Operation Manual

October 1, 2024

I. Device Setup

A. Turn on the Jetson by plugging the power port in. See Figure 1.

B. Turn on the motor controller with the switch. See Figure 4.

C. Turn on the power supply with the switch. See Figure 5.

D. Ensure everything is plugged in correctly.

i. USB ring light is powered. It's best NOT to power it with the USB ports on the Jetson.

ii. Jetson is connected to motor controller with a USB-B to USB-A cable

iii. Jetson is plugged into the monitor with DisplayPort to HDMI converter

iv. Power supply is plugged into the wall and also into the motor controller

v. Motor controller is connected to X, Y, and Z motors

vi. Motor controller is connected to X, Y, and Z limit switches

E. Log into the Jetson

i. Username: dragonfly

ii. Password: alls33ingFly

F. Launch the GUI

i. Open Terminal. See Figure 10

ii. Run the following

a. cd /Desktop/refactored

b. sudo chmod 777 /dev/ttyUSB0

c. python gui.py

G. Use the GUI to connect to establish a connection between the Jetson and the motor controller. See Figure 8

i. Press the physical 'Reset' button on the motor controller. See Figure 4

ii. Click the 'Serial Connect' button on the GUI and wait until the GUI is responsive again. See Figure 8

iii. Test that the connection has been made by clicking the arrows to manually jog the machine. See Figure 8

H. Set Home

i. Confirm that there are no obstructions in the machine that will cause a collision

ii. Click the 'Set Home' button on the GUI. This will move the machine towards the limit switches until they are triggered. See Figure 8

iii. *** If the machine doesn't move, repeat the previous step to establish a connection between the Jetson and motor controller ***

II. Sample Setup

A. Sample levelling

i. Ensure that the the top and bottom face of the cookies are relatively level
ii. Take note of the sample name, id, etc on to a piece of paper
iii. Place the cookie on sampling table
iv. Place the bullseye level on top of the sample. See Figure 6
v. Rotate the sample until the bubble is biased towards the side of the levelling table with only one screw
vi. Loosen the lone screw until the bubble is centered on the bullseye. See Figure 7

B. Capturing Samples
i. Click the 'Fast' option in the jogging controls section of the GUI
ii. Set the jogging distance to be relatively large like 10 or 20mm
iii. Navigate with the jogging arrows to the approximate middle of a sample
iv. Jog in the Z-axis to get the sample in focus
a. I like to start by setting the jog to 5mm, and seeing the sample go into then out of focus
b. To tune closer, I then change the jog to 1mm to get roughly to the focus
c. Finally, I switch to 0.1mm and get as in focus as possible
d. Note that it is pretty important to start off in focus. While the machine has a control algorithm to help keep the machine in focus, it performs best with a good start
v. Fill in the 'Sample Height' and 'Sample Width' text boxes with an estimation of the size
vi. Click 'Test Sample Boundaries'
a. The purpose of testing the boundaries is to show the user the border of the sample.
b. The button will take the location of when you click the button, and traverse around the border of the sample according to what you defined as the height and width
c. You should watch to verify that all of the sample that you want is within the border
d. If you do not see all of the cookie, adjust either the starting location of the sample with the jogging arrows, the 'Sample Height' text box, the 'Sample Width' text box, or a combination of the three

C. Click 'Add Cookie'
i. Once the boundaries are looking inclusive of the entire sample, add the cookie sample.
ii. If you only want to do one cookie, now you can click 'Capture All Cookies'. If not, continue to Multiple Samples.

D. Multiple samples
i. Repeat the sample levelling process for each cookie. Then repeat the Capturing Samples process. When you are ready click 'Capture All Cookies'
ii. Note that it's possible for the device to fail when stitching cookies. If this happens it will nullify your work setting up the cookies unfortunately.

E. Cookies vs. Cores
i. The process remains mainly the same for capturing cores and cookies.
ii. The main difference would be that if you can see the entire width of the core in one image, make the height OR width equal to zero.
iii. Because a core holder is very close in height to the core itself, this can mess up the focusing control.
iv. Before doing a lot of cores, test out one at a time to dial in settings and confirm that the stitch is working alright.

