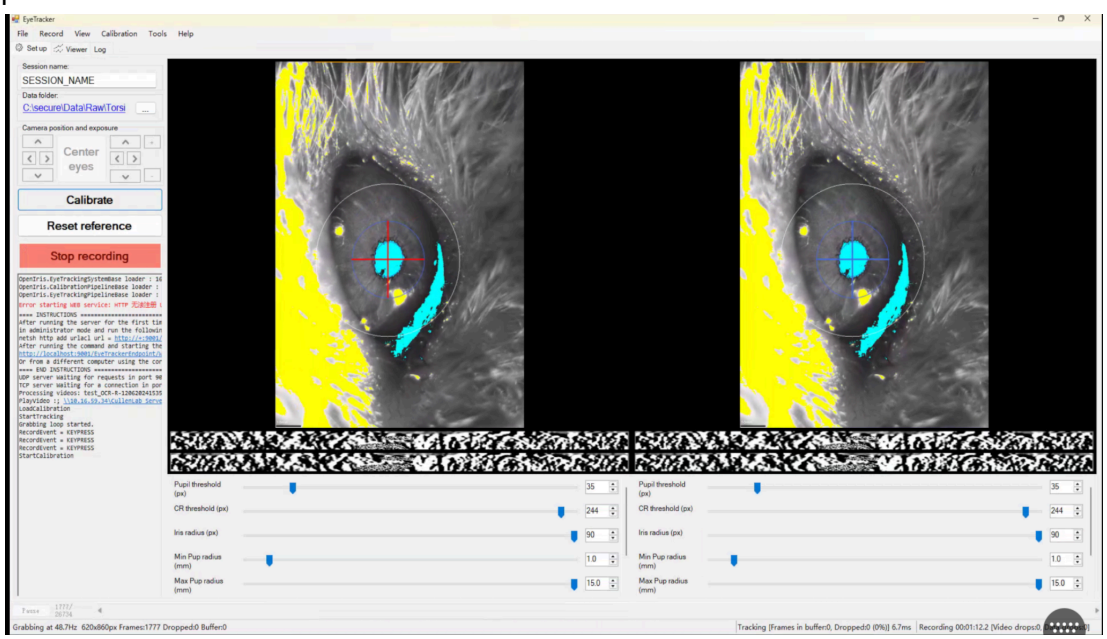
OCR Processing for OpenIris SOP

I. Acquire original data

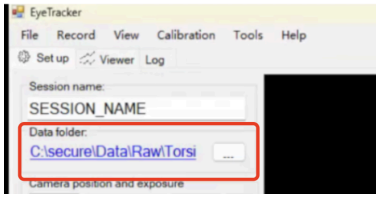
1. **FLIR** – get the original videos.
2. **OpenIris** (Only work on Windows)
   a. Dual WebCam Mode (Calculate the same eye)
   b. Set the parameters of OpenIris before click the **Calibrate button**
      i. Pupil Threshold: Recognize the pupil
      ii. CR (Corneal Reflection) Threshold: Recognize the CR
      iii. Iris Radius: Make sure it is larger than the pupil radius
      iv. Min Pupil Radius (mm)
      v. Max Pupil Radius (mm)
      vi. Min CR Radius (mm)
      vii. Max CR Radius (mm)

   The range of radius should make sure that the pupil and the CR can be recognized but not mistake other features as pupil or CR.

   Once you have started the Calibrate, the **Set up** Tab looks like the following picture. You can also monitor the data at the **Viewer** Tab.

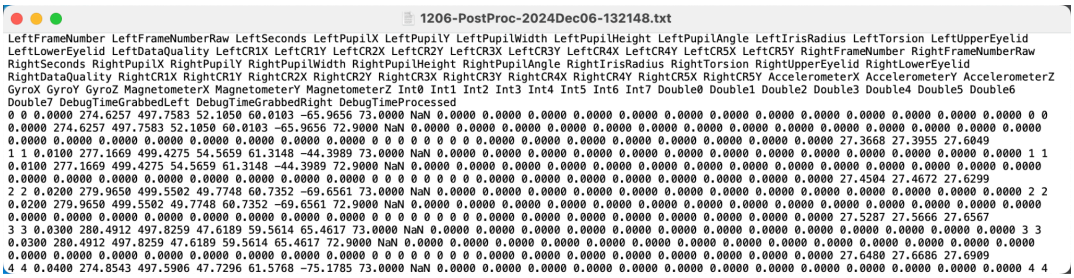


   c. Find the **Data folder** where the data has been saved. The path of the folder is shown on the left column.



d. In the folder, you can see the following files. <u>We only need the ".txt" file in the red box!</u>

If you open this file, you can see all the data generated by OpenIris.



