

time: 10 secs

The image shows the MATLAB R2016b interface. The top menu bar includes HOME, PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The Editor window displays the file `C:\code\Trac_MSM_Code\code\Traction.m`. A red box highlights the line `File = OpenFiles(Settings);` in the script. The Command Window shows a warning about function names conflicting with MATLAB builtins and the command `>> Traction`. A file selection dialog titled "Open first fluorescence image" is open, showing the directory `C:\code\Trac_MSM_Code\data` with files `bead1.tif`, `bead2.tif`, `phase1.tif`, `phase2.tif`, and `trypsin1.tif`. The file `bead1.tif` is selected.

Current Folder: `C:\code\Trac_MSM_Code\code`

Editor - `C:\code\Trac_MSM_Code\code\Traction.m`

```
43 %%
44
45 %Open all image files
46 File = OpenFiles(Settings);
47
48 %% Crop images
49
50 ROI(1).i1=150;
51 ROI(1).i2=1749;
52 ROI(1).j1=300;
53 ROI(1).j2=1899; %j is image width
54
55 %File = cell_cropper(Settings,File);
56
57 %%
58 %Compute Gel Displacement
59
60
61 Settings.resolution = 32; % Size
```

Command Window

New to MATLAB? See resources for [Getting Started](#).

Warning: Function `abs` has the same name as a MATLAB builtin. We suggest you rename the function to avoid a potential name conflict.

Warning: Function `plot` has the same name as a MATLAB builtin. We suggest you rename the function to avoid a potential name conflict.

>> Traction

Step : 9.1.3 time: 10 secs

The image shows the MATLAB R2016b interface. The top menu bar includes HOME, PLOTS, APPS, EDITOR, PUBLISH, and VIEW. The toolbar contains icons for New, Open, Save, Find Files, Compare, Go To, Find, Insert, Comment, Indent, Breakpoints, Run, Run and Advance, Run Section, Advance, and Run and Time. The current folder is C:\code\Trac_MSM_Code\data. The Editor window displays the script Traction.m with the following code:

```
46 %File = OpenFiles(Settings);
47
48 %% Crop images
49 ROI(1).i1=150;
50 ROI(1).i2=1749;
51 ROI(1).j1=300;
52 ROI(1).j2=1899; %j is image width in X, i is image height in Y
53
54 File = cell_cropper(Settings,File,ROI);
55
56 %%
57 %Compute Gel Displacement
58
59
60
61 Settings.resolution = 32; % Size of each window of the PIV analysis
62 Settings.overlap = 0.75; % Overlap between windows for PIV analysis. 0 means no overlap, 1 means full overlap
63
64 %File = displacement_finder(Settings,File);
```

The Command Window shows the following messages:

```
New to MATLAB? See resources for Getting Started.
Warning: Function plot has the same name as a MATLAB builtin. We suggest you rename the function to avoid a potential name conflict.
>> Traction
2
```

The Workspace window shows the following variables:

Name	Value
File	1x1 struct
imagenum	2
mag	1
obj	5
ROI	1x1 struct
Settings	1x1 struct

Step : 9.1.4 time: 5 secs

HOME PLOTS APPS EDITOR PUBLISH VIEW

Insert Comment Indent Breakpoints Run Run and Advance Run and Time

FILE NAVIGATE EDIT BREAKPOINTS RUN

Current Folder: C:\code\Trac_MSM_Code\data

Editor - C:\code\Trac_MSM_Code\code\Traction.m

This file can be opened as a Live Script. For more information, see [Creating Live Scripts](#).

```
55 %File = cell_cropper(Settings,File,ROI);
56
57 %%
58 %Compute Gel Displacement
59
60
61 Settings.resolution = 32; % Size of each window of the PIV analysis
62 Settings.overlap = 0.75; % Overlap between windows for PIV analysis. 0 means no overlap, 1 means full overlap
63
64 File = displacement_finder(Settings,File);
65
66 %%
67 %compute stage drift
68
69 Settings.disp_max = 4;% sets color bar limit for displacement
70
71 %File = dedrift(Settings,File);%use for bead defrict
72
73 %%
```

