Instructions for triangulation and piecewise affine transformation (TPAT)

The source code is available at https://github.com/SuFeng-SF/Triangulation-and-piecewise-affine-transformation

TPAT was developed and tested on MATLAB R2019b using an Nvidia GeForce GTX 1080 Ti GPU with 11 GB memory.

1 TPAT toolbox

1.1 File description

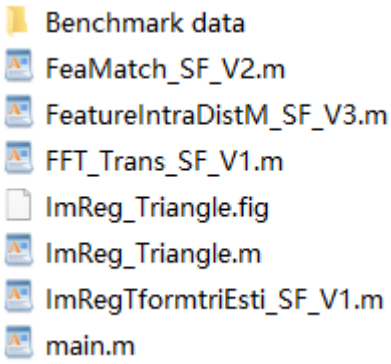

Fig. 1 Folders or files in TPAT toolbox

Table 1 Description for Folders or files in TPAT toolbox

Folder or file	Description
Benchmark data	Benchmark test dataset
FeaMatch_SF_V2.m	Function of feature matching
FeatureIntraDistM_SF_V3.m	Function of calculating distance between features
FFT_Trans_SF_V1.m	Function of 2D FFT
ImReg_Triangle.fig	GUIDE file

ImReg_Triangle.m	GUIDE file
ImRegTformtriEsti_SF_V1.m	Function of estimating transformation matrix
main.m	**Main function to implement TPAT toolbox**

1.2 Run

Run the file “main.m” to implement TPAT toolbox.

2 Graphical User Interface

2.1 Overview of TPAT toolbox

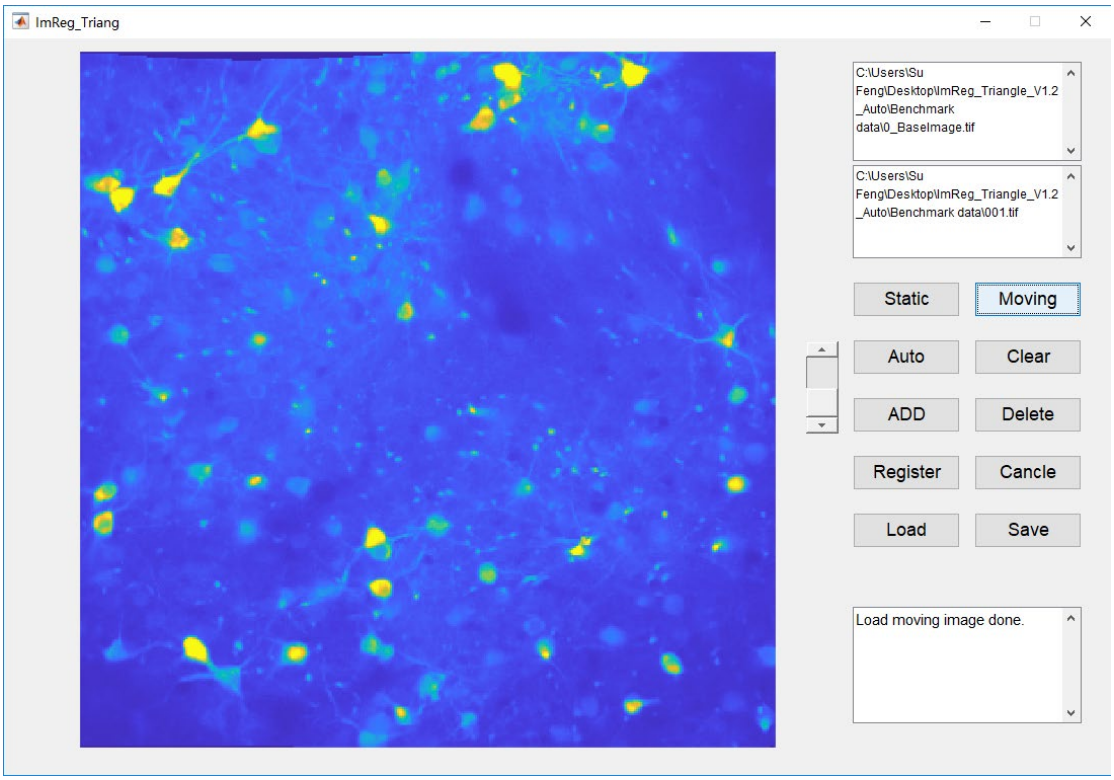

Fig. 2 Illustration of GUI

2.2 Function of buttons

Table 2 Function of buttons

Button	Description
Static	Import the reference image.

Moving	Import the deformed target image.
Auto	Calculate the pairing features automatically
Clear	Clear all the pairing features.
ADD	Add feature point pair manually.
Delete	Delete feature point pair manually.
Register	Register the two image using the chosen features.
Cancel	Cancel the image registration.
Load	Load the registered results (*.mat file).
Save	Save the registered results as *.mat file.
Slider	Drag the slider to switch the images.

