Getting started tutorial - headless

Living Optics

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This tutorial is intended to help you get started with using your Living Optics Camera headlessly. We will use the `camera tool` installed on the Nvidia Jetson AGX Orin and the multicolor LED torch supplied with the development kit.

- Please ensure that you have completed all steps in the *Unboxing the camera hardware* section of the user manual before proceeding.
- If you have the Camera kit, ensure you have performed all software setup steps at (https://docs.livingoptics.com/product/camera-kit/software-setup.html) before starting this guide.
- Follow the video version of this tutorial at (https://livingoptics.com/getting-started/) for a more hands-on view of this tutorial.
- You will need a mobile device with Wi-Fi capability and with a chrome-based browser to complete the tutorial.

Set the scene

Arrange the components of your Development Kit as shown in the picture below.

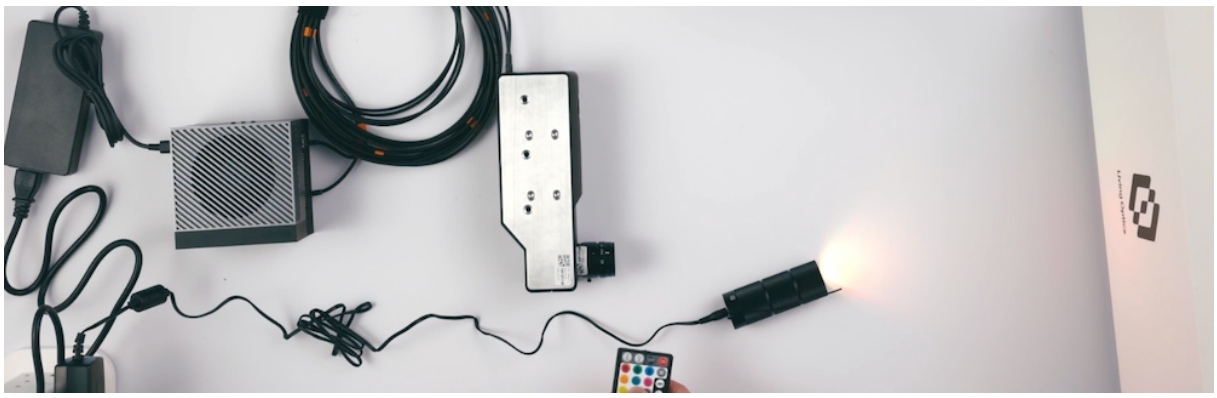

Figure 1: Set the scene

- Ensure the Nvidia Jetson AGX Orin is placed correctly with the fan and metal grating facing upwards - this is how it stays cool.
- Ensure your camera has the zoom objective lens fitted.
- Place your camera on a flat, level surface and orientate it towards the white surface of the Shipping box (or other white, matt surface of your choice).
- Plug the LED torch Power cable into a suitable power socket and attach to the back of the LED torch.

- Place the torch approximately 15-20 cm away from your chosen white surface.
- Turn the LED torch on using the LED remote and press the “W” button to set the torch to white.
- Connect the Nvidia Jetson AGX Orin power cable (it will now boot if power is flowing).

Start the Camera tool

- Using a mobile device, connect to the Wi-Fi hotspot `locamera{X}` generated by the Nvidia Jetson AGX Orin, where {X} is a unique number to your system.

> **Note:**
>
> This is a passwordless connection. To setup a custom password, read here

- Open a chrome-based browser on your mobile device and go to the dashboard at: `http://10.42.0.1`.
- Press the `Start Service` button and wait for several seconds for the status to change to On.

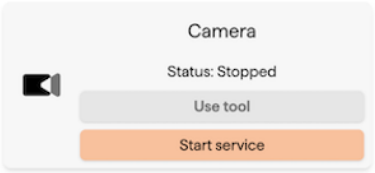

Figure 2: Dashboard showing Start Service

- Then press `Use tool` to start the `camera` tool. This will appear in a separate tab.
- The `camera tool` will now show the live scene-view.
- Adjust the focus of the objective lens so that the white surface of the shipping box is in focus. If your image is too dark or too bright, you may have to change the camera settings to get suitable lighting levels. Check the frame rate, exposure time and gain in the `Advanced` tab on the `Camera` menu.

Field Calibration

It is important to take a field calibration image regularly and we recommend doing so before each data capture session to ensure the best results. This image helps the software adjust for any physical changes that might affect the accuracy of the spectral information.