Workspace

Name	Value
File	1x1 struct
imagenum	2
mag	1
obj	5
ROI	1x1 struct
Settings	1x1 struct

Command Window

New to MATLAB? See resources for [Getting Started](#).

```
.
... shift from trypsin is (1.9959,1.1428) pixels...
Computing global shift of 2 of 2 images
.
... shift from trypsin is (1.9462,1.1577) pixels...
```

fx >>

Step : 9.1.5 time: 5 secs

script Ln 73 Col 3

HOME PLOTS APPS EDITOR PUBLISH VIEW

Insert Comment Indent Breakpoints Pause Run and Advance Run and Time

FILE NAVIGATE EDIT BREAKPOINTS RUN

Current Folder: C:\code\Trac_MSM_Code\data\croppeddata

Editor - C:\code\Trac_MSM_Code\code\Traction.m

```
21 - Settings.resolution = 32; % Size of each window of the PIV analysis
22 - Settings.overlap = 0.75; % Overlap between windows for PIV analysis
23
24 %File = displacement_finder(Settings)
25
26 %%
27 %compute stage drift
28
29 Settings.disp_max = 4;% sets color
30
31 File = dedrift(Settings,File); %use
32
33 %%
34 % Compute the traction field
35
36 % Results for all files written in
37 % and strain energy (pj)
```

Figure 1: Original Displacements

Figure 2

Command Window

New to MATLAB? See resources for [Getting Started](#).

Computing Displacements of C:\code\Trac_MSM_Code\data\croppeddata\crop_Fluorescence_2.tif

Computing Displacements of C:\code\Trac_MSM_Code\data\croppeddata\crop_Fluorescence_2.tif

>> Traction

Step : 9.1.6 time: 10 secs

script Ln 71 Col 1

The MATLAB R2016b interface is shown with the following components:

- Top Bar:** HOME, PLOTS, APPS, EDITOR, PUBLISH, VIEW. Search Documentation.
- Toolbox:** FILE, NAVIGATE, EDIT, BREAKPOINTS, RUN.
- Current Folder:** C:\code\Trac_MSM_Code\data\croppeddata. Files: crop_Fluorescence_1.tif, crop_Fluorescence_2.tif, crop_PC_1.tif, crop_PC_2.tif, crop_Trypsin_1.tif.
- Editor - C:\code\Trac_MSM_Code\code\Traction.m**
 - Line 79: This file can be opened as a Live Script. For more information, see [Creating Live Scripts](#).
 - Lines 80-85 (highlighted in red):

```
Settings.Filter.CutFreq = 1; % cutoff frequency in units of the nyquist frequency originally
Settings.FlipMatrix = 'no'; % flip matrix for edge or interior assay only.
Settings.GelHeight = 100; % Gel Height input if using traction_finite
Settings.height = 'finite'; % 'infinite', 'finite', 'constrained', tells what traction code to use
Settings.DedriftImage = 'yes'; % was image dedrifted above?
Settings.TracBoundCond = 'unconstrained'; % traction boundary condition constrained or unconstrained
```
 - Line 86: File = traction_finder(Settings, File, ROI);
 - Line 87: %%
 - Line 88: % Plot the traction results
 - Line 89: %%
 - Line 90: % Plot the traction results
 - Line 91: %%
 - Line 92: % Plot the traction results
 - Line 93: Settings.reshapeMatrix = 'yes'; % reshape image to reduce traction pixelation in plot_traction.m
 - Line 94: Settings.PlotDisp = 'yes'; % plot displacements yes or no
 - Line 95: Settings.PlotTracX = 'yes'; % plot tractions in x
 - Line 96: Settings.PlotTracY = 'yes'; % plot tractions in y
 - Line 97: Settings.PlotRmsTrac = 'yes'; % plot rms tractions
- Workspace:** File (1x1 struct), imagenum (2), mag (1), obj (5), ROI (1x1 struct), Settings (1x1 struct).
- Command Window:**
 - New to MATLAB? See resources for [Getting Started](#).
 - Computing Displacements of C:\code\Trac_MSM_Code\data\Croppeddata\crop_Fluorescence_1.tif
 - Computing Displacements of C:\code\Trac_MSM_Code\data\Croppeddata\crop_Fluorescence_2.tif
 - >> Traction
 - >>