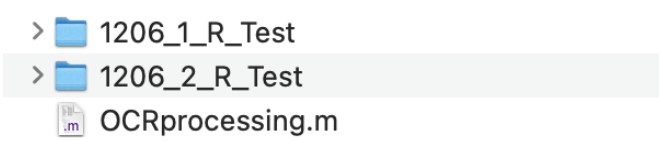
II. OCRprocessingGUI

1. OCRprocessing.m

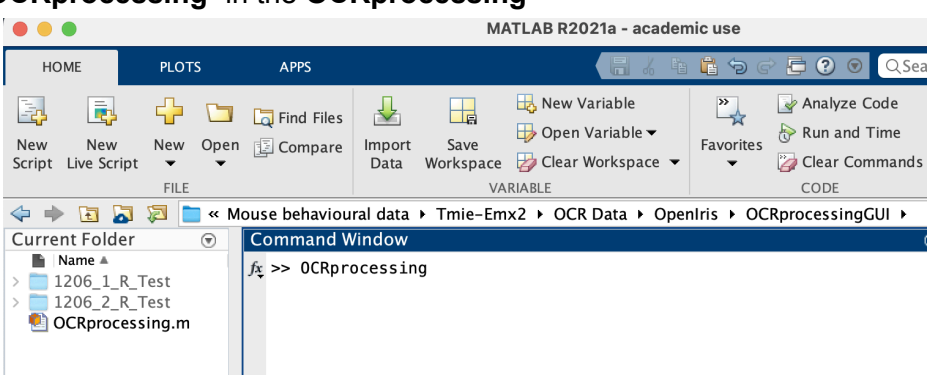
   This is the program that runs **OCRprocessingGUI**, and you can either put the program in the same folder where OpenIris will store the results after processing, or copy it to the path you want.

   E.g.

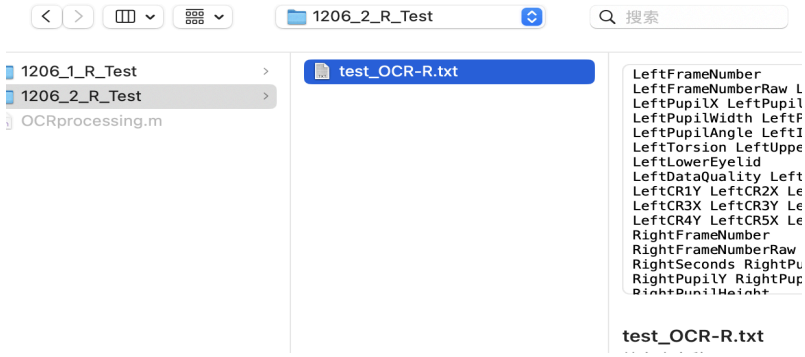
   - ***1206_1_R_Test*** and ***1206_1_R_Test*** are the two folders where OpenIris processes two videos and stores their respective data.
   - You can put the **OCRprocessing.m** in the same path with the result folder.



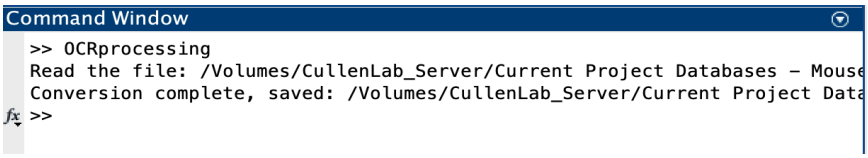
2. Open MATLAB in this folder
3. Input "**OCRprocessing**" in the **OCRprocessing**



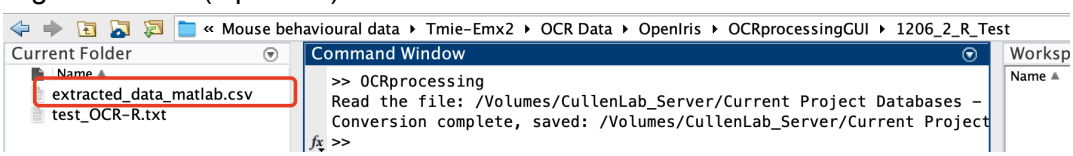
4. GUI Start
   a. Select the **".txt" file** that you are going to process.



b. The GUI reads the .txt file and converts it to a .csv file before starting.
If the read and conversion are normal, the Command Window displays the following with the file path:

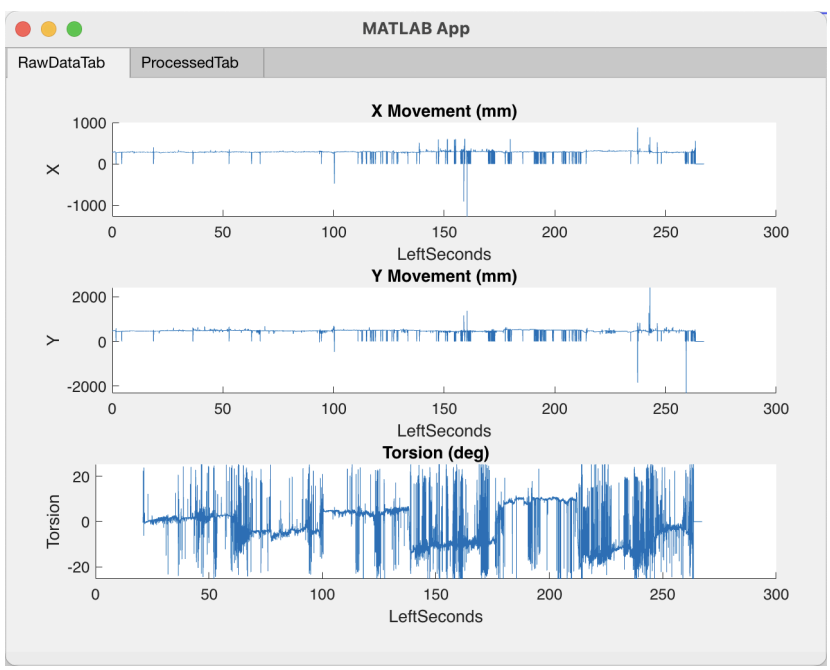


c. Check if there is an ***extracted_data_matlab.csv*** file in the same folder with the original .txt file. (Optional.)



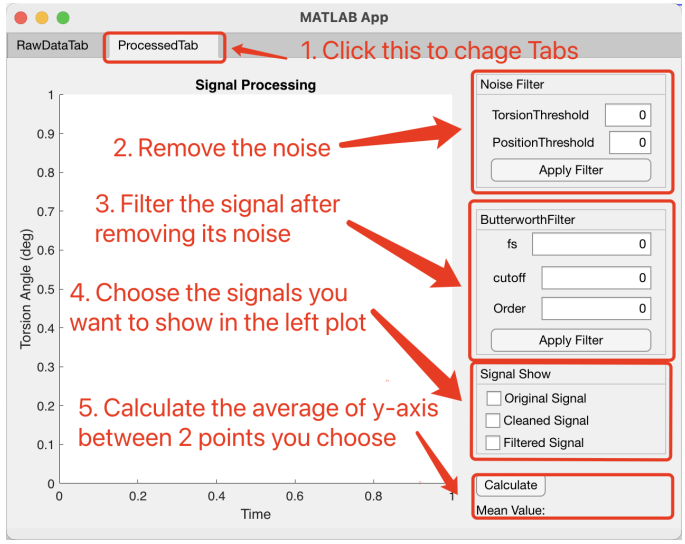
5. RawDataTab

In the GUI Start step we get the extracted data of interest, and then we can view the original signals drawn in the first **RawDataTab** of the GUI. You can zoom in/out to see it clearly



6. Processed Tab

For the ProcessedTab, you should follow the steps below. Missing steps may cause Errors.



a. Noise Filter

Principle:

The noisy frames should be removed. Since we maintained static angles for a long time, removing a few noisy frames did not affect the analysis of the static angles.

By differentiating position and torsion signals, I get eye velocity and angular velocity. And Frames with values over a threshold of velocity are considered as noise (e.g., due to the mouse struggling). Therefore, we have 2 parameters

Parameters:

- Torsion Threshold
- Position Threshold

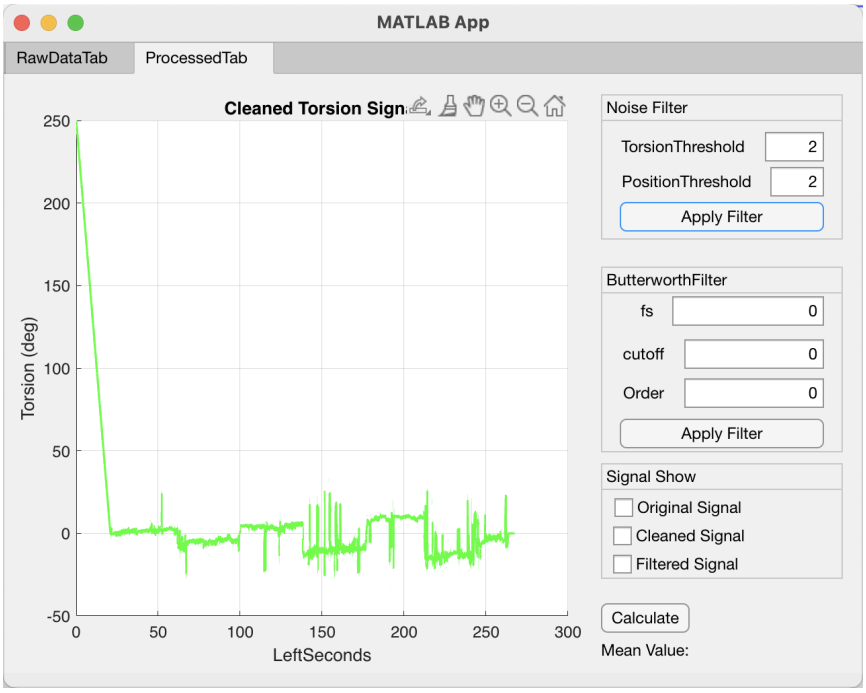
For both parameters, the smaller the value, the more noise points can be removed. We recommended that both parameters be less than 3.

Plot:

Click the **Apply Filter** button. The plot will be shown on the left.

And also the Command Window will print the result of moving noise filter.

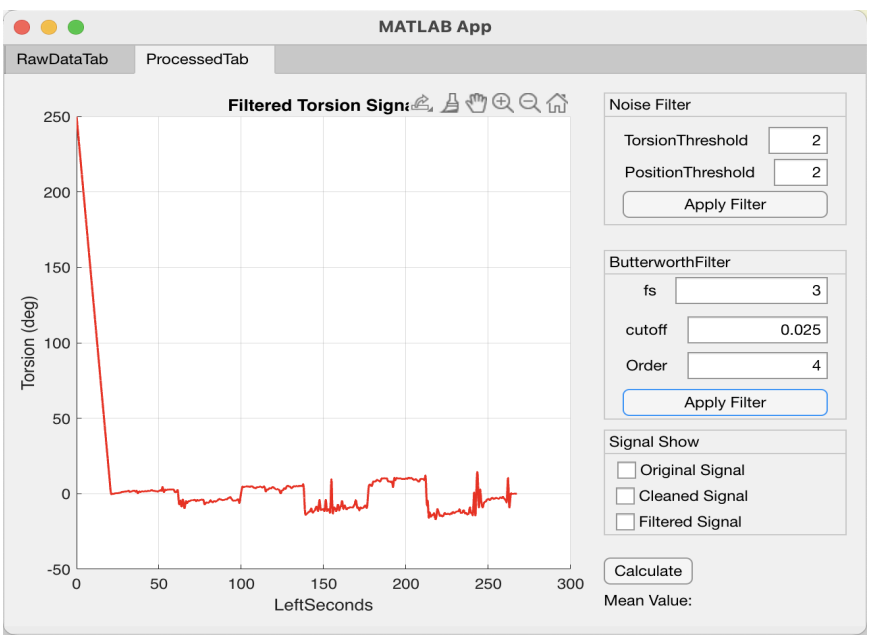
```
>> OCRprocessing
Read the file: /Volumes/CullenLab_Server/Current Project Databases -
Conversion complete, saved: /Volumes/CullenLab_Server/Current Project
Using Torsion Threshold: 2
Using Position Threshold: 2
Cleaned data plotted successfully.
```



b. ButterworthFilter

Design your own butterworth filter.

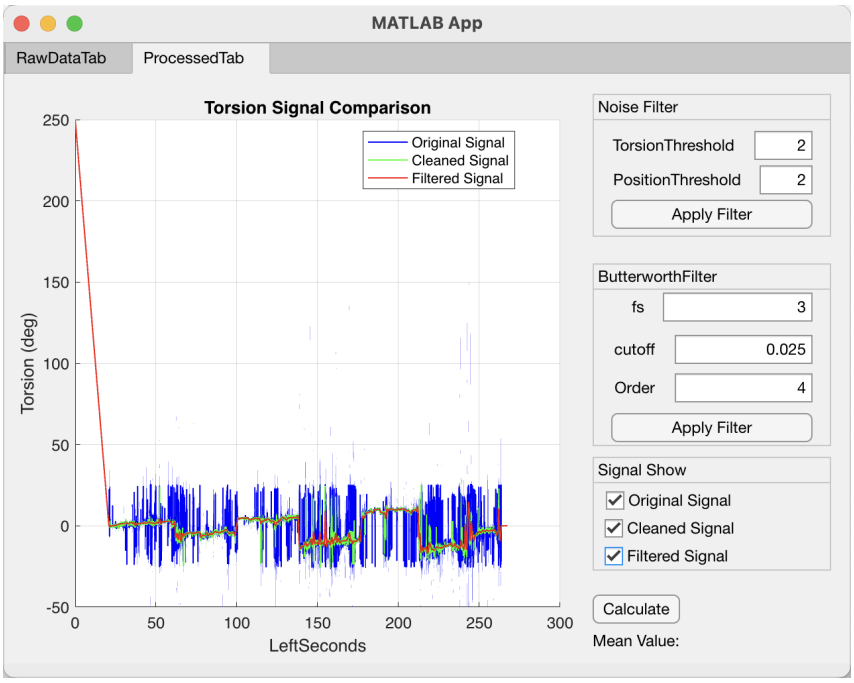
- Fs: recommend 3 ~ 10 Hz
- cutoff: recommend 0.02 ~ 0.1 * fs
- Order: 3 or 4



