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Spectral (Polarimetric) Imaging Sensor Operations

(The Polarimetric capability is an option only available on special request).

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1. Software

The laptop contains two special programs on the desktop:

1. Qcapture: This program runs the camera by itself
2. Multispectrum: This program runs the LCTF and camera together for synchronized capture of image cubes.

Multispectrum can not be run while the Qcapture are running since they talk to the same devices. Qcapture is a utility program that is useful for setup and testing the camera.

The Computer has a folder called “pallets” that contains sample “sequence” files (*.seq) that can be used by the Multispectrum program. These files can be edited using any text editor. The *.seq file allows setting individual exposure time for each spectral band in order to take full advantage of the dynamic range of the camera (this is useful since the illumination level is not uniform at all wavelengths, and system response is also non uniform).

The Multispectrum program saves image cubes with a default extension *.fla (for flat file structure). The default name can be changed to any other name. A header file (*.hdr) is also generated. This file allows ENVI to open the image cube automatically. If you do not use ENVI, the file structure is as follows. Each pixel is saved in two bytes (or one byte for RS-170 cameras). The first image is the first spectral band starting at top left of the image, going from left to right, and then the next row all the way to the bottom right corner of the image. The next two bytes belong to the next spectral band, etc. The number of bands, and the x-y dimensions of the image are provided in the header file.

For radiometric calibration it is recommended to capture a dark image cube, and a bright field image cube using the same *.seq file. The data file and the dark and bright field files allows the calculation of the reflectance of the target scene by using band math.

For further details see the MultiSpectrumApp Software Document.

2. DUAL Spectral Range LCTF Hyperspectral Sensor: hardware

A dual band LCTF hyperspectral sensor uses two separate tunable filters. The VIS covers 400 to 720 nm, and the NIR covers 650 to 1100 nm.



Figure 1. The camera, relay optics, LCTF, and foreoptics.



Figure 2. Each LCTF has a dedicated controller box (same serial numbers).



Figure 3. To switch from one LCTF to another, use the 3 set screws in the back of the LCTF, on the C-mount adapter.



Figure 4. When switching between the VIS & NIR LCTFs use the focusing ring on the relay optics to focus the image (the difference between VIS and NIR is about 2 mm motion). Make sure that the front lens is focused to infinity (all the way in the FAR direction). Lock this focusing ring in place and use the front lens to focus to close by objects.

3. Electrical connections

If you plan to interchange VIS and NIR LCTFs, we recommend that you set up both control boxes, and connect to their respective optical head (the LCTF). Power both of them. It takes about 30 seconds for the internal check (light stops blinking). When the two LCTFs are ready, you can switch the optical head in front of the camera using the set screws shown in Fig. 3, AND the USB cable going into the back of the computer.

When the LCTF is switched, the proper pallet (*.seq) file has to be loaded into the Multispectrum program.



Figure 5. The camera has two connectors: power and FireWire. The power switch should be turned to “aux”.