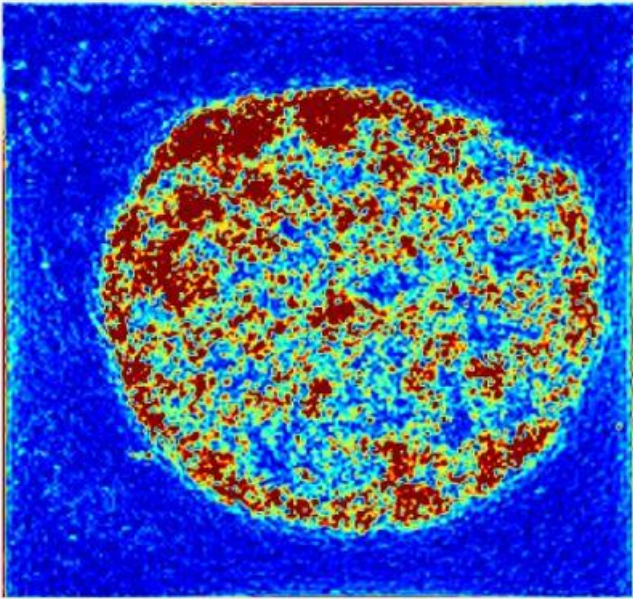
Step : 9.2.1

time: 5 secs

HOME PLOTS APPS EDITOR PUBLISH

File Edit View Insert Tools Desktop Window Help

Figure 1: Traction



Current Folder: C:\code\Trac_MSM_Code\Data

Editor - C:\code\Trac_MSM_Code\Traction.m

```
100 %Traction
101 Settings.
102 Settings.
103 Settings.
104 Settings.
105
106 plot_trac
107 %%
108 % mark the
109 % For N n
110
111 Settings.
112 Settings.
113
114 %mark_circ
115
116 %%
117 % IMPORTANT: Before running this, make sure you have properly edited model.in file
118 % Check if pixel to micron conversion, young's modulus etc.
```

Workspace

Name	Value
File	1x1 struct
imagenum	2
mag	1
obj	5
ROI	1x1 struct
Settings	1x1 struct

Command Window

New to MATLAB? See resources for [Getting Started](#).

```
234.6361 166.9288
215.8135 132.9264

>> Traction
```

Step : 9.2.2 time: 5 secs

HOME PLOTS APPS EDITOR PUBLISH VIEW

Insert Comment Indent Breakpoints Pause Run and Advance Run Section Advance Run at Time

FILE NAVIGATE EDIT BREAKPOINTS RUN

C:\code\Trac_MSM_Code\Data

Current Folder

- croppeddata
- Displacements
- Results
- Tractions
 - bead1.tif
 - bead2.tif
 - island.exe
 - model.in
 - phase1.tif
 - phase2.tif
 - trypsin1.tif

Editor - C:\code\Trac_MSM_Code\code\Traction.m

Traction.m

This file can be opened as a Live Script. For more information, see [Creating Live Scripts](#).

