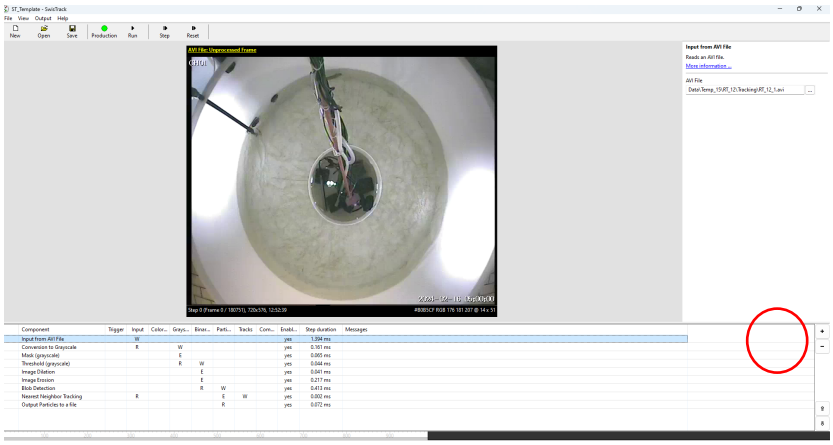
1. **Guide for using Swistrack for the proposed method to obtain the x,y position of the fish continuously.**

This manual was made for teaching students at the Fish Biology course at University of Copenhagen. There is already a specific manual for the SwisTrack software available when downloading the software. This manual is explicitly made for tracking in a setup like the one in this project.

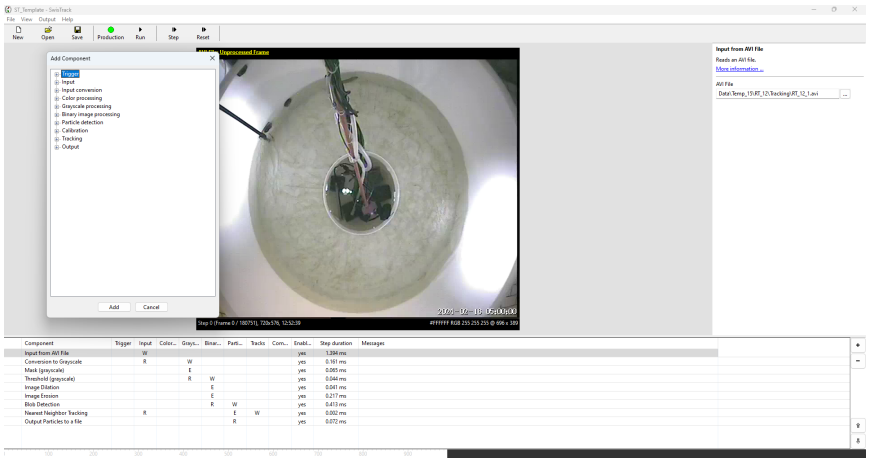
SwisTrack can do both live and prerecorded video tracking. In this particular manual the setup is for prerecorded video tracking. But most of the component setup is the same for both. Explanation to most components can be found on https://en.wikibooks.org/wiki/SwisTrack/Components.

NB: Be aware that you use the latest version of SwisTrack (4.2), kindly made by Thomas Lochmatter in 2023. The new version allow among others the use of HD USB cameras, which the old version couldn't. The new version can be downloaded from this link: www.mbl.ku.dk/JFSteffensen/SwisTrack (JFS Need to update the page! Will do SASP)

1. To add or remove any components press "+" or "-" on the right side of the window (red circle).

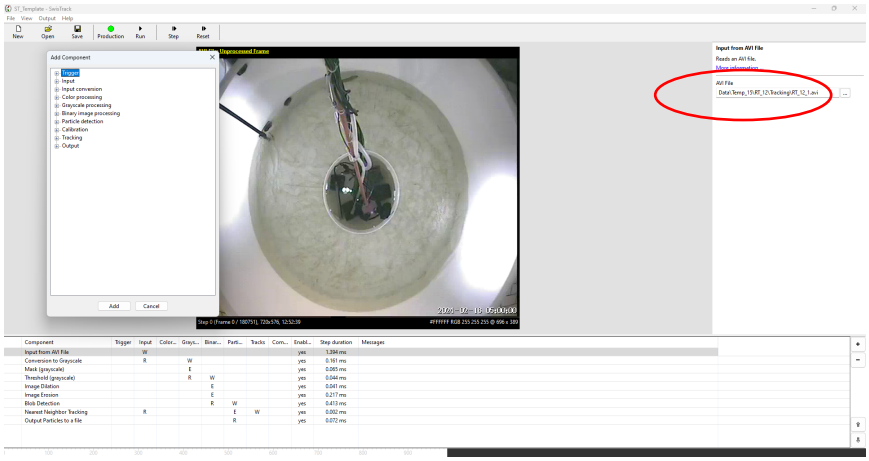


2. When “+” is pressed the “add component” window shows up. Select any component you want to add to the component (command line).



