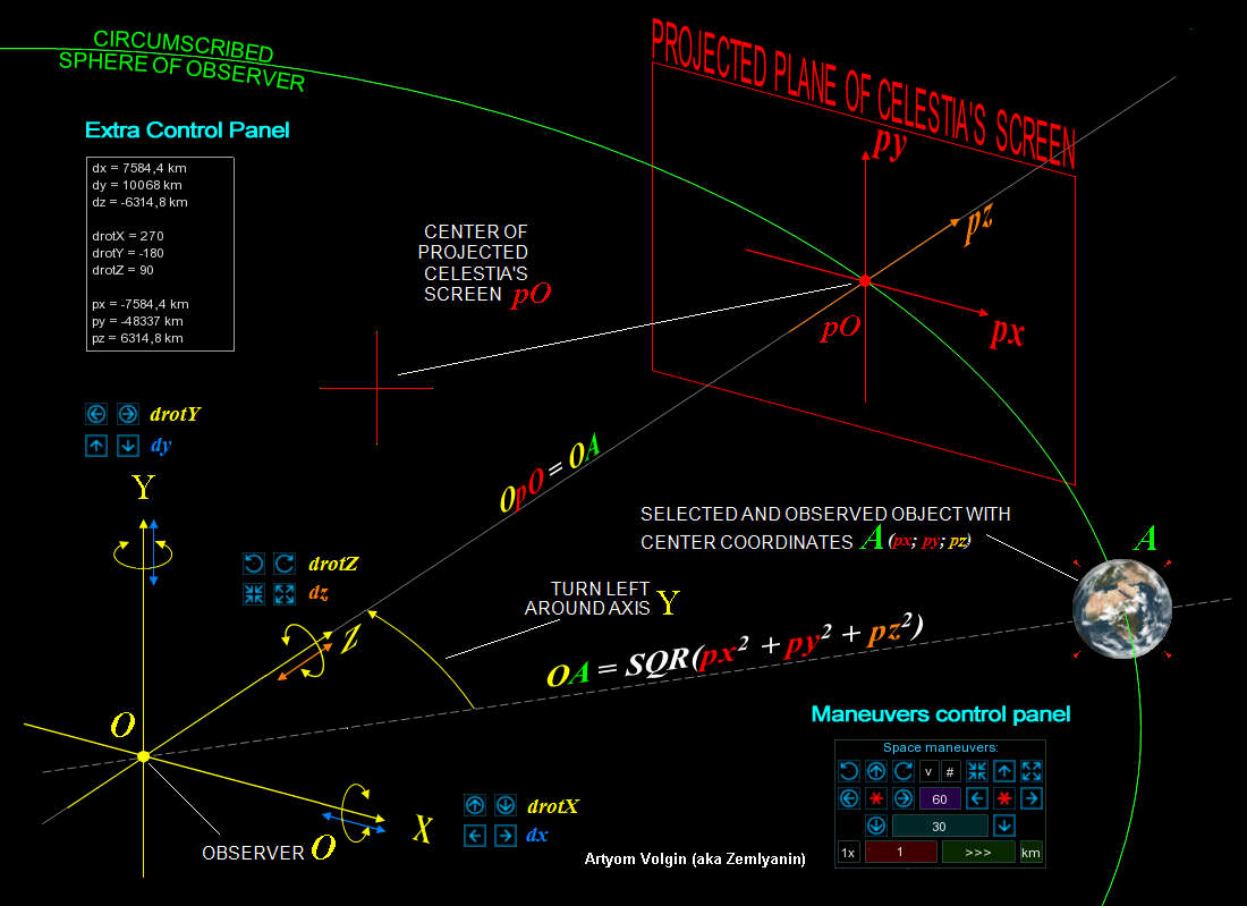7. New outlines of the old constellations

