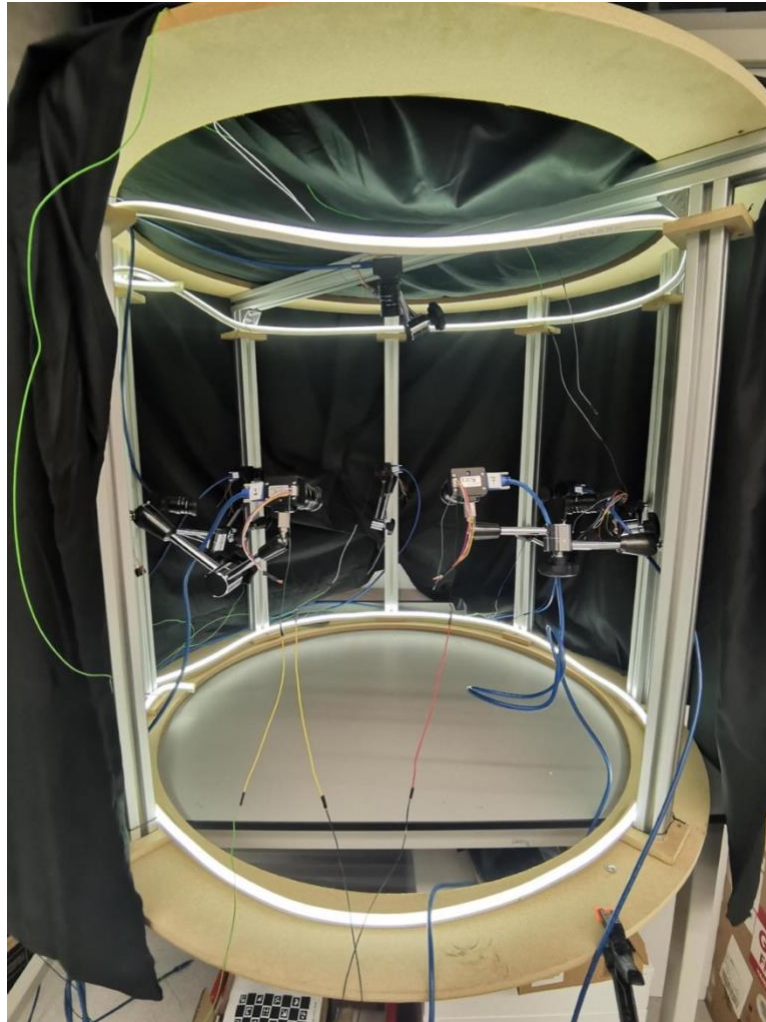# Manual for Markerless Motion Capture Setup

*A markerless motion capture system to record and automatically annotate hand gesture videos.*

Pre-steps:

1. If not using the pre-configured computer with the camera setup, install the following software: SpinView, Jarvis Acquisition Tool, Arduino IDE, and SLEAP.
2. Position the cameras correctly and connect them to the computer with the USB ports. Only need to connect the cameras you are interested in using.
3. Verify that the ground (black) and voltage (green) wires for each camera are properly connected to the breadboard.
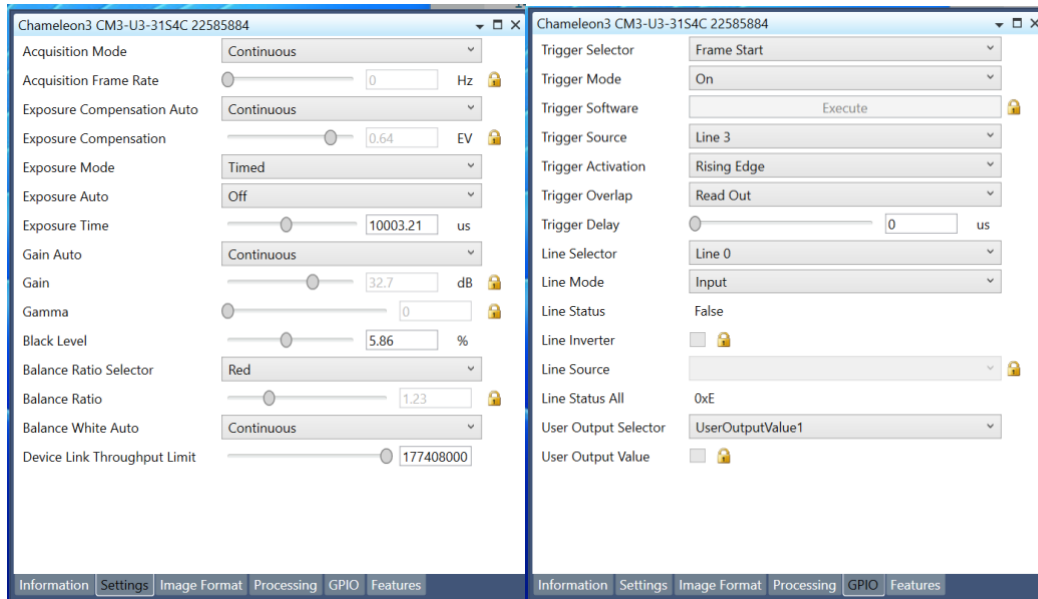
Steps:

1. **Launch SpinView:**
    1. Make sure that all cameras appear on the left-hand side. If any cameras are not visible, connect them to alternative ports in the computer:
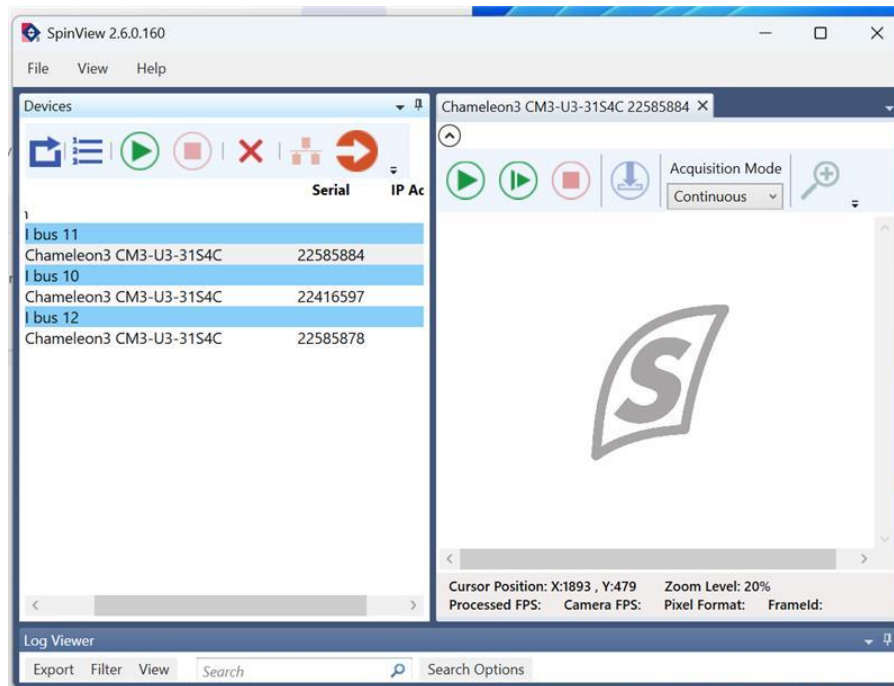
    2. You should have these settings:
        1. Exposure time: ~10ms (*settings window*)
        2. Trigger settings (check everything is like in the image) (*GPIO window*)

3. Do not close these windows

2. Open Arduino to connect the cameras:

Note: The cameras are synchronously triggered by the Arduino. The Arduino code also defines the recording frame rate (default is 50 Hz, ideal for capturing hand movements).