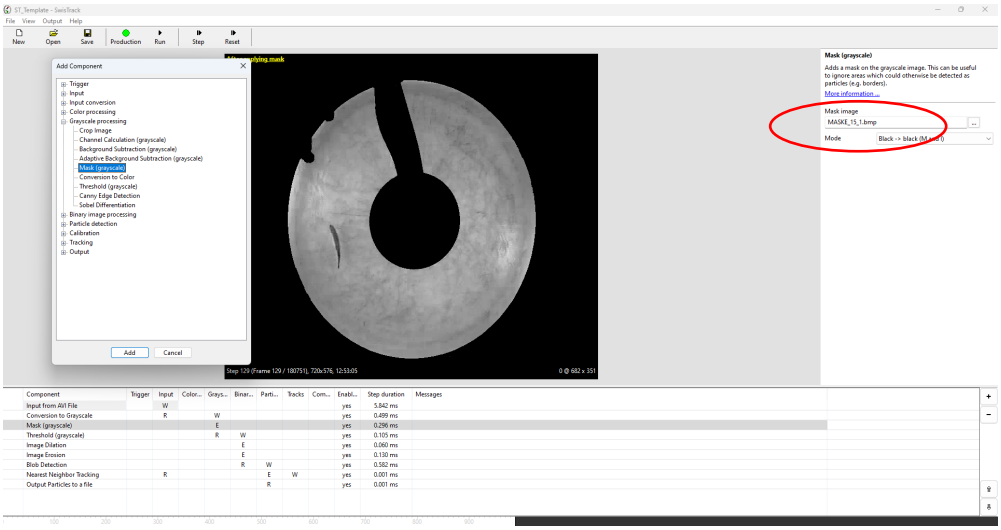
3. Press Input: Select “Input from AVI File” and choose the file or insert the path to the file into the address bar in the right corner of the window (red circle).

   OBS. Sometimes the path is faulty, try swapping or deleting “/” or “\” in the path.



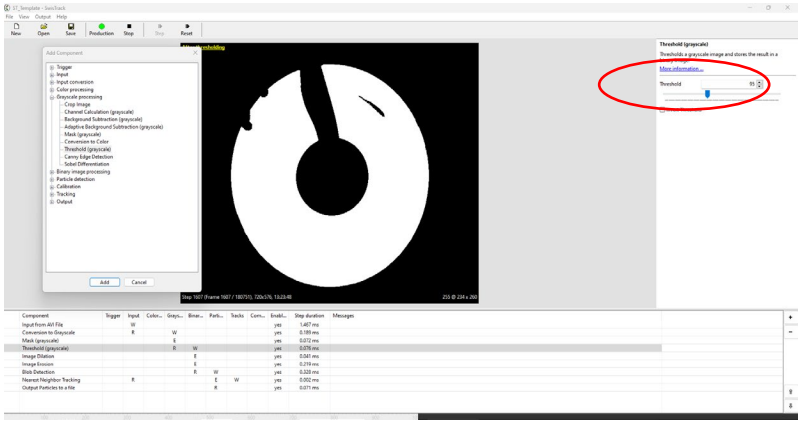
4. Press Input conversion: Select “Conversion to Grayscale”

5. Press Grayscale processing: Select “Mask (grayscale)” and choose the file or insert the path to the file into the address bar in the right corner of the window (red circle). In this case a mask was created with Paint3D. **OBS.** Remember to make mask in same size as video.