**More about the new tools:**

**1.  Maneuvering  tools. (**by Joël aka Jogad)**:**
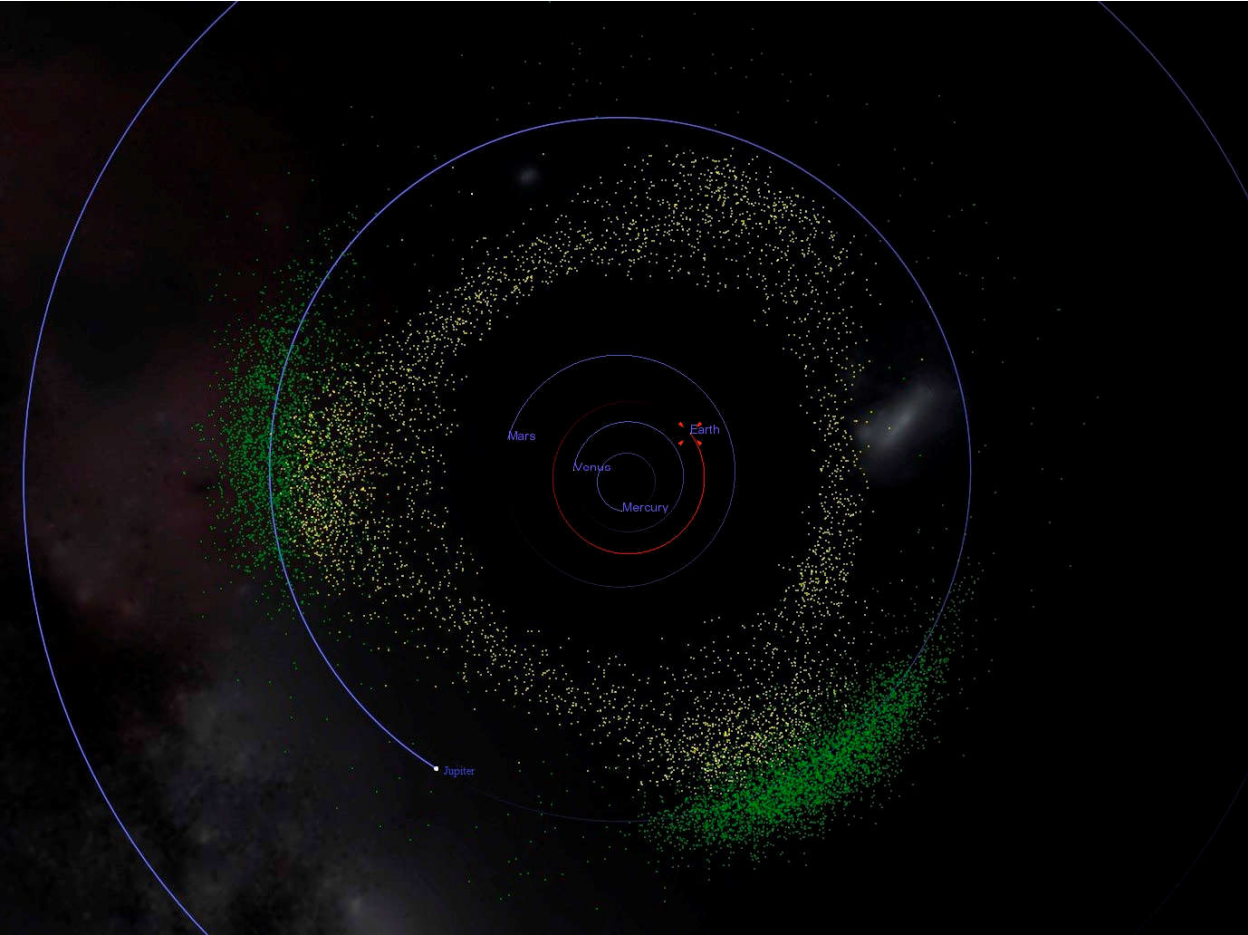
*Panel # 5, Panel  # 6:*



Pressing [Scheme] appears maneuvers control circuit:
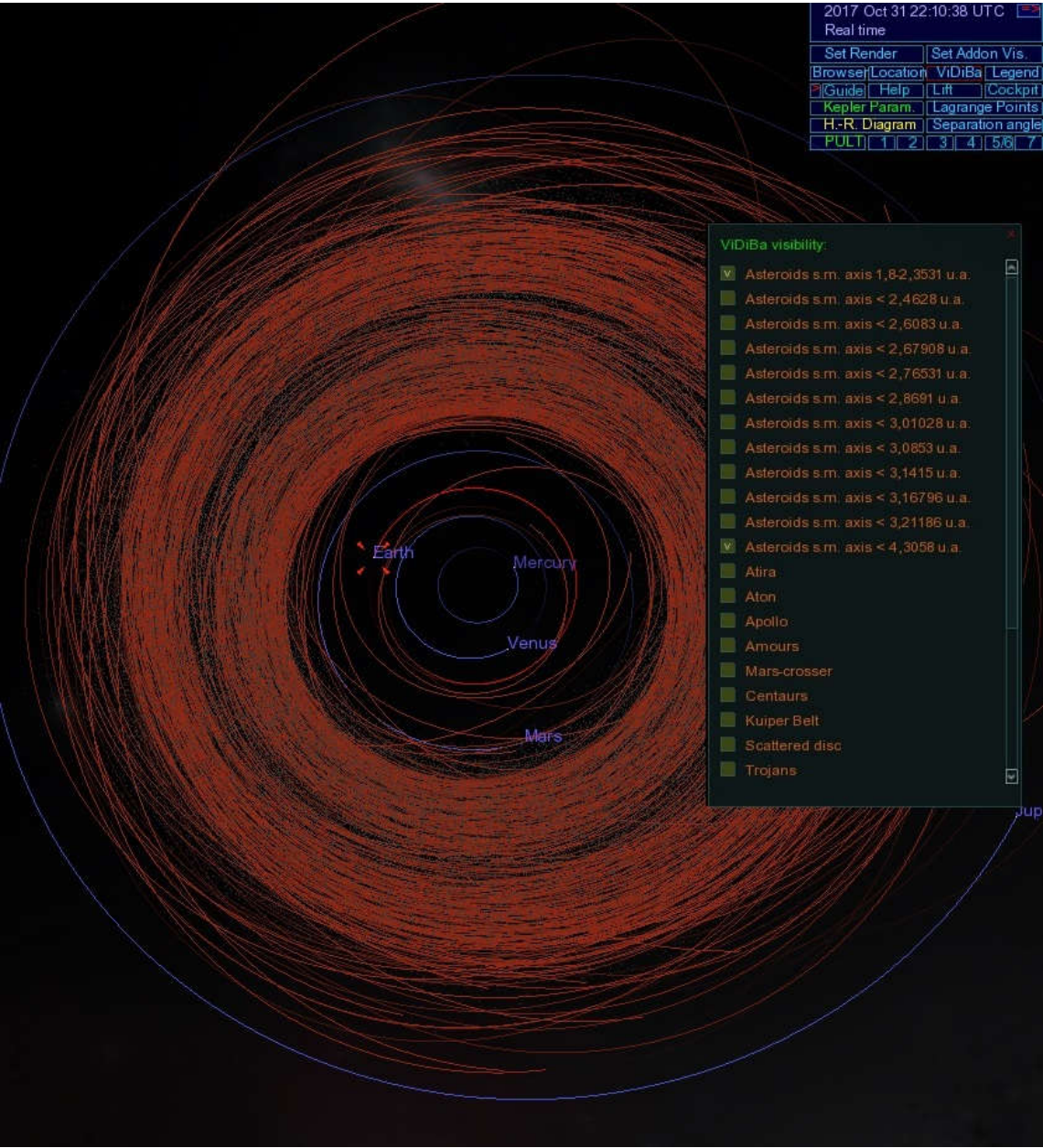


**2. Virtual Discrete Base**

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:
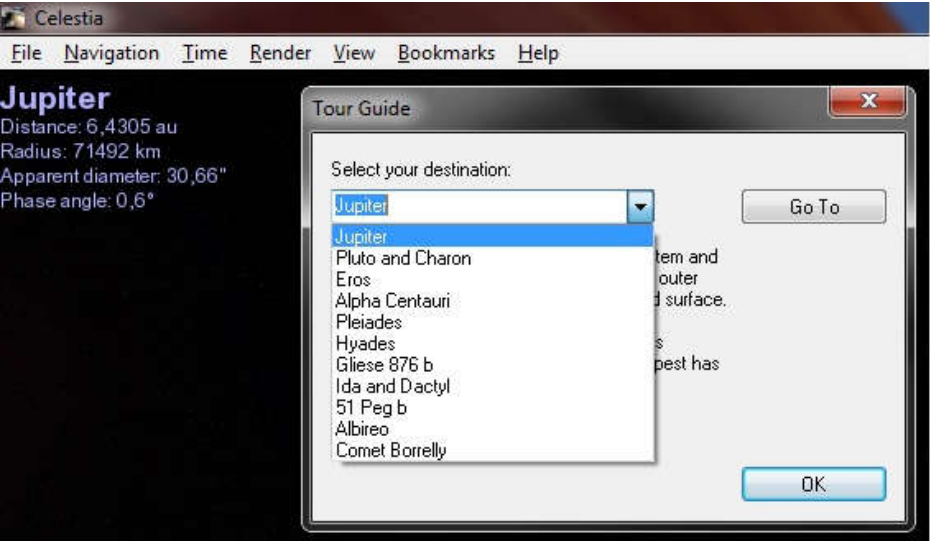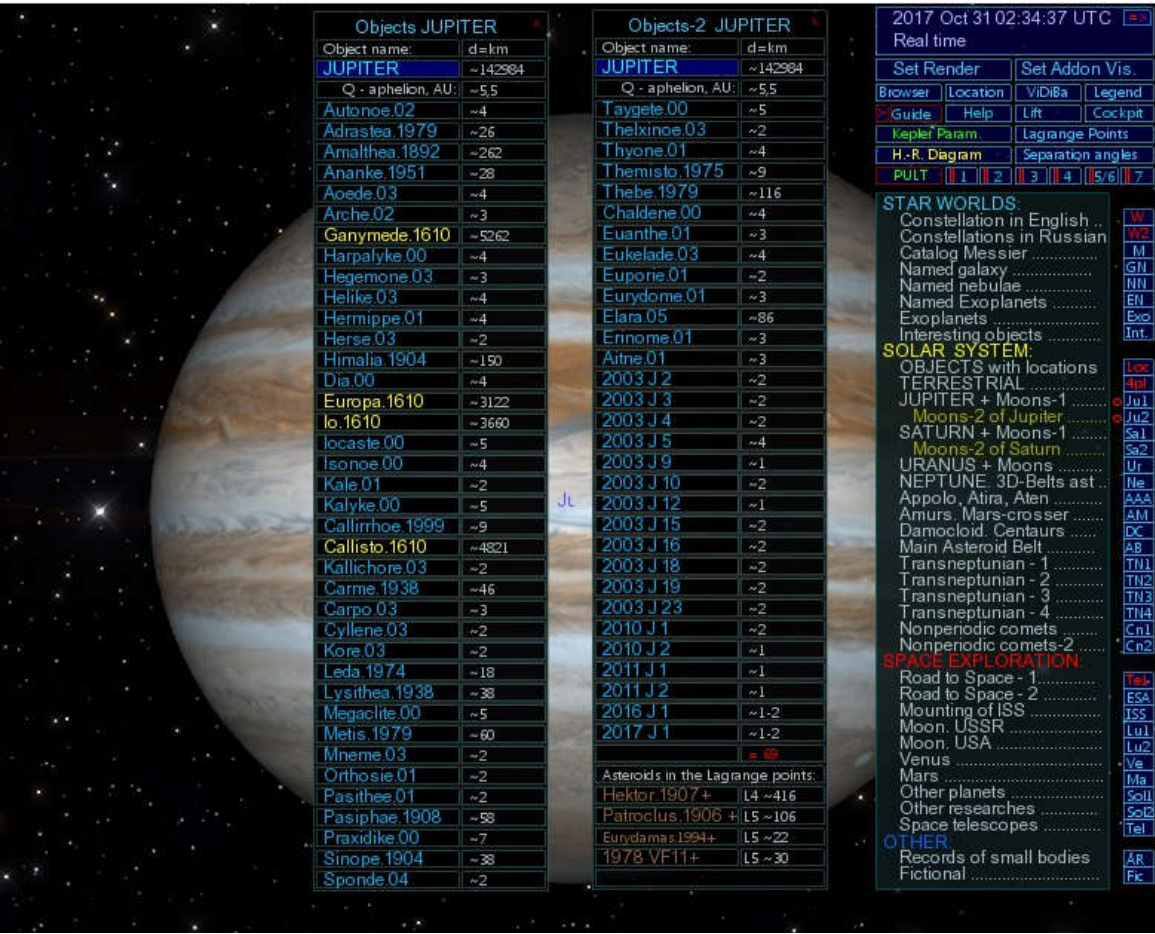
Showing a group of asteroids would not be possible without the application of basic sampling. All the asteroids and comets selected were displayed on the screen, not the others. Without sampling, it is not possible to visualize even a small group of asteroids with orbits and names as this quickly becomes overloaded.