III. Potential errors

A. Running out of memory

i. While this shouldn't be a problem, there is still a memory problem in the stitching implementation from when it was ported from Stitch2D. In theory this is fixable, but I haven't had the time to get to the root bug yet.

ii. If you need a higher resolution stitch than what the Jetson can do, you'll need to load the images onto a computer with more RAM, such as the Legion laptop, and stitch them on there.

B. Visible seams

i. This is an annoying artifact from what we have deduced to be a poor lens. If you want to maximize sampling speed, it is possible to take zoomed out photos with larger field of view. Although this results in visible seams which have seemingly only been able to be fixed by cropping the images to a size which effectively cancels out the increased field of view.

ii. If you are going to be using a manual dating software like Coorecorder, then the seams may not be the end of the world. As long as you can differentiate the seams from the rings.

C. Failing before capturing all samples

i. If this occurs, you'll have to check which cookies were completed and remove them from the table. Restart the adding samples step.

ii. If this happens a lot, let Adam know.

D. Unresponsive GUI

i. Close the terminal. This will force everything to close and end the process that is causing the delay. If this keeps happening let Adam know.

IV. Figures

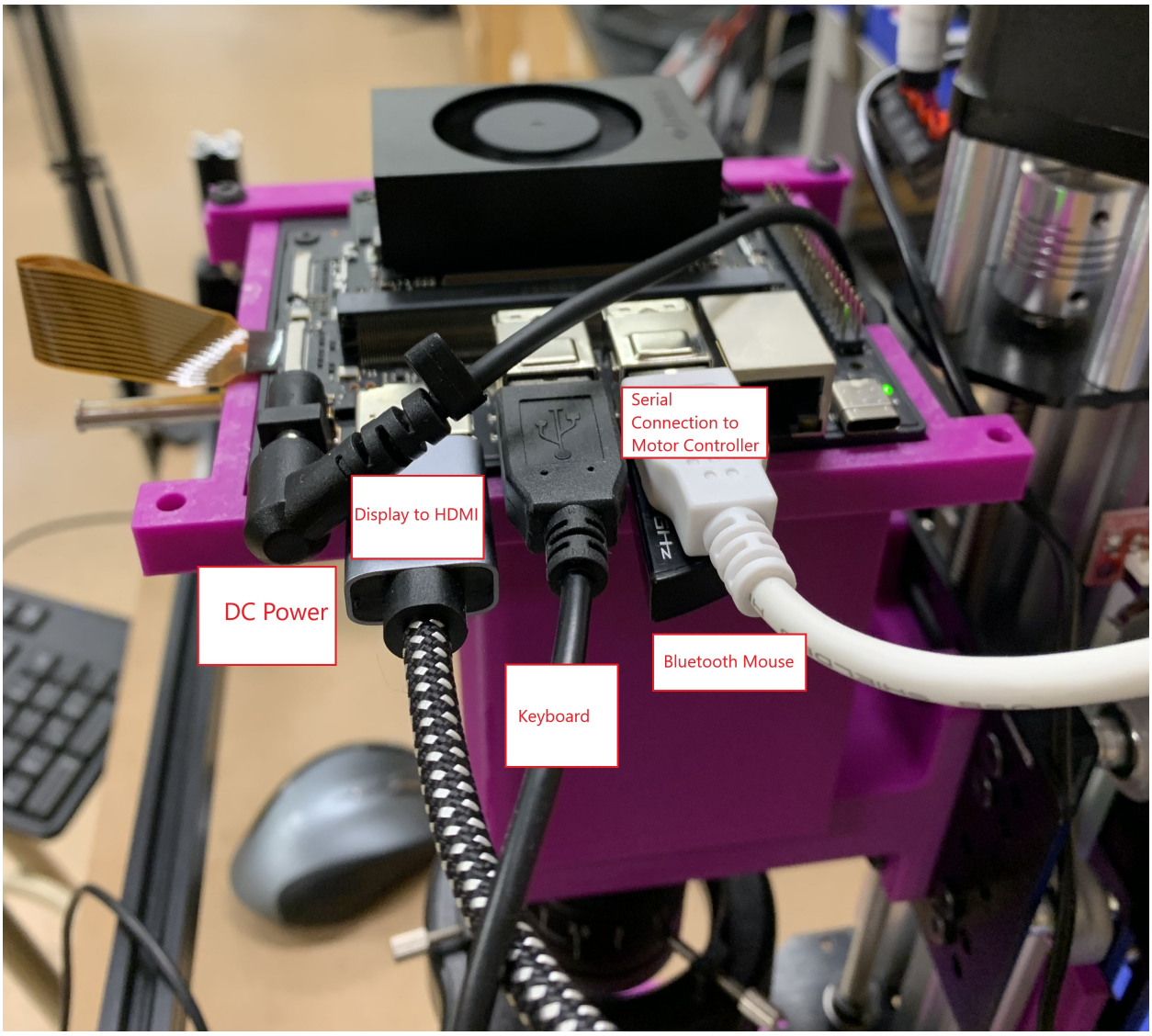

Figure 1: Jetson Orin Nano with all the ports connected.

Figure 2: Blackbox X32 Motor Controller from above.

Figure 3: Blackbox X32 Motor Controller fully connected ports.

Figure 4: Blackbox X32 Motor Controller buttons.

Figure 5: Power supply fully connected.

Figure 6: Cookie with the bubble of the level pointed directly towards the side of the table with one screw.

Figure 7: Cookie with the bubble of the level centered.