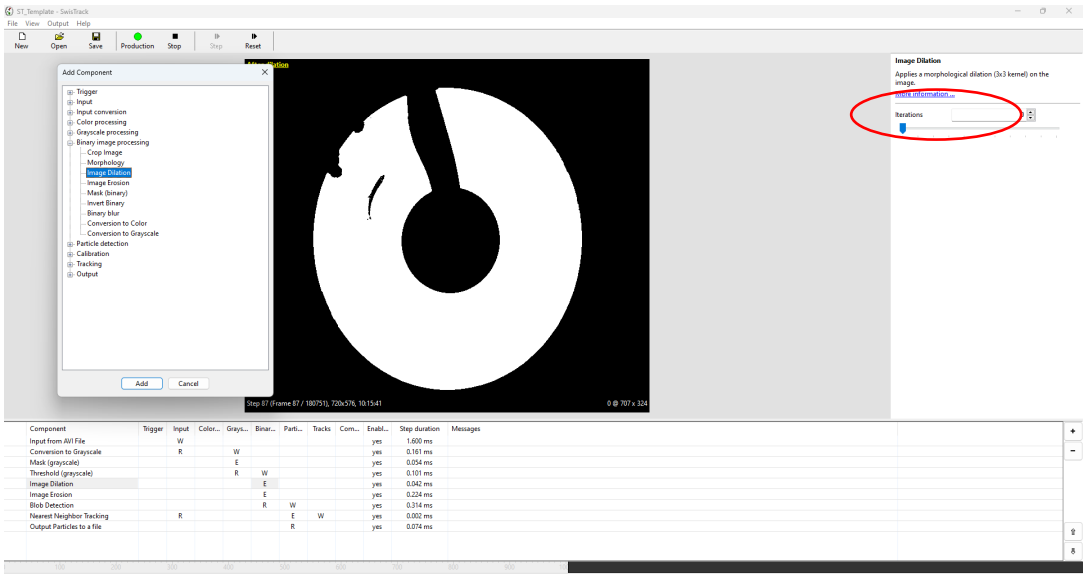
6. Press Grayscale processing: Select “Threshold (grayscale)”.

   - Set the threshold to 100 (red circle). If the background “noise” is to prominent lower threshold

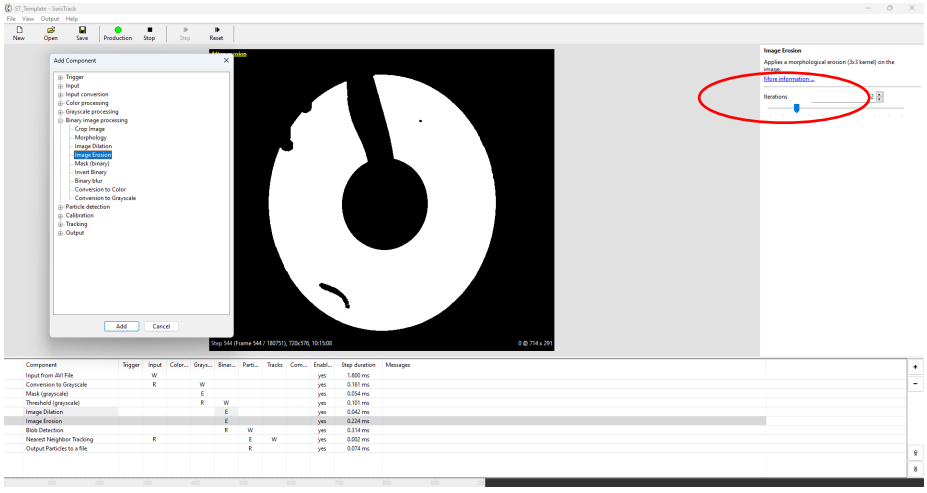


7. Press Binary image processing: Select “Image Dilation”

- Set the iterations to 0 (red circle).



8. Press Binary image processing: Select “Image Erosion”.
   - Set Iterations to 2 (red circle).



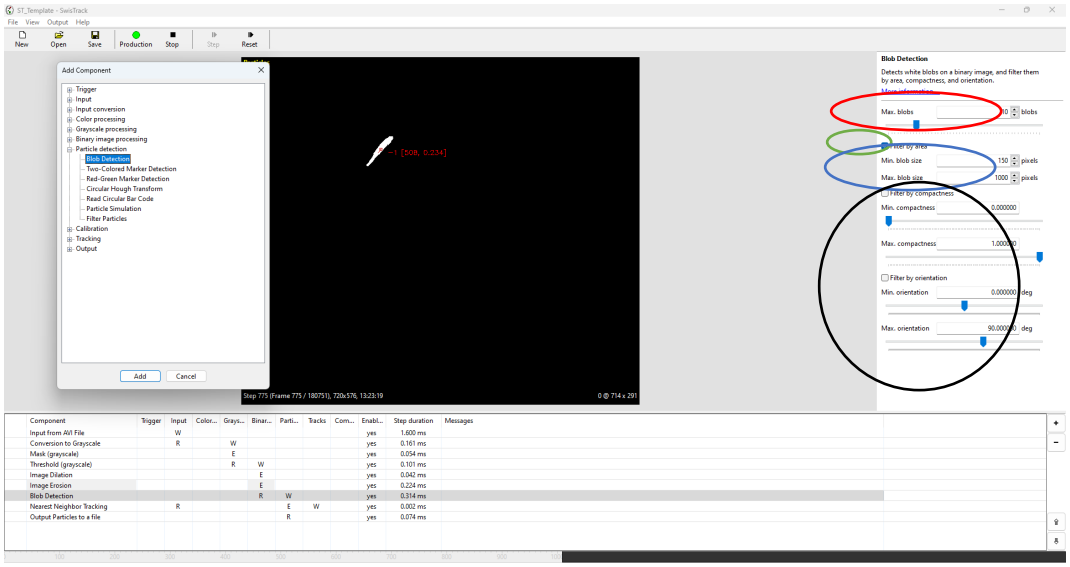
9. Press Particle detection: Select “Blob Detection”.
   - Set “Max blobs” (red circle) to the amount of objects that you want to track. In this case it is set to 10, but only one fish is being tracked. Setting it higher than the