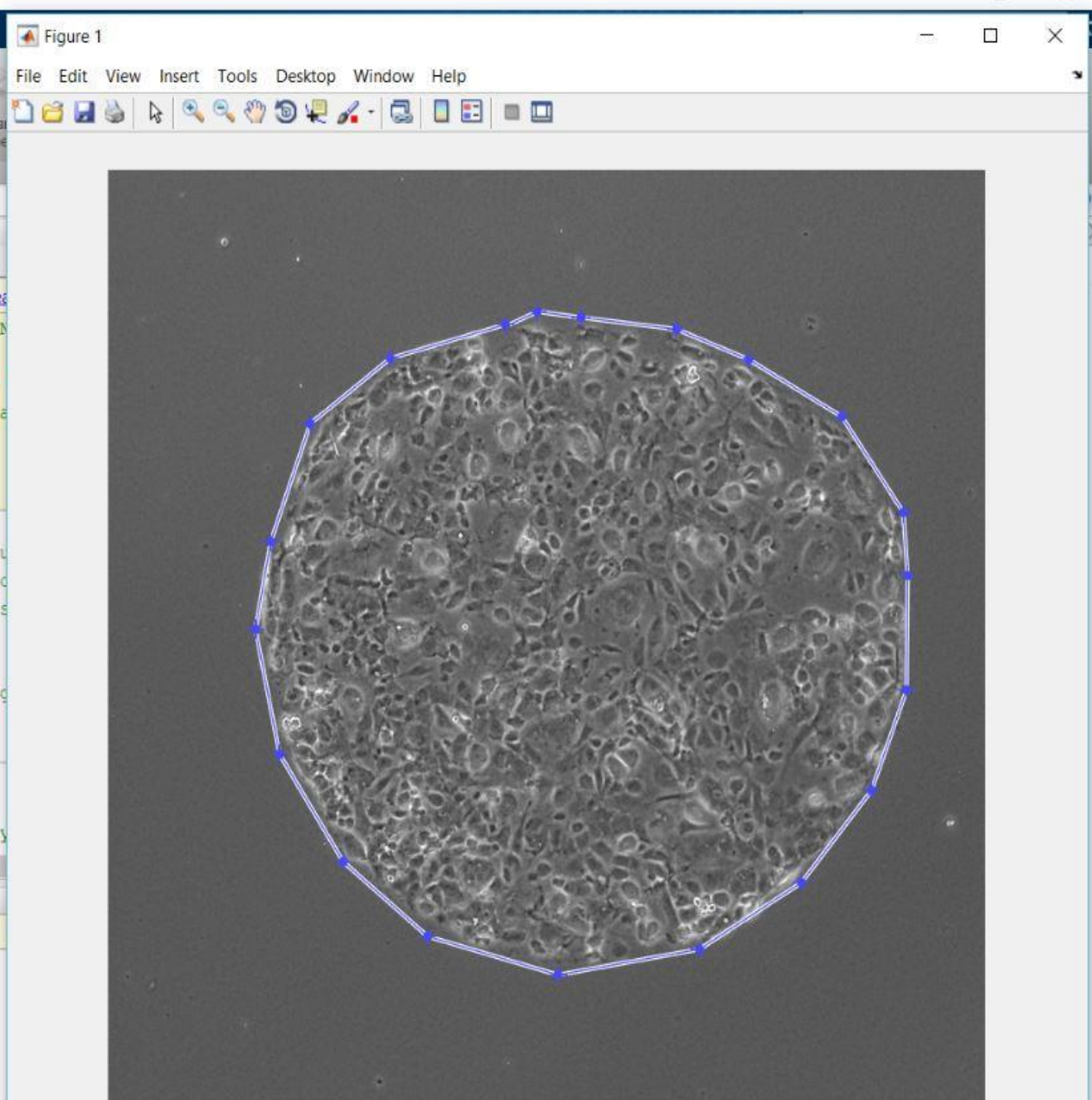
```
109 % For N number of images, draw boundary N
110
111 Settings.DomDrawn = 'no'; %was domain for
112 Settings.DomImagej = 'no'; %was domain dra
113
114 mark_circular_domain(File,Settings)
115
116 %%
117 % IMPORTANT: Before running this, make su
118 % Check if pixel to micron conversion, yo
119 % If pixel to micron doesn't match what's
120 % come.
121
122 imagenum = 2; %specify the number of ima
123 %Run_StressCode(imagenum);
124
125 %%
126 %Plot Intercellular Stresses
127 Settings.reshapeMatrix = 'yes'; % set to y
```

Command Window

New to MATLAB? See resources for [Getting Started](#).