*400 asteroids from the Main Belt, including 200 asteroids from the inner zone and 200 asteroids from the outer zone with the orbits.*
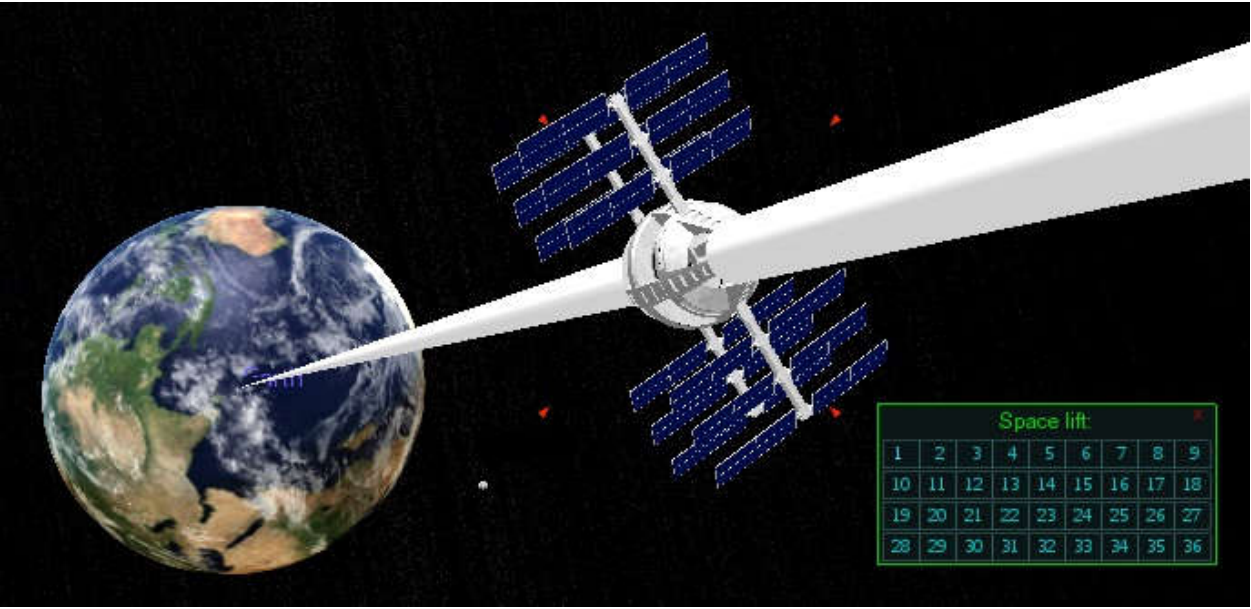


**3. Travel guides:**





*For comparison:*

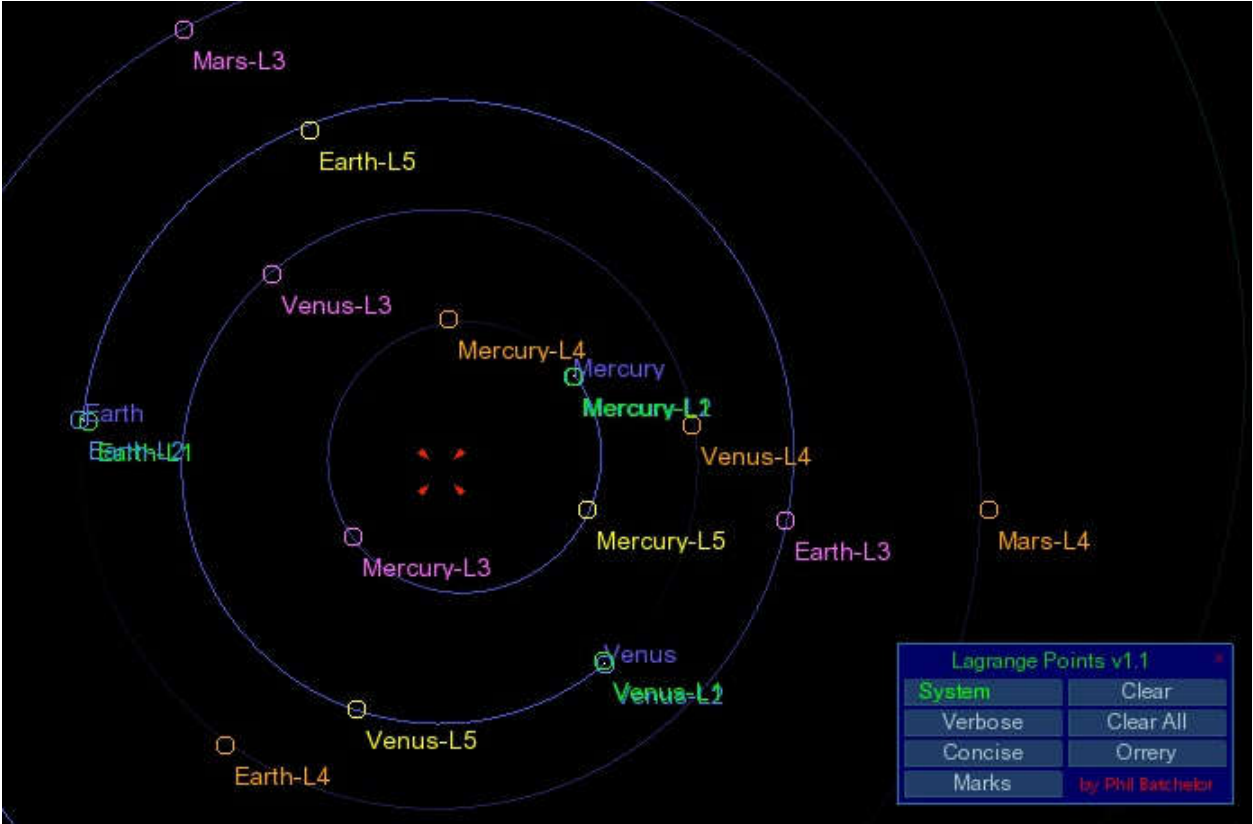*In the illustration on the left staff guide from Celestia 1.6.1*