number of individuals is always better for testing if it works, then lowering it after object is identified.

- Check the box “Filter by area” (green circle)

- Set “Min. blob size” and “Max. blob size” (blue circle) to a relatively large span to ensure Swistrack finds the object. Then raise and lower the two until there is none or very little background noise in the tracking and only the object that is being tracked or nothing shows when the tracking is running.

- The other variables in “Blob detection” should just be set to the default (black circle).



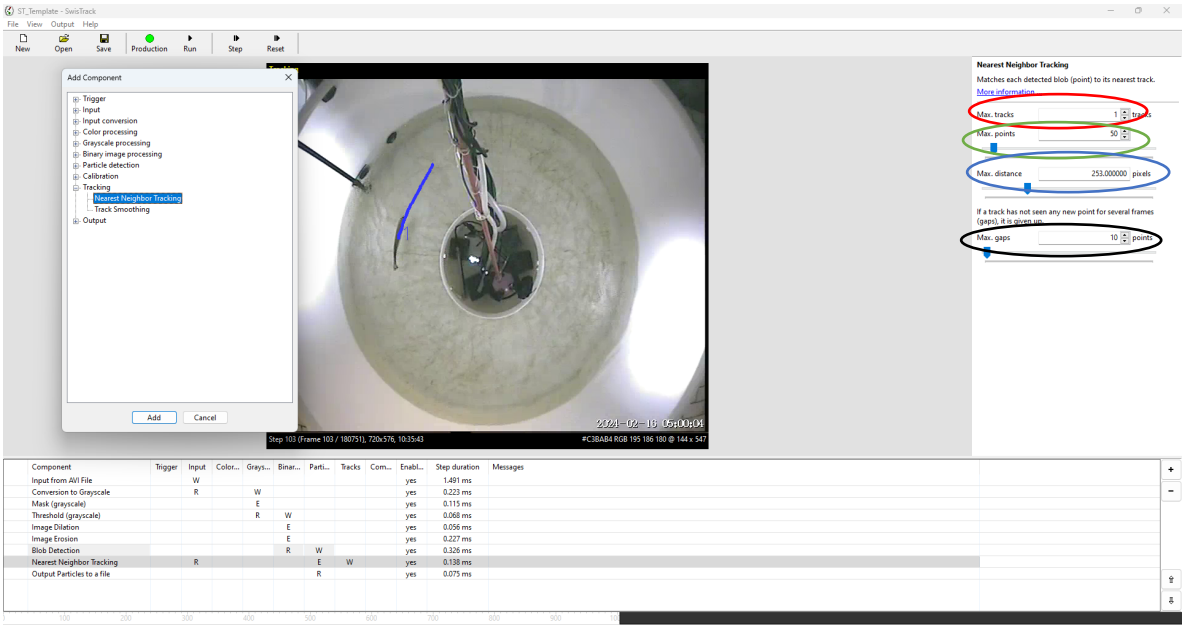
10. Press Tracking: Select “Nearest Neighbor Tracking”.

- Set “Max. tracks” (red circle) to the amount of objects you want to track (preferably the same as “Max. blobs”).