1. Upload the Arduino Code to the board.
2. Initiate triggering by clicking the right arrow.
3. Use the serial monitor: press *b* to start and *s* to stop the cameras.
4. Once triggered, the cameras should appear in SpinView: manually refocus the cameras if needed.
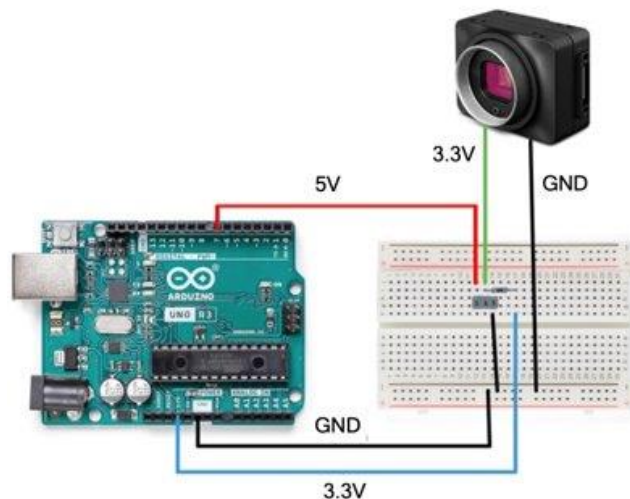

3. Open Acquisition Tool:

1. Go to the camera section (it looks like a family tree) and click on Auto Detect Cameras
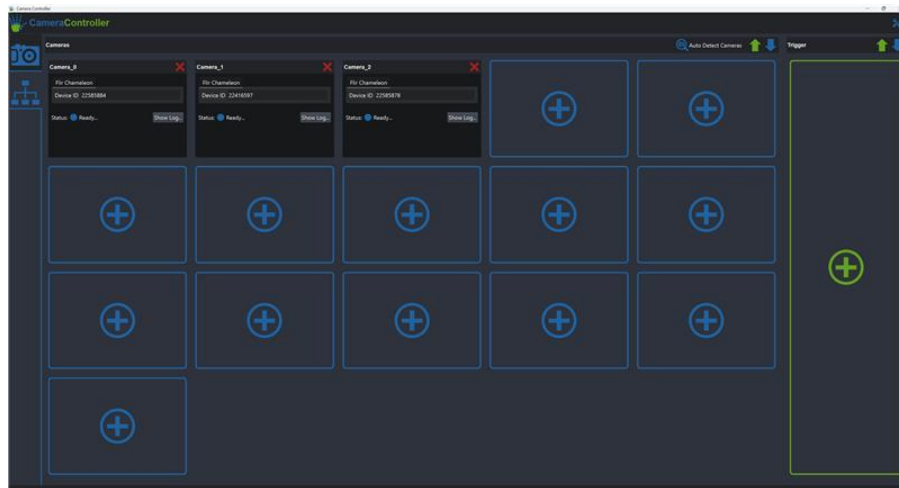
2. On the right there is a section that says Trigger, do not add anything in there
3. Go back to the main camera section and check that all settings that you defined in SpinView are the same (specially the exposure time and triggering)

4. **Start the recordings:**

    1. Make sure that the cameras triggered off in Arduino IDE
    2. Choose the path where you want to save your videos
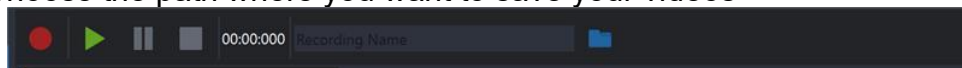
    3. Click on the red dot to record.
    4. Start the trigger of the Arduino.
    5. Do your task.
    6. Stop Arduino trigger.

    7. Click on the square to stop the recordings.
    8. Check if they are synchronized in the metadata.csv file by checking if they have an equal number of frames. You can open this in Excel and do control F and look for each camera. Then each camera should have the same number of cells.

Remember to always record calibration videos using the ChArUco board every time you change the camera's position!

5. **Annotation part:** https://sleap.ai/
Note: You need a good GPU
In this part you will be getting 2D models of the hand for each camera

6. **Combine it with ANIPOSE to do a 3D reconstruction**
 https://github.com/talmolab/sleap-anipose
Note: You do not need a good GPU
Here you will combine the 2D models to create 3D models.

Congrats! Hope it was useful