**4. 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)

**5. Lagrange points (**by  Phil Batchelor **):**



**6. Help Information Panel:**



**7. New outlines of the old constellations**

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".



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...
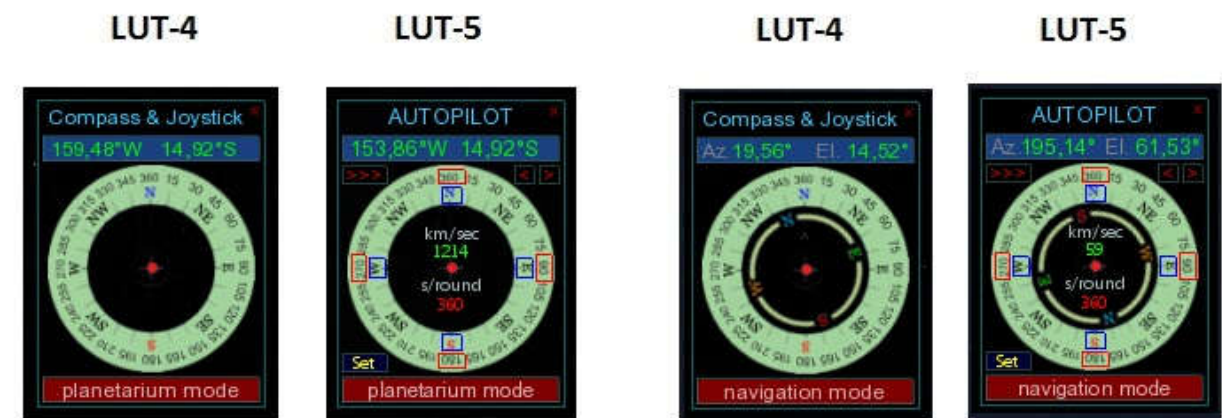
The LUT-3/4/5 kit offers an alternative asterism based on Hans Ray's ideas (asterisms.dat file):
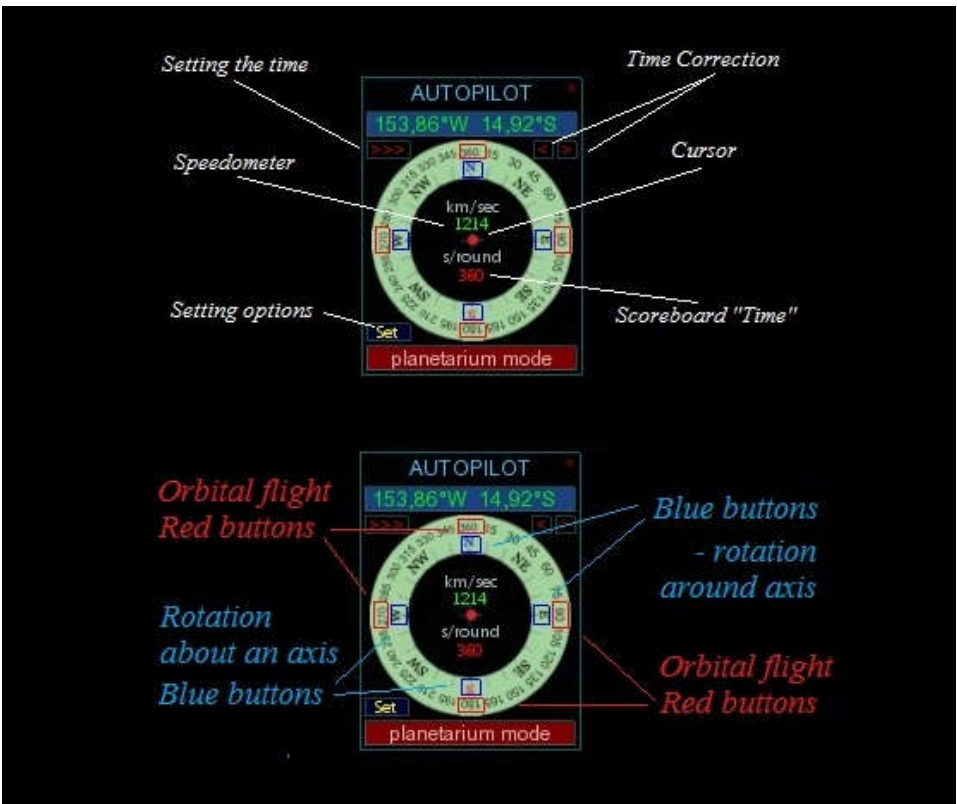
# New tools in Lua Universal Tools v5.0:

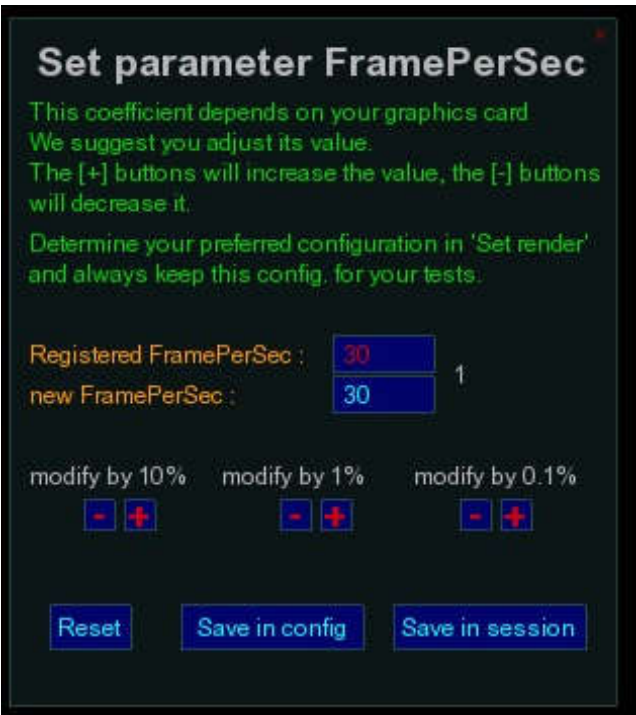## 8. Autopilot (Modernization of the Compass & Joystick):



