

ASMIT

User Guide

ASMIT 1.0

<https://github.com/lacan/ASMIT>

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Installation

Dependencies

As you complete the installation steps below, make sure that the following update sites are enabled as well:

- **IBMP-CNRS** Contains the ActionBar Plugin by Jérôme Mutterer
- **PTBIOP** Contains the BIOPLib and attached plugins used for managing ASMIT's settings and other internals
- **Imagescience** Contains the FeatureJ Laplacian Plugin used by ASMIT ## Use

Using Fiji Update Sites

The simplest way to install ASMIT is to use the ASMIT Update site through Fiji:

1. From Fiji, go to **Help > Update...**
2. Select **Manage Update Sites**
3. Click on **Add Update Site**, this will create a new line on the table
4. Change the Name to "**ASMIT**", for clarity's sake
5. In the URL column, enter or paste **http://biop.epfl.ch/ASMIT/**
6. Click on **Close**
7. Finally click on **Apply Changes** and **restart Fiji**
8. After these steps, you should find **ASMIT** under **Plugins > ActionBar**

Manual Installation

We do not recommend manual installation as ASMIT depends on multiple packages that would become difficult to manage outside of the Fiji Update Site solution.

Sample Dataset

To test ASMIT, you can download a sample dataset from ZENODO with the following DOI:

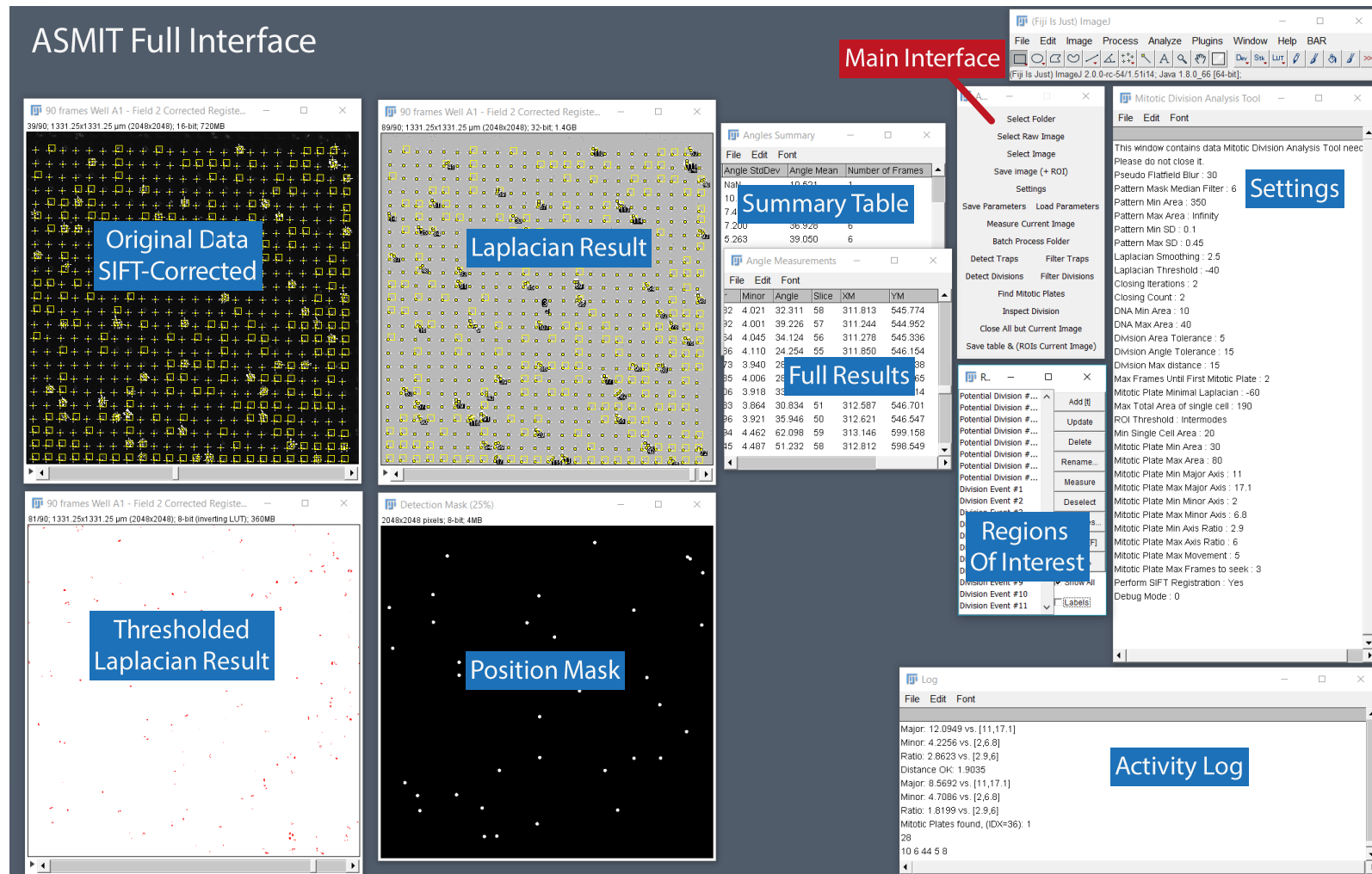
<https://doi.org/10.5281/zenodo.232218>

Interface

ActionBar User Interface

AS...	
Select Folder	Image Handling
Select Raw Image	
Select Image	
Save Image (+ ROI)	
Settings	Access all ASMIT Settings
Save Parameters Load Parameters	
Measure Current Image	Full Analysis on Current Image
Batch Process Folder	
Detect Traps Filter Traps	Run Each Step Individually (Useful for initial parameter setting)
Detect Divisions Filter Divisions	
Find Mitotic Plates	
Inspect Division	Inspects Currently Selected ROI
Close All but Current Image	Convenience Shortcuts
Save table & (ROIs Current Image)	