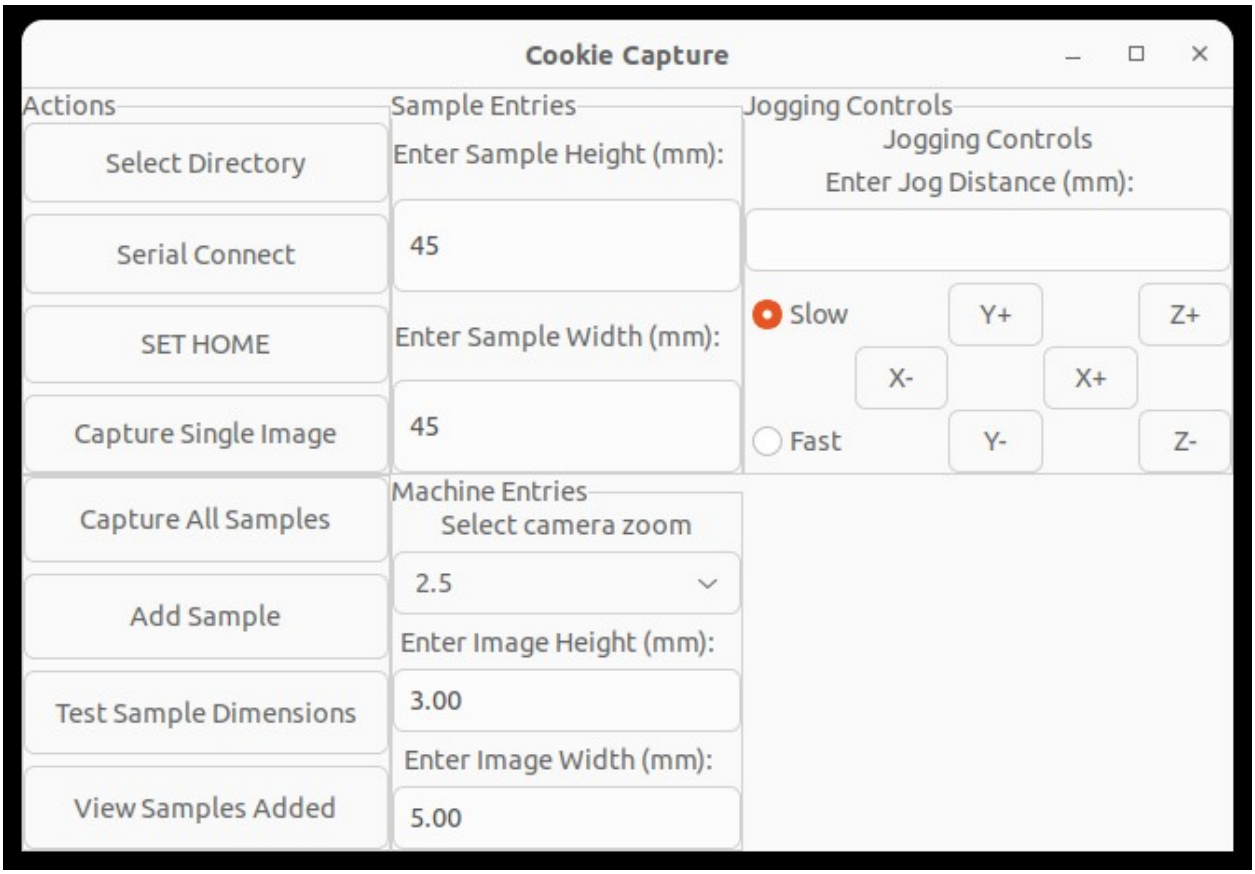

Figure 8: Default GUI appearance after launching.