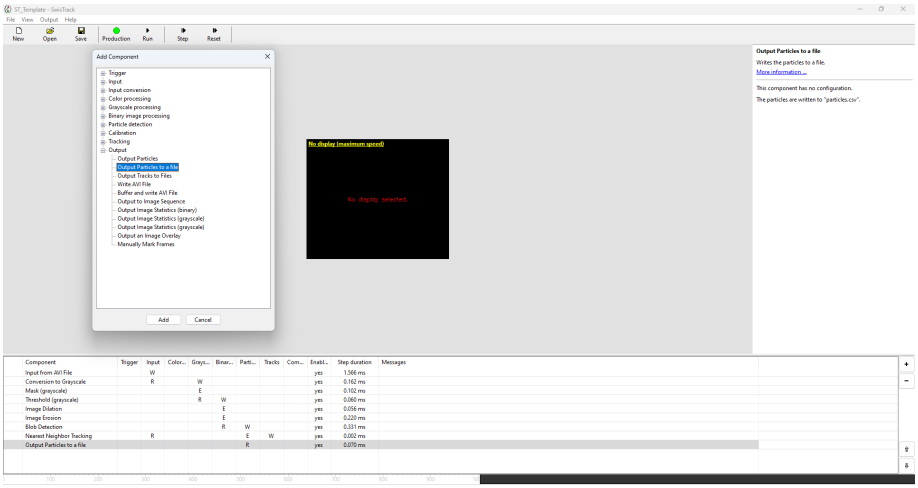
- Set “Max. points” (green circle) according to how/what you are tracking. If you are tracking a position (as in the case of this example) there is no need to set it high. But if you want to showcase a route or the movement of an object then set it high and adjust accordingly.

- Set “Max. Distance” (blue circle) according to “Max. points”. It is the limit for how far a track can become on the video before it detaches from the blob and then makes a new track.

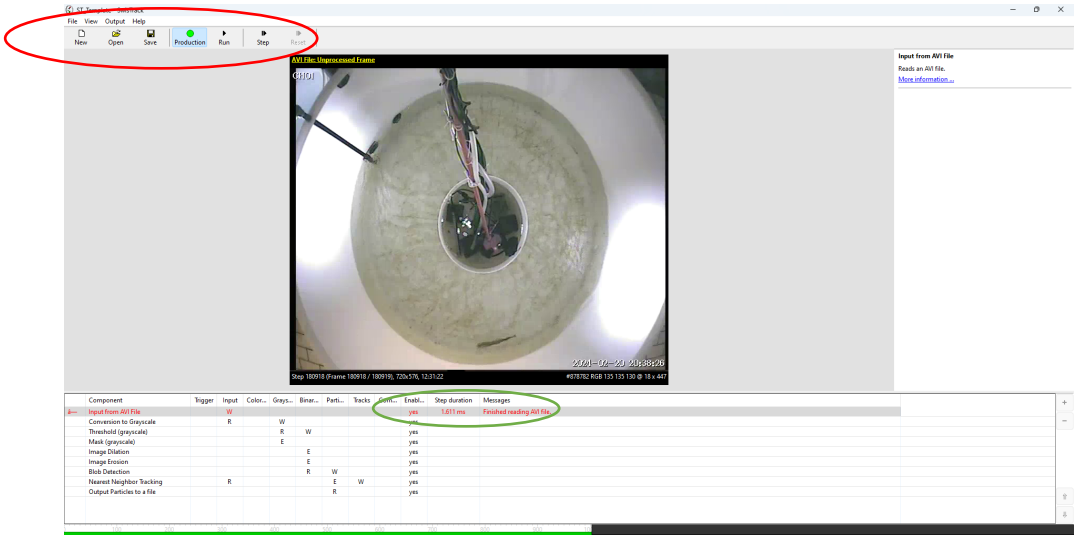
- Set “Max. gaps” (black circle) according to how your “arena” looks. If there are many things that can block the object in the “arena” then the gaps should be set according to the precision level, you are looking for. (In this example it is set for 10, but it could set lower as the only thing that can block the object are the pipes coming down from the top of the frame and it is really not the track that is important in this case, but the position).



11. Press Output: Select “Output Particle to a file”
    - This outputs the tracking data to a csv file called “particles.csv”, which should be found in the same directory as the configurations file that is opened in SwisTrack. To change directory, save the configurations in desired directory, reload SwisTrack and open the configurations from the folder where it was saved.



12. To start a tracking sequence, follow these steps:
    1. Press “Reset” on the command bar (red circle) on the top.
    2. Press “Production” on the command bar (red circle) on the top. It should then appear to be “on”.
    3. Press “Run” on the command bar (red circle) on the top.
    4. Wait for SwisTrack to process all the frames.
    5. When a message (green circle) appears on the component “Input from AVI File” saying “Finished reading AVI file”. Press Production so it appears “off” and then go to the directory to get “particles.csv”.



13. If the same “arena” is used for many experiments. Just reload the data and change the path in the “Input from AVI File” component. Then redo all the steps from **12**.

14. Remember all raw data is in pixels. To get it into cm or whatever you need. If possible, measure the full width of the frame or put a static object in the frame, that you know the length of. Then it should be straight forward to count the pixels to find how many pixels are in a cm.