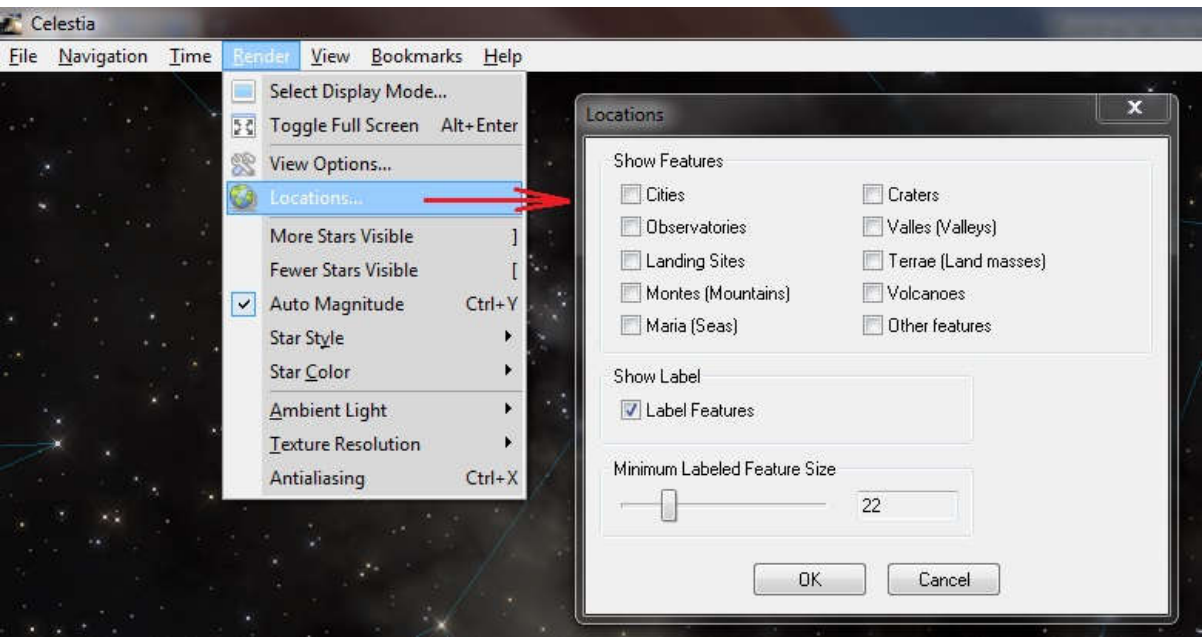Operating diagram of the autopilot tool:



Description of functions:

- button with red border - analogous to the keyboard command Shift + arrows; when you click on one of these buttons, the orbital movement starts around the planet (or any other object like space ships). On the button, a blue circle appears as a witness.

- The [>>>] button sets the time required for an orbital revolution in seconds (360-300-270-240-210-180-150-120-90-60-30-20-10-5). 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 total time value is displayed below the center slider (red dot).

- The orbital speed is indicated above this same red dot (in km / s).



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!

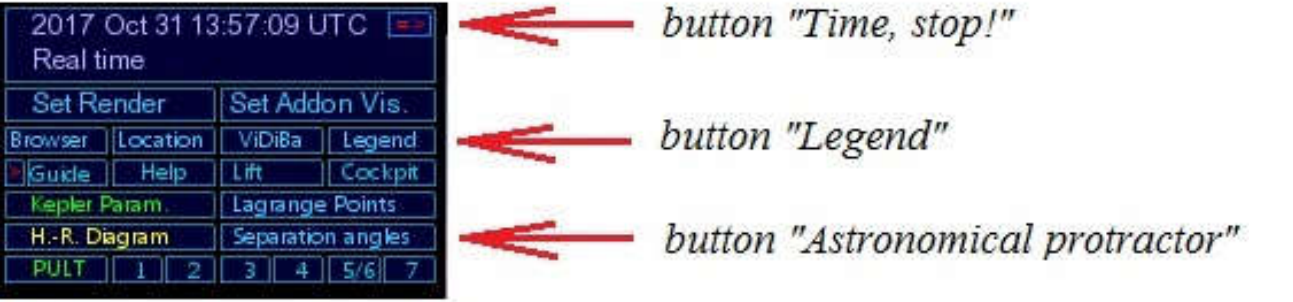## 9. Planetography (Celestia) / Planetary Nomenclature (LUT-5):

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

The Planetary Nomenclature panel contains 80 checkboxes, so 80 types of locations. It allows each type of place to be activated / deactivated separately.
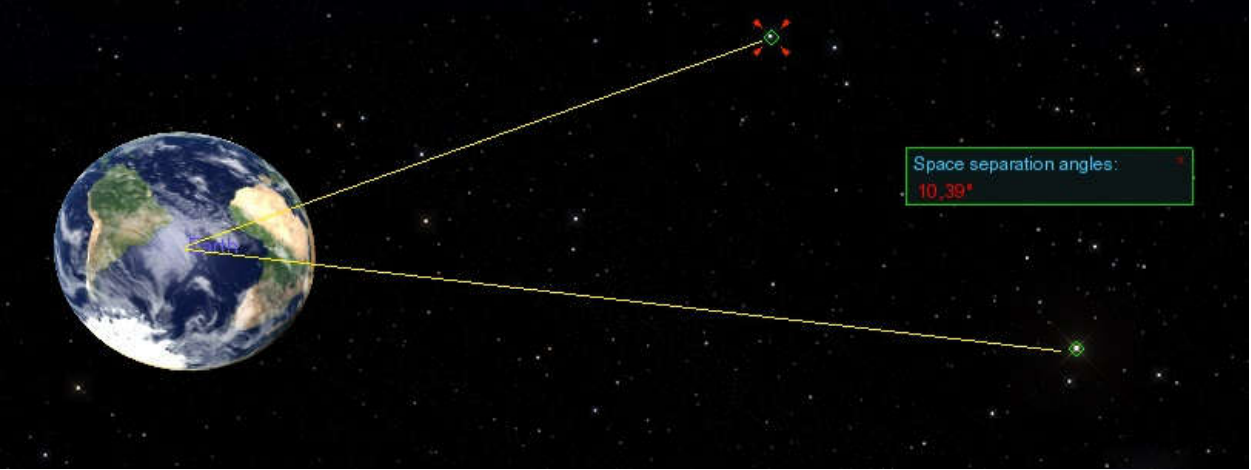


## 10. Quick button "stop time"



button "Time, stop!"

button "Legend"

button "Astronomical protractor"