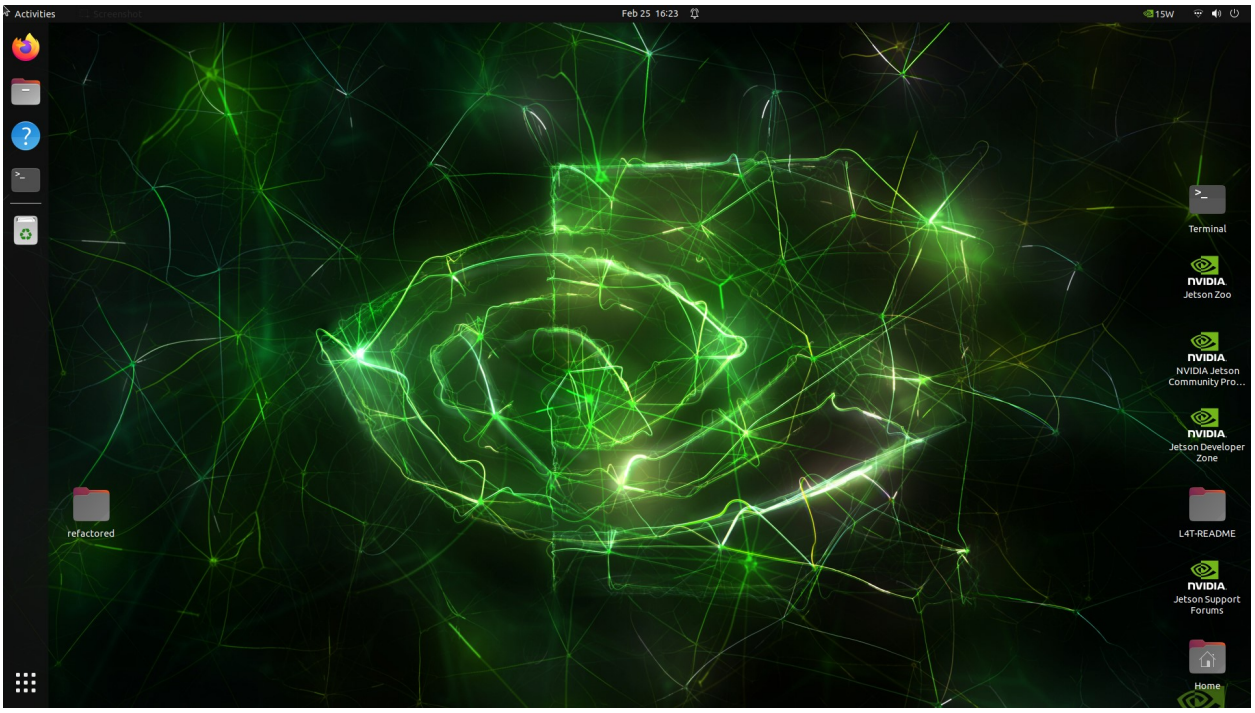

Figure 9: Background after logging into the Jetson.

