LuSol-Guide v1.3
04.04.2015

Since the arrival on the market of amateur astronomy h-alpha filter for solar observation, new interesting perspectives are offered to amateurs to observe and photograph the dynamics phenomena of the Sun. Rare in amateur astronomy, the Sun seen thanks to a h-alpha filter is a dynamic subject offering fast (few minutes to few hours) and beautiful transient phenomena like sunspots moving or prominences. Coupled with the use of fast camera for astronomy imaging, it is possible now to achieve on one hand high-quality photographs, and the other hand, animations over several hours to enjoy these fast transients Sun.

In order to perform an animated sequence of h-alpha phenomena, we need to take several images over many hours. To do that, it is necessary that during the acquisition work, the sun don't quit the photographic field. If the mount is correctly polar aligned, then it is not a problem. But, a polar alignment is not easy during a sun observation! So, we propose to introduce here the guiding software LuSol-Guider, in order to keep the Sun in the field of view of your photographic setup and that for many hours.

Minimum requirements

To use this software, you need:

-   A pc installed with Microsoft Windows XP or more recent.

-   ASCOM version 6 installed on your system.

-   A mount compatible with ASCOM drivers or connected to the PC by ST-4 port with the "Shoestring Astronomy GPUSB" interface.

- A small guiding telescope with a solar filter and a webcam directly put at the prime focus. Typically a 50 mm finder with 150 mm to 200 mm focal length and a webcam with a ¼'' sensor work very well.

It is important that the sun disc is completely contained in the camera field, so don't use a too large focal length for the guider. Moreover, **LuSol-Guide is able to guide on crescents for example in the case of sun eclipse or even on the Moon.**

Installation

Download the archive "LuSol-Guide.zip". Unzip this archive and launch LuSol-Guide double clicking on the icon "LuSol-Guide.exe".

Quick start guide

In order to test quickly LuSol-Guide, run these steps :

1) start the camera and verify that the Sun is centered on the camera sensor.

2) Connect your mount with an ASCOM interface or GPUSB interface.

3) Run the calibration.

4) Start the autoguiding, enjoy it !

Usage

LuSol-Guider is designed to be a simple tool for guiding on Sun. It is very easy to use. With just a few clicks, you can guide on your target. Here is an easy guide to run the guiding step by step, with a few detailed setup instructions.

The figure below illustrates the main window of the software. Legends are added on the figure for the main controls of the program, in order to be referenced easier in this manual.
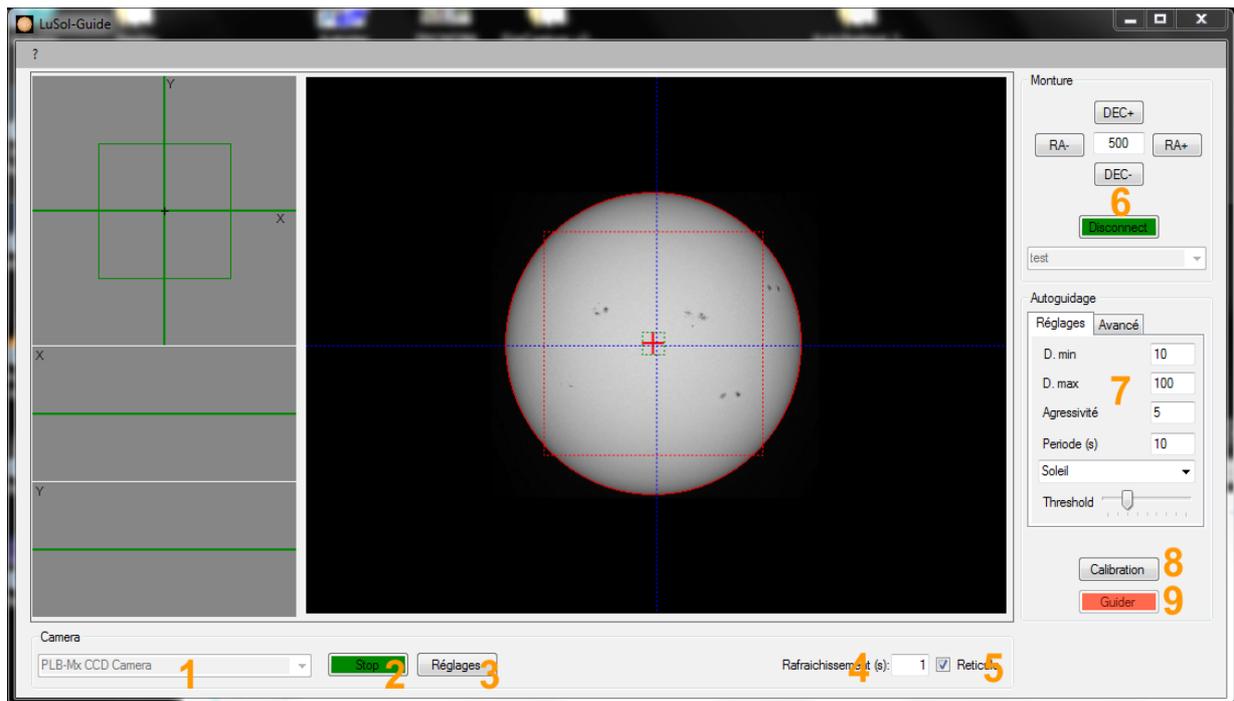
1) Install the webcam on the guiding scope, point your setup to the Sun, and connect the mount to the PC. **Don't forget to install a full aperture solar filter over the front of the guiding scope.**