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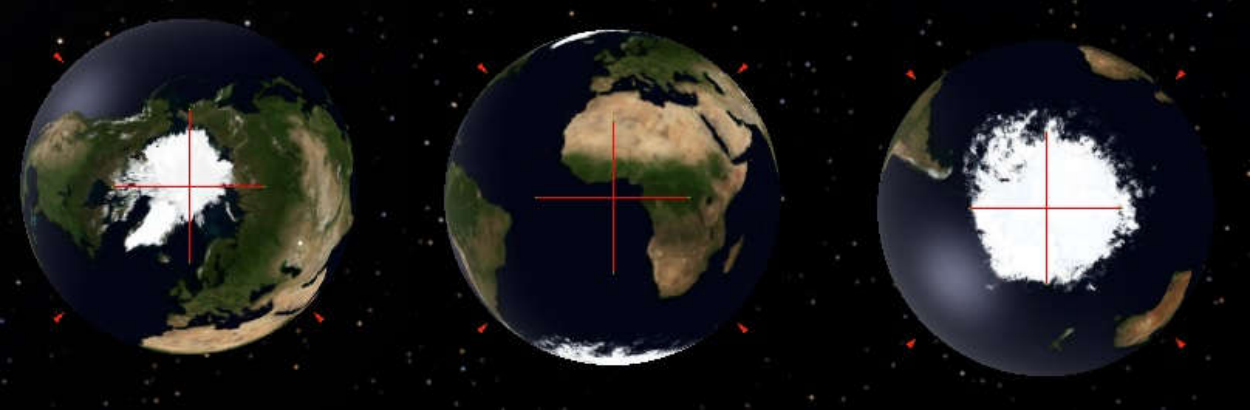


## 12. Angle of separation:



## 13. Button [N] [0°0°] [S]  positioning above:

- North Pole

- from the equator, on the zero point of longitude,

- South Pole



## Differences between Lua Universal Tools version 5.0 and 4.0:

### 1. Travel Guides have been renamed or added:

"Road to space-1" (USSR + USA), the button is [Te1]

"Assembly of the ISS", the button is [ISS]

"Road to Space -2" (ESA), the button is [ESA]

*(The names may be different according to the language of the system)*

**2. Guide buttons are transferred to the main menu area:**



**3. Guide buttons are transferred to Control Panel # 2**

"Objects/Orbits/Others" tool " Overview of orbits ".

**4. Removing clusters of galaxies**

**5. Enable / disable mini buttons Guides:**



*This button [ > ]*

*... disables / enables all these buttons that include / disable Guides.*

*Now on the screen even more free space!*

**6. Added mini buttons:**

• Objects with locations [Loc]
• Spatial objects of ESA [Te2]
• Space telescopes [Tel]

**7. Changes in the dashboard**



LUT-4   Remote control, panels #1, #2, #3



LUT-5   Remote control, panels #1, #2, #3

**Panel #4**



LUT-4 ← ← LUT-5 →

**LUT-4  Remote control, panel #5, #6, #7**



**LUT-5  Remote control, panel #5, #6, #7**



Panel # 5 LUT-5 is shown in the new layout. The sign is clearly divided into zones:

- spaceflight
- Maneuvers

The maneuvering area is a programmer.

Adding titles that facilitate orientation in the buttons of maneuver management:

- Angle of rotation
- Speed control
- Speed adjustment

Note. The rotation of the Earth (or of another celestial body) on the "Z" axis makes it possible to define the angle of inclination of the flight orbit around the planet from 0 to 90 degrees.

**8. New travel guides:**

- The "Objects with Locations" guide is very useful when using surface locations.

- After the USSR and the United States, a very large collection work for the study of space conducted by the European Space Agency (ESA). A new collection of ESA spacecraft was needed.

- The guide "Telescopes" hosts space telescopes, space probes for observation and other devices for space exploration.

*(all of them do not have a 3D representation yet, advice to amateurs !)*

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

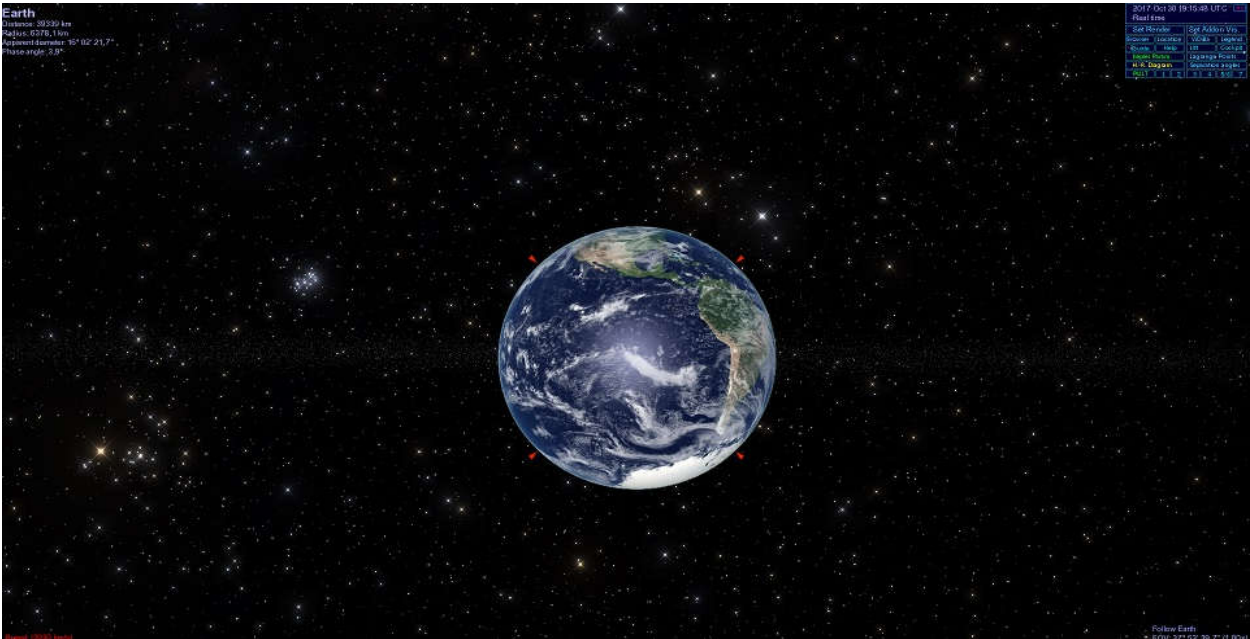*The 2 dashes have changed places.*

*This is the mark of a comment in Lua language.*

**9. In connection with the development of the new RenderLocsBox tool in LUT-5 this has reduced the number of add-ons with locations:**



## 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 8 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.

**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

Video card NVIDIA GeForce 7600 GS

Screen 1280 x1024 / 1920 x1080

And also as :