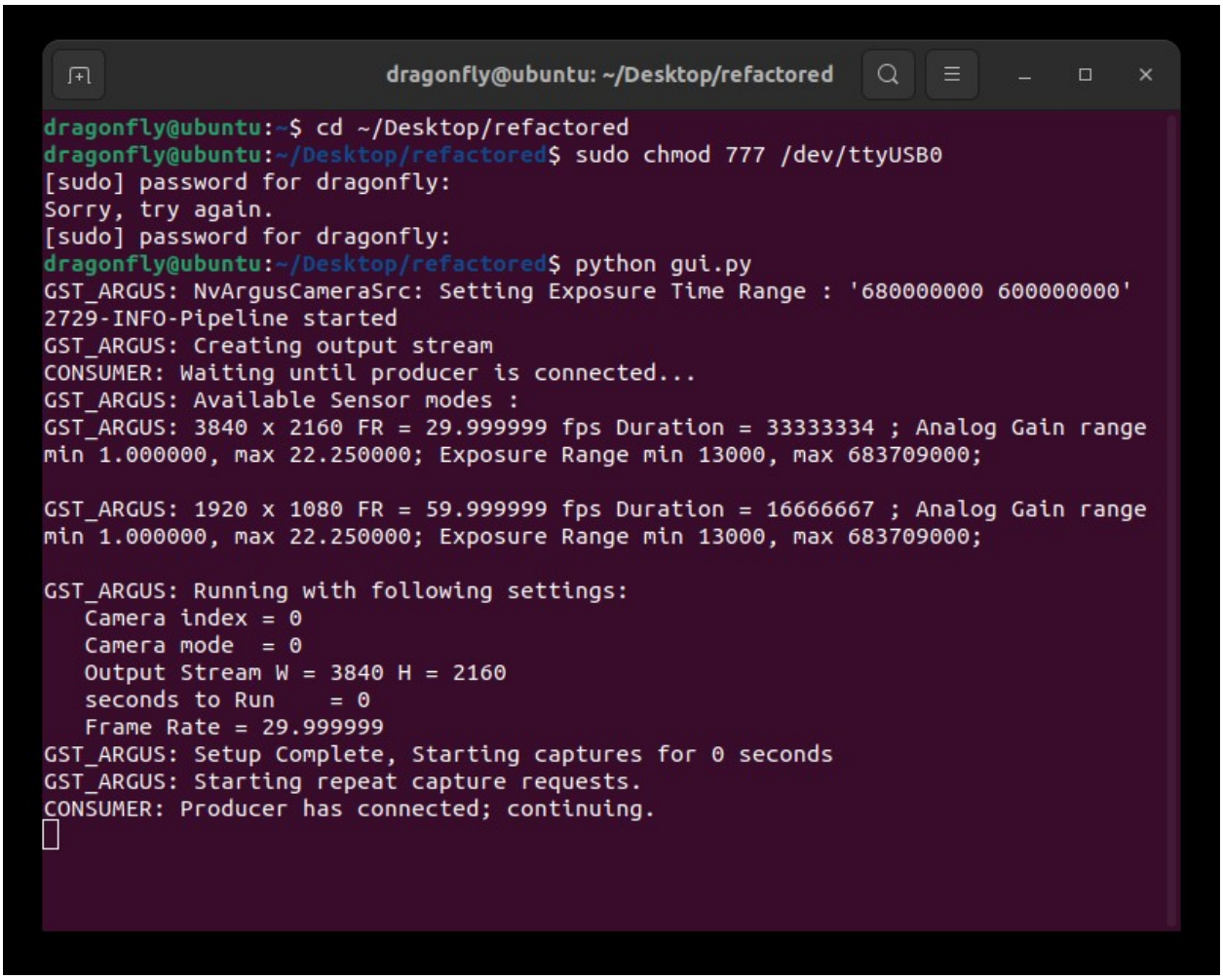

Figure 10: Background after logging into the Jetson.