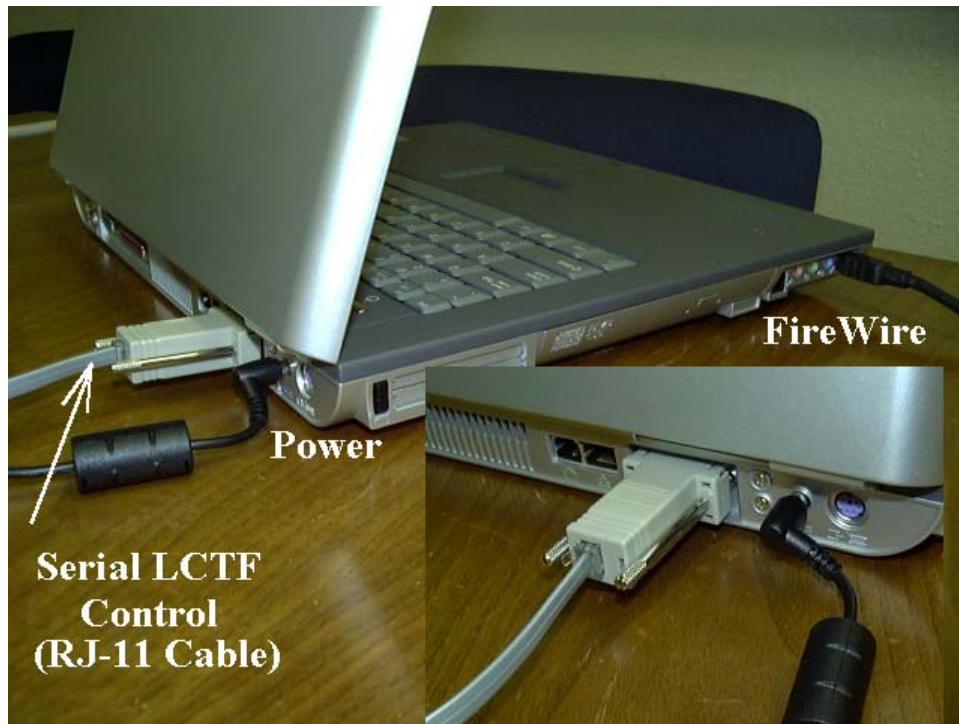


Figure 6. The Firewire (camera) and LCTF serial cables (older models) are connected to the computer.



Figure 7. The two LCTF control boxes have identical connections for USB cables and the optics.

4. Applications



Figure 8. Precision farming; crop canopy spectral signatures measurement in support of remote sensing.

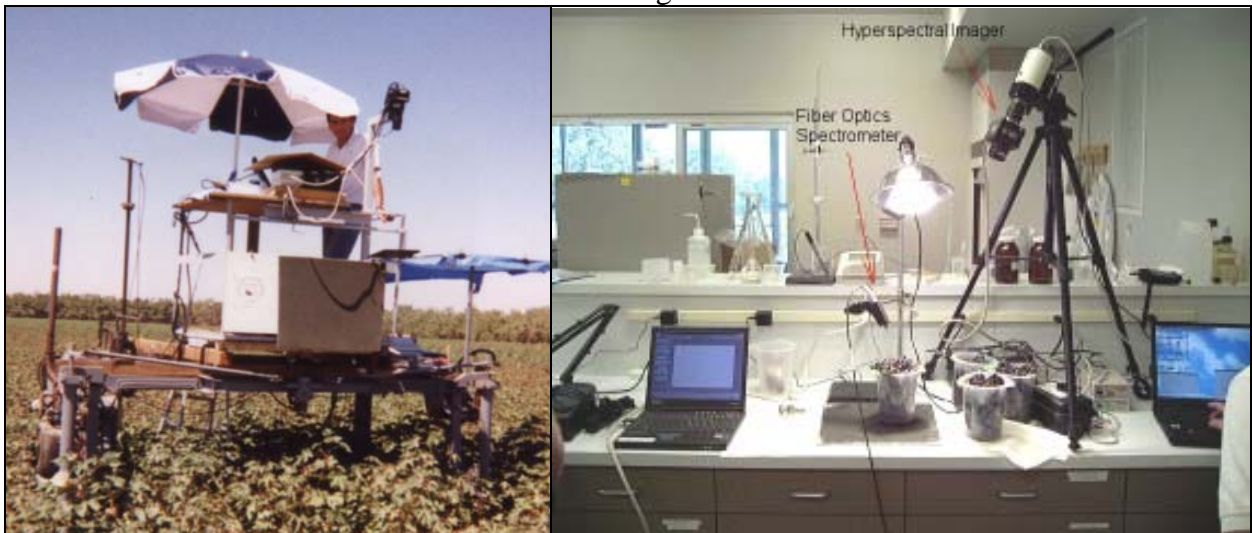


Figure 9. Other field and lab applications.

WHEN YOU NEED TO COMPARE ... APPLES TO ORANGES