3 Results

Reference image: 0_BaseImage.tif; target image: 001.tif.

3.1 Auto-TPAT

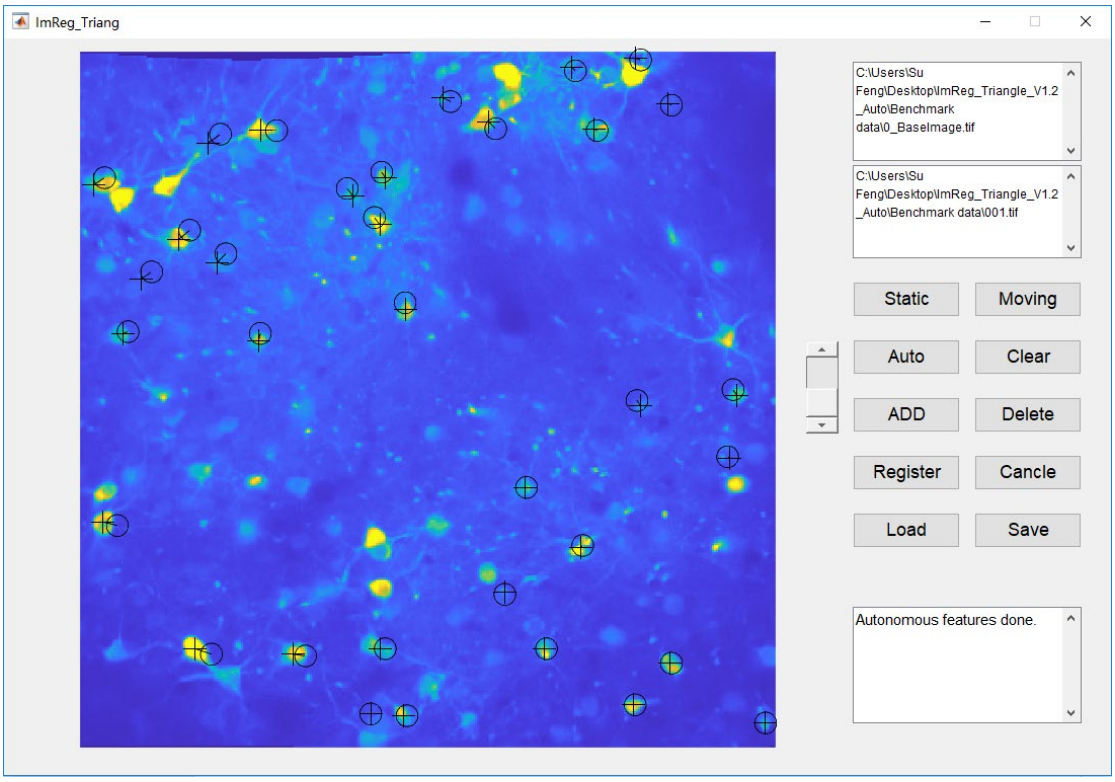

Fig. 3 Automatically recognized pairing feature points

3.2 Semi-auto-TPAT

On the basis of automatically recognized pairing feature points, delete the

incorrect pairing feature points or add new pairing feature points manually.