Intel® Pentium® D CPU 2.80 GHz

Installed memory (RAM) 2.00 GB

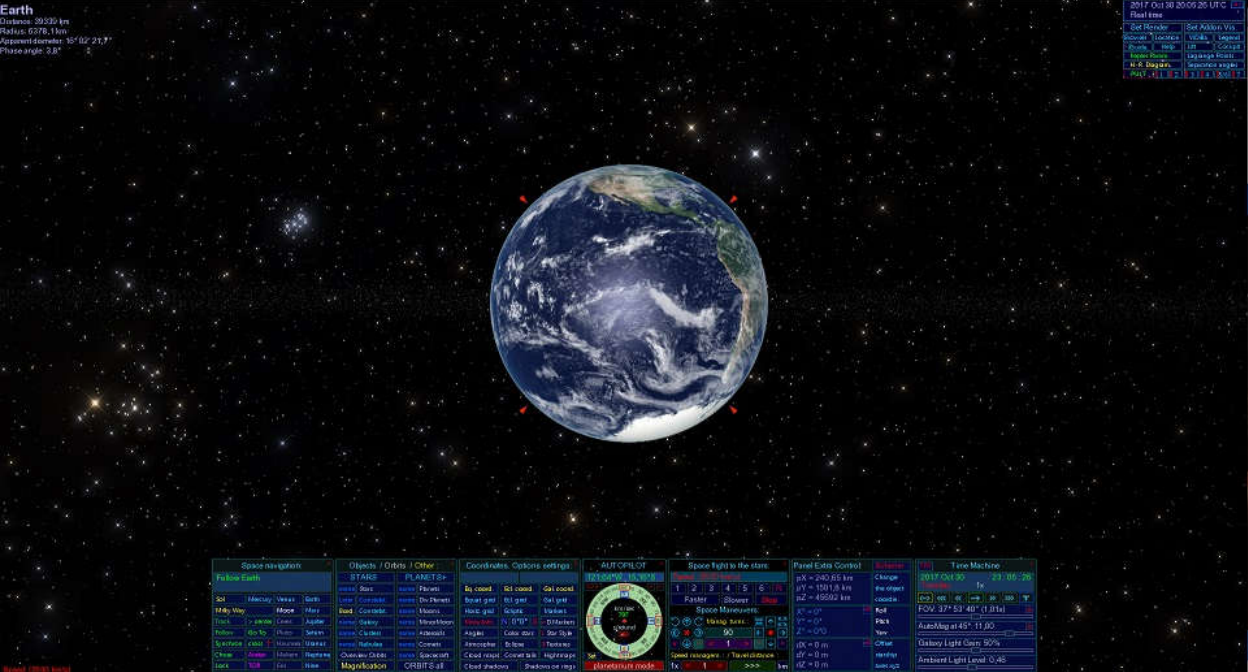Windows 10 operating system

Video card NVIDIA GeForce 8400 GS

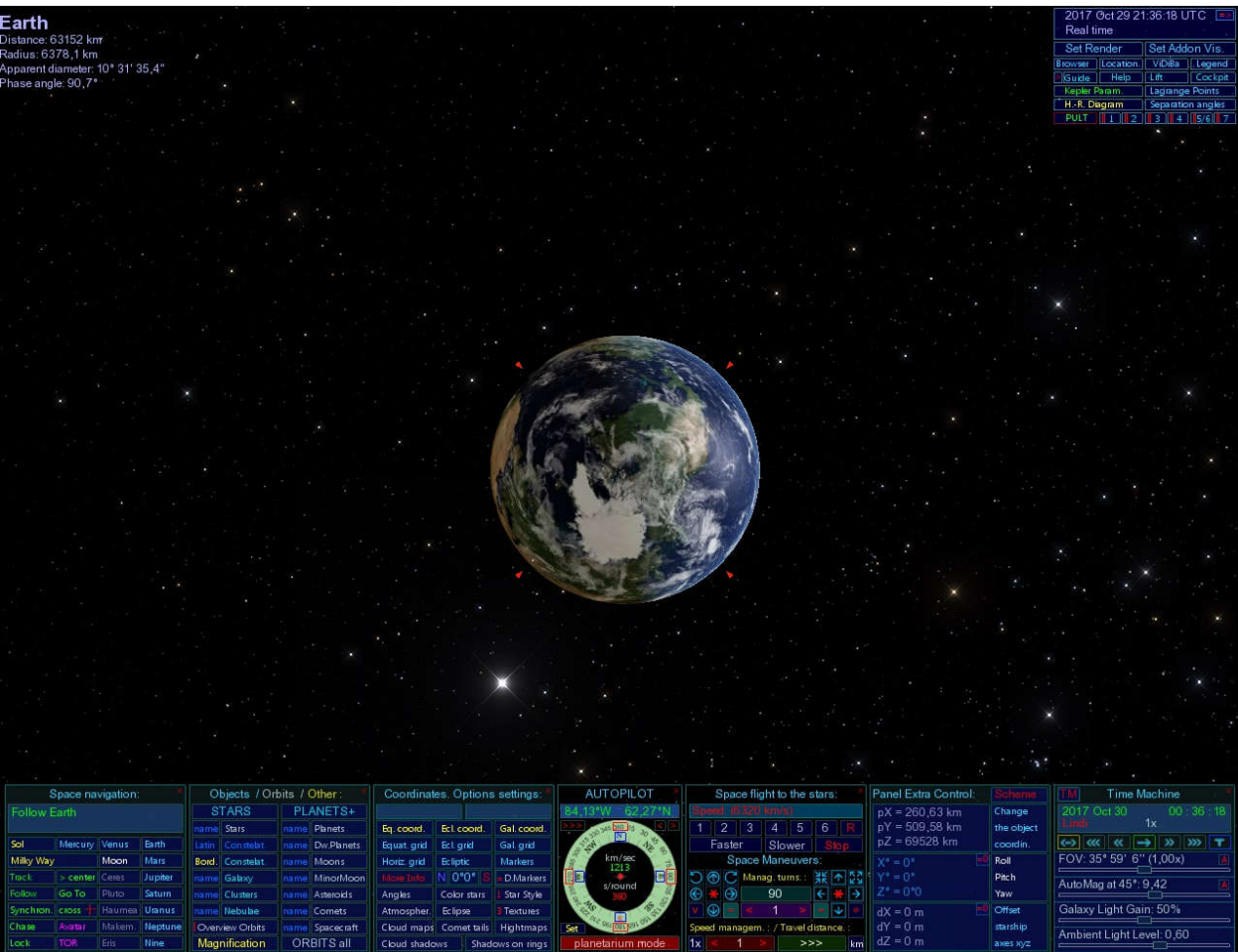Screen 1920x1080

(but also on lower systems)

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 700 pixels.