- Select the type of field calibration you wish to perform and follow the prompts. We recommend `Auto Calibration` where it is available.

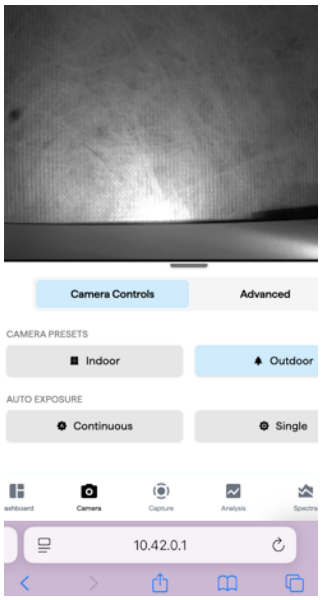

Figure 3: camera tool

Figure 4: Field Calibration

- Wait a few seconds and a confirmation message will appear stating the field calibration has completed.
- Your field calibration is now complete and you can continue the tutorial below.

> **Note:**
>
> This field calibration does not persist once the camera tool has been closed. Please repeat the process above every time the camera tool is opened.

Live spectral visualisation

The `camera tool` features a live spectral viewer. We will use this to investigate the spectrum of the LED torch colours.

- Open the `Spectra` menu by pressing the graph icon on the far right of the bottom toolbar.

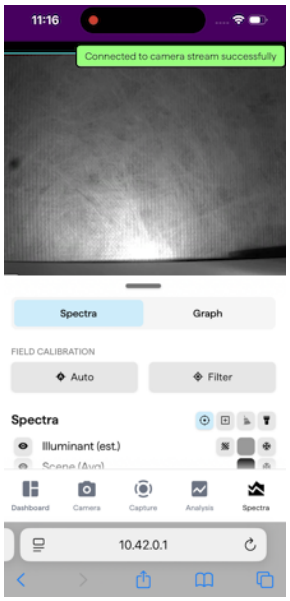

Figure 5: Spectral viewer

- Toggle on the reference torch spectra by pressing the `torch` icon once.
- Toggle off the `Scene (Avg)` spectrum by pressing the `eye` icon once.

Steps

The representative spectra of the the following five LED torch colours have been overlayed on the spectral viewer as an approximate reference guide (1-Red, 2-Green, 3-Blue, 4-Brown, 5-Pink).

Figure 6: Torch remote

> **Note:** that the Living Optics Camera will detect the spectra of any colour available on the LED torch remote but the reference overlays have only been provided for the 5 colours above.

- Press the Red button on the LED torch remote
- Place the `crosshair` onto the torchlight in the scene by pressing on the scene-view.
- Then press the `eye` icon associated with the `red` spectrum in the `camera tool`.
- Switch to the `Graph` tab to see the plot

You will now see in the spectral viewer the spectrum at the `crosshair` location overlaps with the Red reference spectrum.

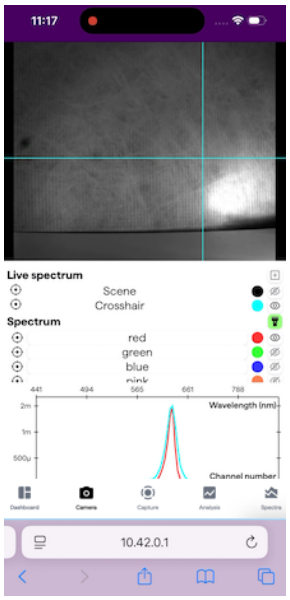

Figure 7: Reference red spectrum

- Cycle through the rest of the colours available by repeating the steps above, and see the spectra are approximately overlapping with the overlays.

This concludes this tutorial, showing how mixing just three LED colours can create a vast combination of perceived other colours by the human eye, and that the Living Optics Camera can reveal the spectral details behind this colour mixing.

For a fun and easy experience of seeing the spectra change with each colour, try the `breath` button on the LED remote, which cycles through various preset colours of the torch.

Next steps

Next, you are ready to start using the `camera` tool in earnest to explore and record hyperspectral data of the world around you.

Further details and guides on the camera tool can be found at (https://docs.livingoptics.com/sdk/tools/camera/tool-guide.html)

If you want to perform some analysis and run some applications, see our analysis tool at (https://docs.livingoptics.com/sdk/tools/analysis-qt/tool-guide.html)

Further guides, tutorials and examples can be found at (https://docs.livingoptics.com/sdk/index.html)