2) Start the camera

The camera panel, at left bottom of the main windows, allows the setup of the camera. First, you must choose the camera driver with the list box (1). Then, you can launch the camera and the preview clicking on the "start" button (2).

The settings button (3) opens the settings windows of the camera. Take the time to obtain a correct image of the Sun, i.e. with a good exposition and a good focus quality.

It is possible to adjust the preview refresh time (4). Note that this parameter doesn't impact the guiding quality: you can choose for example a fast preview refresh during focusing and slower refresh time for the guiding, just to check the position of the target.

Last, it is also possible to display a cross hairs on the preview window thanks to the reticule check box (5).

3) Connect the mount to the software

Firstly, you must choose the interface in the list box (6). Then, press the "Connect" button. If all is ok, the button background becomes green. Then the four direction buttons are enabled and allows controlling manually the mount. The text field is used to set the impulsion time (milliseconds) sent to the mount when you press a direction button.

Remarque : thanks to ASCOM plateform, most of the mounts are compatible with LuSol-Guide, using directly the ST4 port of the mount or using an additional interface USB-ST4 (Pierro Astro, Shioestring AStronomy, ZWO etc…). On the other hand, the ST4 ports embedded into few guiding camera aren't compatible with LuSol-Guide because the application don't manage yet the camera via ASCOM drivers. **Few constructors like ZWO gives ASCOM driver for using the ST4 port of their cameras independently of the video functionnality. So, in this case, you can use ST4 port of the ZWO camera after installing of the driver pilote « ASI ST4 Telescope » :**

http://www.zwoptical.com/Eng/Software/index.asp

4) Just before guiding

The camera and the mount are now connected. So, you have just to run the calibration before to launch the autoguiding. The calibration step computes the relation between the mount axes and the camera orientation. To perform this operation, click on the "calibration" button (8). The software sends movement instructions to the mount, so that it is important to check that the target doesn't go out the camera field during this step. To prevent this, put the target at the field center as good as possible. This step could take a short time: don't touch the software or the mount, and wait the end of the step.

Note that the calibration step must be done again if you change the camera orientation.

5) Start the autoguiding

Now it is time to launch the guiding! To do that, press the corresponding button (9). First, the software saves the current position of the object (green crosshair) as guide target. The guiding operations make sure that the position of the object (red crosshair) doesn't move too far from the guide target. Some parameters make it possible to control the guiding quality: for example, you can adjust the value of the guiding period or the guiding box. However, theses parameters can be changed only when the guiding is off.

It is not necessary to do again the calibration step after changing the values of these parameters.

Here is a short description of them:

Aggressiveness : This parameter must be chosen between 1 and 10, and determines how much the estimated correction should be applied. A too high value will cause overcorrections and oscillations, but it is not really a big problem, unlike the autoguiding for long exposure photography.

D. Min: this parameter determines the minimal distance from guiding target, represented by a number of pixels, considered to involve mount position corrections.

D. Max: this determines the maximal distance from guiding target, represented by a number of pixels. Over this value, no corrections are sent to the mount. This prevents bad corrections due to a temporary loss of target (clouds etc…).

Period: This is the time between two corrections, expressed in seconds.

Centroid computation : two choices are available.

The first one « Sun », is suited to the case of sun and solar eclipse autoguiding. It detects the center of the disc as well as its edges. This method doesn't work correctly on the moon, mainly on Moon's phases. Moreover, with this choice, you can adjust the « threshold » parameter described above.

The second one, "Moon/Sun" computes simply the center of gravity of the image. This method is more robust for Moon autoguiding.

threshold : control to change the detection threshold of the sun boundary. You could adjust this parameter in case of bad detection of the target boundary. Useful for autoguiding on the Moon.

In the autoguiding panel, there is also an « Advanced » tab giving additional possibilities:

RA only guiding : check this box if you want autoguide only on the RA axis.

Log « Desktop/lusol.log » : check this box to create « lusol.log » file on your desktop, with correction informations on the two directions during autoguiding.

Restore previous calibration at startup : check this box to restore previous calibration data at start up of the software. This option must be used only if the setup mount/camera/finderscope hasn't beed moved.

Contact

You could e-mail all questions concerning this software to oc.lab@free.fr, with the message subject "LuSol-Guider".