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

*View of the control panel on a screen 1920x1080 pixels:*



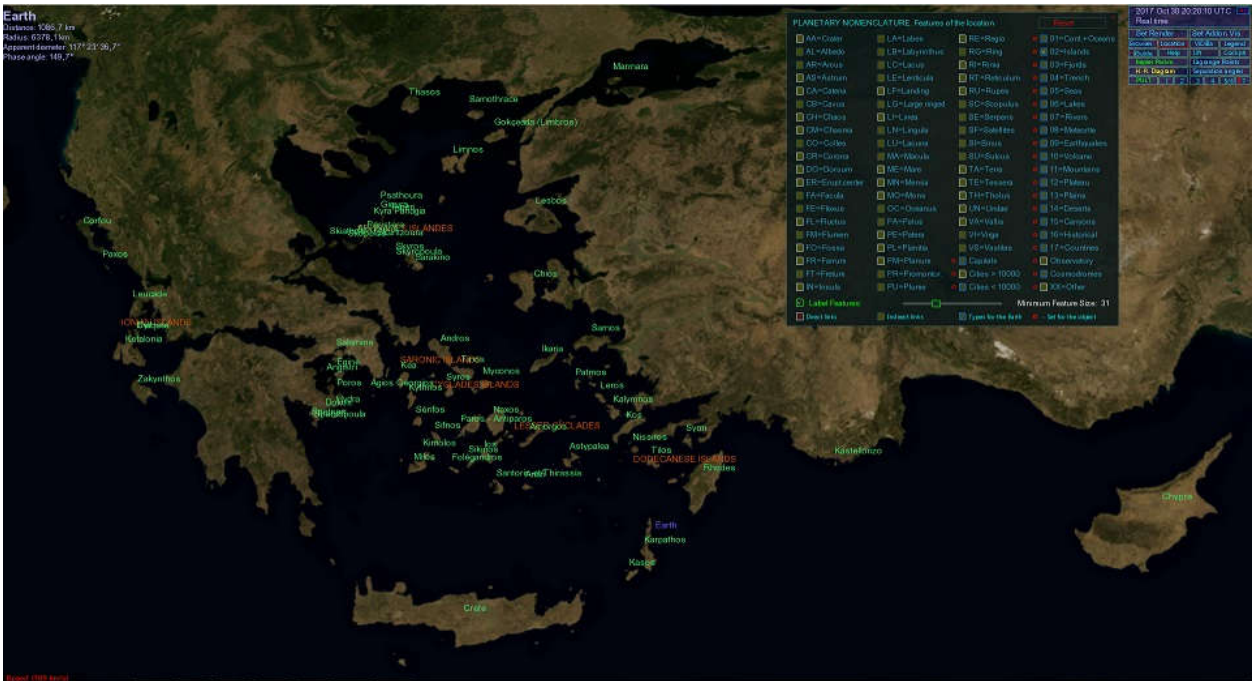*On a monitor 1280 x1024:*



*And in a window 900 x700:*



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.
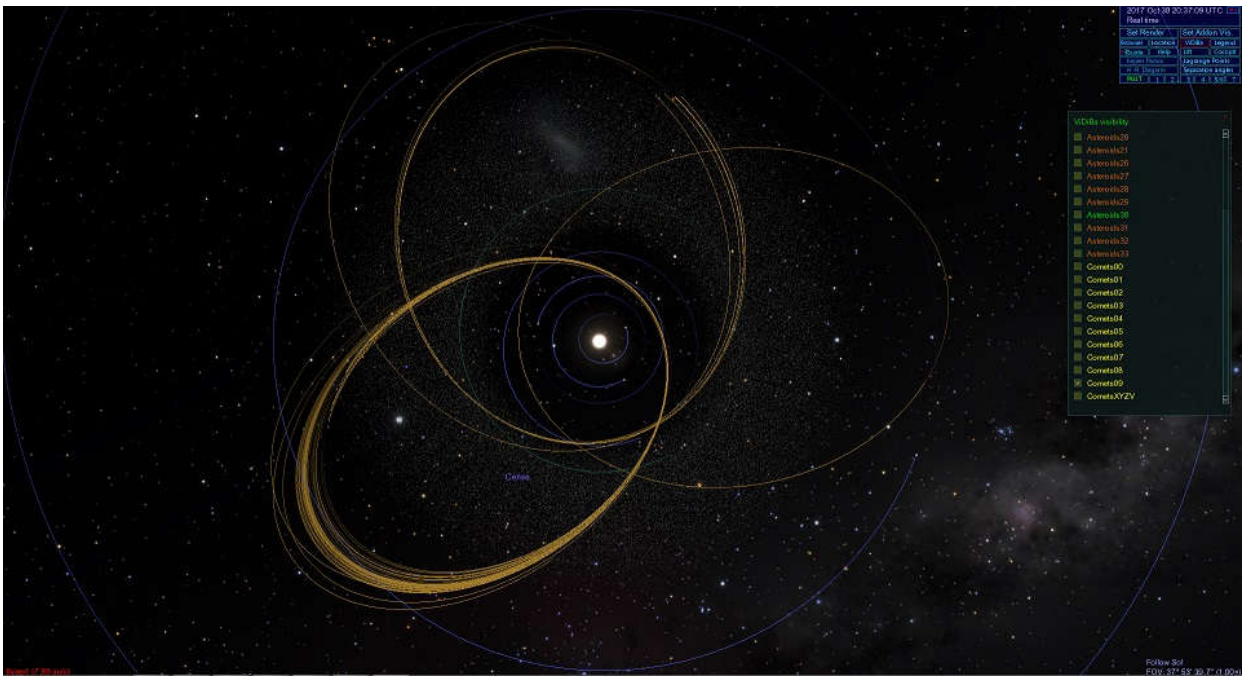
# Some screenshot:

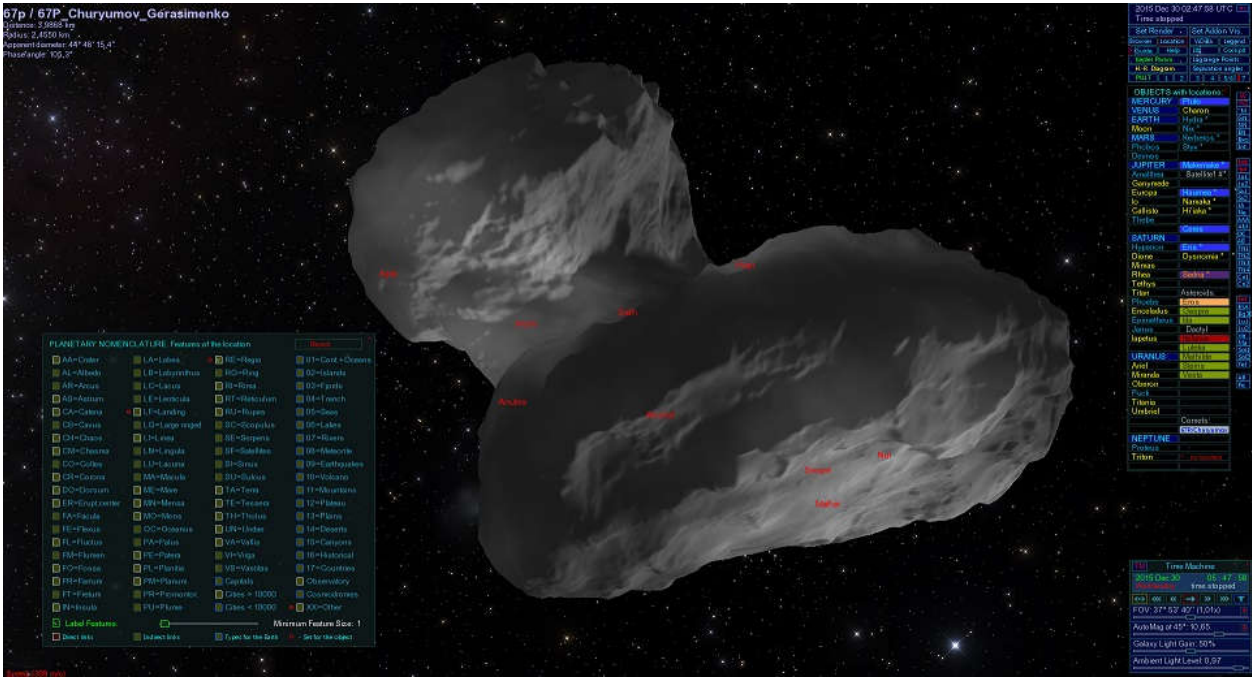*Islands in the Mediterranean region*



*Rivers of South America*



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



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

# Comparisons between LET and LUT-5:

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 !**



*(CC0 Public domain Free for personal and commercial use https://pxhere.com)*

Authors:

Author User work guide with the graphical

interface Lua Universal Tools v5.0   -  Gennady Lygin

Author of translation  - Patrick Ziegler

November 2017