The result of Butterworth Filter will be shown in the Command Window.

```
>> OCRprocessing
Read the file: /Volumes/CullenLab_Server/Current Project Databases -
Conversion complete, saved: /Volumes/CullenLab_Server/Current Project
Using Torsion Threshold: 2
Using Position Threshold: 2
Cleaned data plotted successfully.
Applying Butterworth Filter with fs=3, cutoff=0.025, order=4
Filtered data plotted successfully.
```

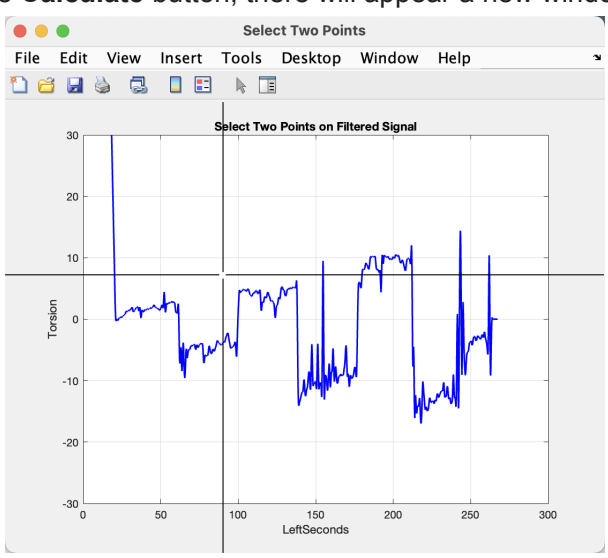
c. Choose the signals you want to see in the left figure!



d. Calculate the average <u>Torsion angle (deg)</u> between 2 points you choose

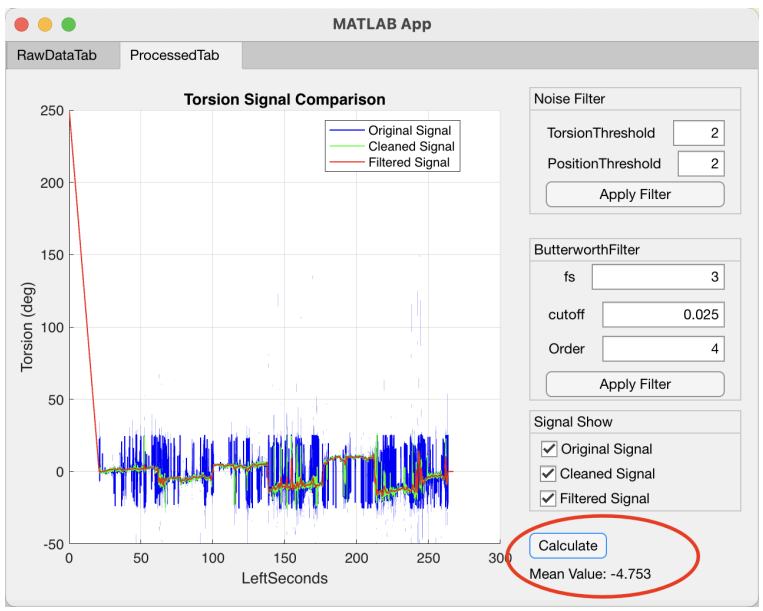
Make sure before this step, you have selected ONE signal in step c.

- Click the **Calculate** button, there will appear a new window



- Select 2 points on the figure. Then the points you choose will be shown as a red circle.

- Then you can find a Mean Value of the signal in this section on the GUI or Command Window.




```
Please click on two points on the new figure.
Mean Value of selected range: -4.753
>>
```

- Close the Choose points window.
- If you want to calculate another section, repeat the steps before.