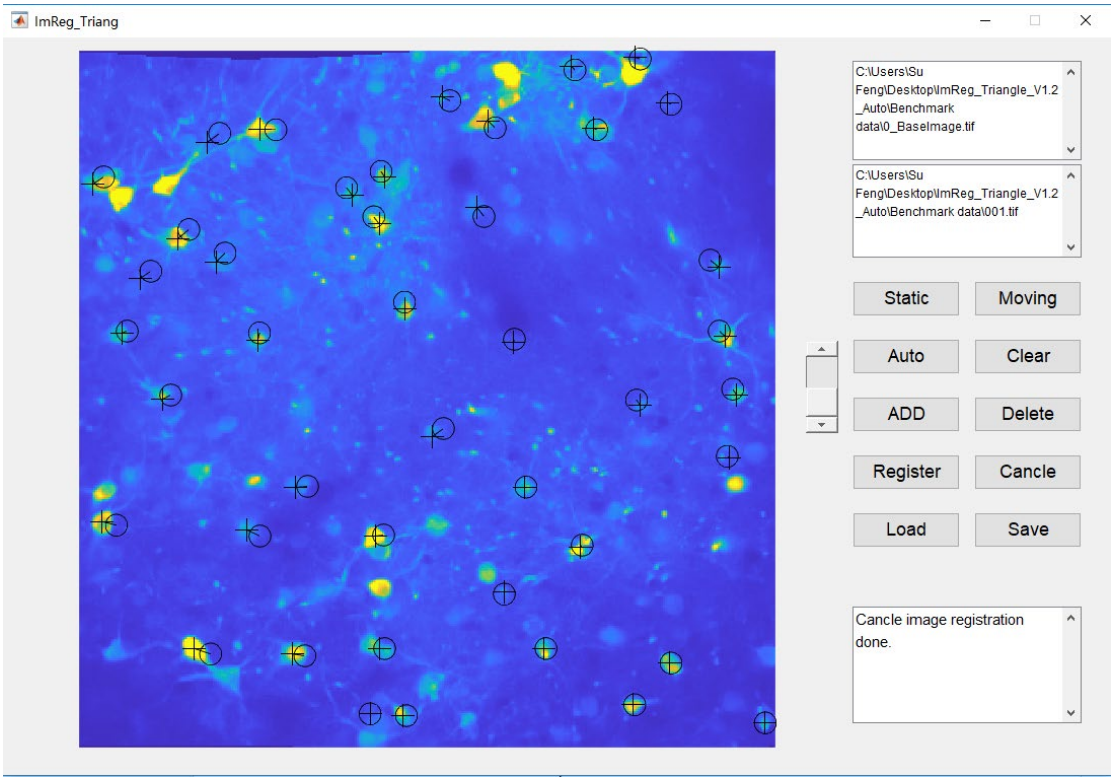

Fig. 4 Semi-automatically recognized pairing feature points

3.3 Registration results

Registration results was saved in the file of "001_RegtriEsti.mat".

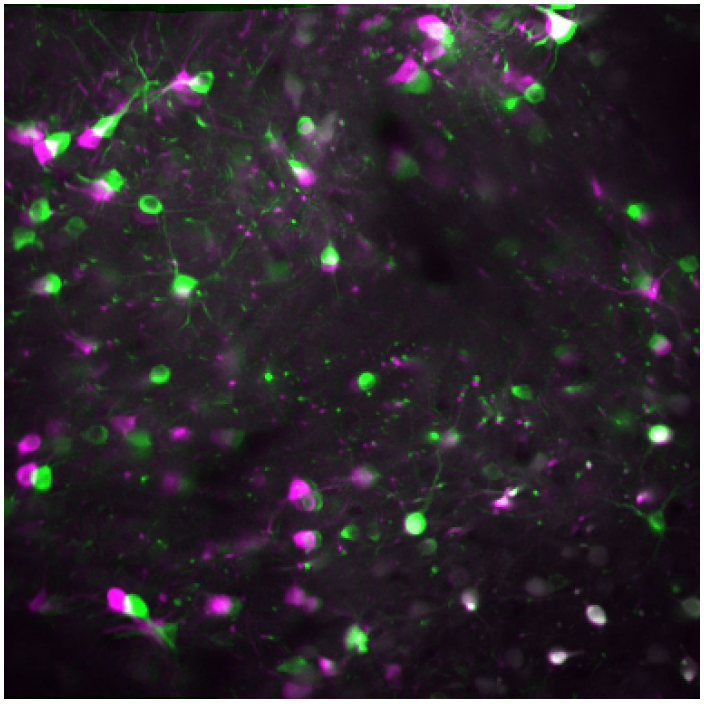

Fig. 5 False-color fusion plot of two images before registration

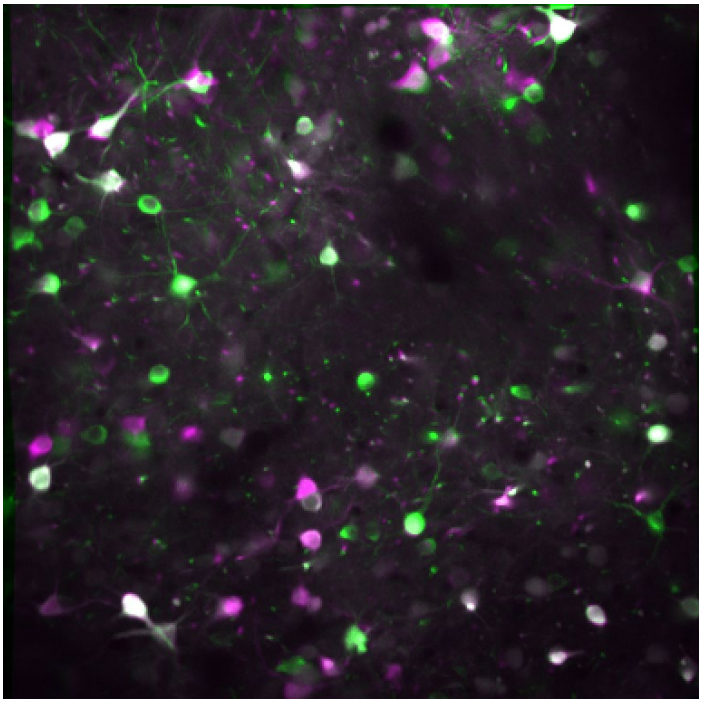

Fig. 6 False-color fusion plot of two images after registration