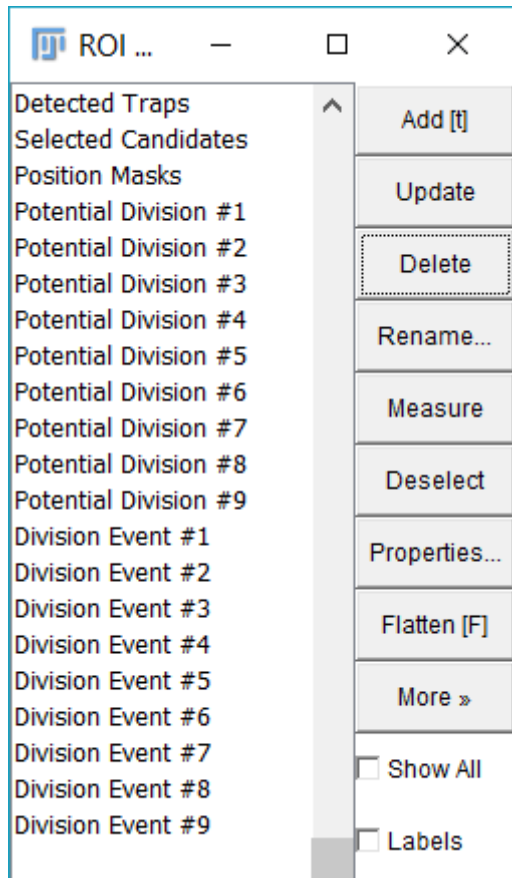
Full Interface when running



When ASMIT is running, several Windows work together as shown above.

- **Original Data** contains the loaded image timelapse
- **Laplacian Result** is a 2D laplacian of Gaussian timelapse used throughout ASMIT
- **Thresholded Laplacian Result** contains the binarized Laplacian Image used for extracting shape features
- **Position Mask** helps ASMIT check if a division event was already detected at a certain location, to avoid duplicate detections
- **Full Results** contains all the data on the detections, and a summarized version (**Summary Table** is also available)
- **Regions Of Interest** is the ROI Manager of ImageJ with all detections named
- **Settings** contains a list of all the variables used by ASMIT
- **Activity Log** helps the user follow the progress of ASMIT

Regions of Interest Manager



Through processing, the ROI Manager will contain 5 Types or ROIs

- **Detected Traps:** a series of points that should match the bottom left of the patterns
 - **Parameters used:** Pattern Mask Median Filter, Pattern Min Area, Pattern Max Area
- **Selected Candidates:** a series of points that represent the patterns kept after Standard Deviation Filtering
 - **Parameters used:** Pattern Min SD, Pattern Max SD
- **Position Masks:** an area ROI showing where the divisions will be searched for within the stack.
- **Potential Division #X:** Each ROI consists of two points that indicate the objects that were interpreted by ASMIT as being anaphase figures. You can visit them by clicking on the **Inspect Division** Button.
 - **Parameters used:** DNA Min Area, DNA Max Area, Division Area Tolerance, Division Angle Tolerance, Division Max Distance, ROI threshold, Max Total Area of Single Cell, Min Single Cell Area.
- **Division Event #X:** Is a point ROI whowing the stack position of a division event where a metaphase plate was found and backtracked. You can visit each one by seleting the desired ROI and clicking on the **Inspect Division** Button.

- **Parameters used:** Max Frame until first mitotic plate, Mitotic Plate Minimal Laplacian, Mitotic Plate Min Area, Mitotic Plate Max Area, Mitotic Plate Min Major Axis, Mitotic Plate Max Major Axis, Mitotic Plate Min Minor Axis, Mitotic Place Max Minor Axis, Mitotic Plate Min Axis Ratio, Mitotic Plate Max Axis Ratio, Mitotic Plate Max Movement, Mitotic Plate Max Frames to seek

Parameter Optimization

As the interface provides a way to perform each step individually, you can optimize these parameter sets independently for each step. Refer to the section above to see which parameters are used in which step.

In order to find the values that would best match the data, such as Min/Max Areas of mitotic plates, the simplest approach is as follows

1. Locate mitotic plates manually within the Thresholded Laplacian Result image
2. Use the ImageJ Magic Wand tool to select a mitotic plate
3. Hit “M” which will measure the current selection and give you the values associated with that mitotic plate
4. Repeat for multiple observations and at different timepoints and you will have a table where you can infer the min and max values to use.

This works for most parameters.

Example Use

To run our example dataset, proceed as follows:

1. Download the default parameters (ASMIT Default Settings.txt)for this dataset from <https://github.com/lacan/ASMIT>
2. Download the sample dataset from <https://doi.org/10.5281/zenodo.232218>
3. Extract the dataset ZIP file
4. Launch ASMIT from Plugins > ActionBar > ASMIT 1.0
5. Click on **“Load Parameters”** and use the downloaded txt file
6. Click on **“Select Raw Image”**
You will be prompted to provide the location of the extracted folder
7. It will offer you two fields, open whichever one you would like to process
8. Click on **“Measure Current Image”**
9. The results table are located EXACTLY behind an empty results table. Make sure that you move it to find them.
10. You can inspect the detected divisions by highlighting the one you would like to see from the ROI Manager and clicking on **“Inspect Division”**

Bugs, problems

Feel free to report all bugs and questions on ASMIT's GitHub Page

<https://github.com/lacan/ASMIT/issues>