The Artemis plugin for MaximDL

Introduction

Maxim DL is a powerful astronomical program, from Diffraction Limited. It is able to control most of the equipment used in astronomical imaging, as well as processing the captured images. In order to allow Maxim DL to communicate with a new piece of hardware, a driver is required to be installed in a location known to Maxim DL.

Installation

The driver file for the Artemis camera is called CCDPlugArtemis.dll and installation is performed by the `SetupArtemisUniversal` installer. If you specify that you want to install the Maxim DL plugin you will be prompted for the location of the Maxim DL base directory. For a default installation of Maxim DL version 4, this is:

```
C:\Program Files\Diffraction Limited\MaxIm DL V4
```

You can identify the correct directory because it will already contain many files named CCDPlug?????.dll - these are the drivers for the various other types of CCD camera supported by Maxim DL.

Using the Plugin

Once the CCDPlugArtemis.dll file has been copied to the correct directory, you can start up Maxim DL and open the CCD Control Window - either by pressing Ctrl+W or by selecting menu option View|CCD Control Window. There may be a short pause while Maxim DL build up a list of available camera drivers, and then you will see the camera setup dialog.

In the box headed 'Main CCD Camera', click the 'Setup' button , and in the dialog which appears scroll down the 'Camera Model' list until you find the Artemis camera. There will be three boxes at the bottom of the dialog, headed 'Priority', 'Hardware FIFO', etc. The functions of these are described below.

- **Priority**

  In order not to 'lock up' Maxim DL while the driver receives data from the camera, a separate process is created for receiving the data in the background while Maxim DL deals with other things such as the user interface. On a slower PC, or one which is particularly busy, it is possible that insufficient time may be available for the download process resulting in stalls during the data transfer. This is undesirable since it may produce artifacts in the image, and so the option is given to increase the priority of the download process. *This option will not normally be required, but is provided as a last resort*.

- **Hardware FIFO**

  The Artemis camera may be fitted with an internal FIFO (First In, First Out) buffer to smooth the transfer of data from the CCD to the USB. To enable the FIFO you can select this option, which may improve image quality slightly but at the expense of very slightly longer download times. Enabling the FIFO when it is not fitted will not cause problems, the request will simply be ignored - you should generally enable this option unless you have a specific reason not to.

- **Precharge mode**

  Here you can select the manner in which the CCD's precharge level is subtracted from the image data. 'None' returns data without subtracting the precharge level - this is the fastest

option but will result in some image noise. 'PC' sends both image and precharge data to the PC for subtraction - this is the method which results in the least noise, but takes up twice the USB bandwidth. 'In-camera' subtracts the precharge data in the camera's firmware, giving an image which is almost identical to the 'PC' subtraction, but using half the USB bandwidth. Generally this is the preferred option.

- **Amp Switching**

  This option allows you to set a threshold exposure duration - for exposures longer than this, the driver will switch off the CCD's internal amplifier during the exposure. Leaving the amplifier switched on can cause a slight brightening towards one edge of the image due to a small but detectable amount of infrared radiation ('amp glow') emitted by the circuitry inside the CCD, so it is best to switch off the amplifier for longer exposures. For short exposures the glow is generally insignificant compared to the brightness of the actual subject being imaged. 2.5s is generally a reasonable value to use.

- **Filter** (only for interlaced CCDs)

  If your CCD sensor is of the interlaced type normally used in video cameras (e.g. ICX254, ICX255, ICX429) then an exposure with full vertical resolution (i.e. Y binning = 1) has to be taken in two fields consisting of odd and even scanlines respectively. These fields are then interleaved to produce the final image. Due to the time taken to download a field the exposure times of the two fields may not match exactly, in which case some fine horizontal banding may be visible in the image. You can use this option to ask the camera driver to do some preprocessing which should help to balance the two fields. Note that for short exposures (less than about 2.4s) the camera will take the two exposures consecutively rather than simultaneously, only starting the second exposure after the first field has been downloaded, so the banding will not occur with these exposures and the preprocessing will not be applied.

Once you have selected the options you require, you can return to the CCD Control Window by clicking 'OK', and then click the 'Connect' button to start using the camera. If you see the message 'Could not initialize camera (1)' then you need to check that the camera is correctly powered up and connected to the USB, and be certain that you have uploaded the correct firmware onto the camera if required. Assuming all goes well, you should now be ready to take an image with the Artemis camera.

The Artemis does not have software control over the Peltier cooler, so the three cooling buttons have no effect. Click on the 'Expose' tab to take a test image - select an exposure time and click the 'Expose' button. After a while a window will open up containing your Artemis image.

If you need to find out more about how to use Maxim DL for imaging there is plenty of information, including tutorials, available from the Maxim DL 'Help' menu.

Note - interlaced CCDs:
With this type of CCD it is physically impossible to produce true vertical binning at any odd multiple apart from 1. The Artemis driver will simulate the correct binning behavior if such a binning multiple is requested.

Working with two Artemis cameras

It is possible to use Artemis/ATK16 cameras for both the Main CCD and Autoguider with MaximDL. Whilst you could simply select 'Artemis' for both cameras, this is not ideal because there is no way for MaximDL to work out which camera to use for which function - the allocation will depend on the order in which Windows discovers the USB ports that the cameras use, and may vary from one run of MaximDL to another. To alleviate this problem you can adopt the following procedure.

In the MaximDL directory you will find the plugin file CCDPlugArtemis.dll - copy/paste this file to a new file named, for example, CCDPlugArtemisGdr.dll (for the Guider), and then rename the original file to CCDPlugArtemisImg.dll (for the Imager). The names are not critical but must begin 'CCDPlug' and end '.dll', and the main part of the name must be no longer than 17 characters.

Now create two text files with the same filenames as the dll files, but with .ini extensions. In this case the names would be CCDPlugArtemisGdr.ini and CCDPlugArtemisImg.ini. Open these files with a text editor (such as Notepad) and create three lines of text in each file in the following form:

```
[Config]
CameraName="ArtemisImager"
CameraSerial="00N21A80"
```

The CameraName field is the identifier which will be seen in MaximDL's dropdown menu of camera types. Use ArtemisImager for the CCDPlugArtemisImg.ini file, and ArtemisGuider for the CCDPlugArtemisGrd.ini file.

The CameraSerial field is the serial number of the USB device of the particular camera which you want to use as the guider or imager. You can discover this serial number as follows:

Connect the camera to the computer - it will be easiest if you only connect one camera at a time. Run Programs->Accessories->System Tools->System Information. Expand the 'Components' item and click on 'USB'. In the list in the right hand panel you should see your camera, followed by a string giving the USB VID, PID and serial number. The string following the last '\' character is the serial number which should be copied into the CameraSerial field of the .ini file.

Now when you run MaximDL and open the CCD Control Window you should be able to select individually ArtemisImager or ArtemisGuider as the camera to use for the MainCCD and Autoguider respectively.

Selecting the Guide Port

You can choose whether to use the guide port on the main camera or the guide camera, by selecting the 'Guide' tab of the CCD Control Window, and then clicking the Options button followed by 'Guider Settings'. Now you can choose the Autoguider Output Control to be via the Main Camera Relays or the Guider Relays, depending on your preference. **Note that the option to use Main Camera Relays was introduced in MaximDL V4.11**