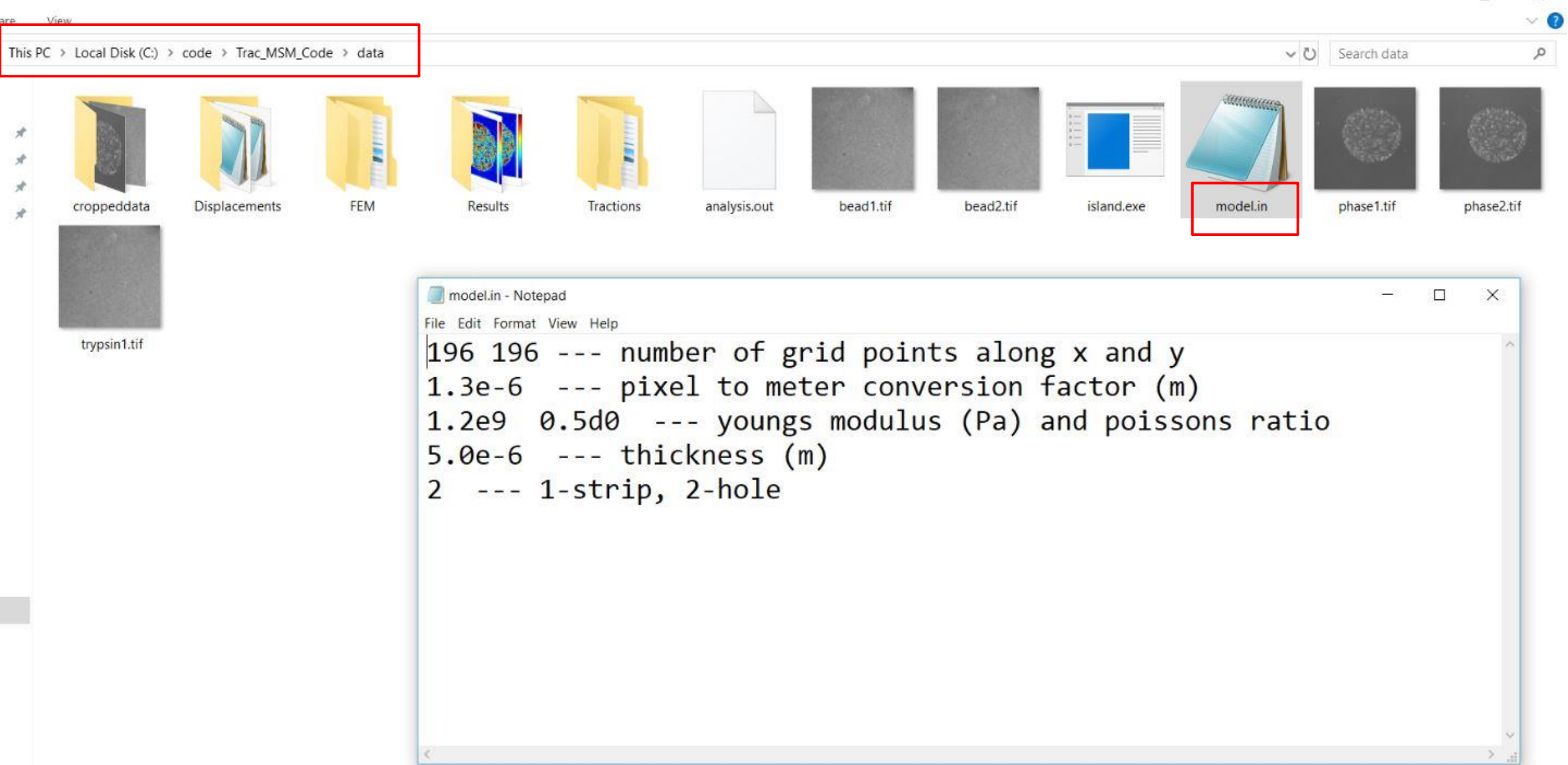
- In [imshow](#) (line 327)
- In [roipoly>parse_inputs](#) (line 183)
- In [roipoly](#) (line 80)
- In [mark_circular_domain](#) (line 36)
- In [Traction](#) (line 114)

Select a file to view details



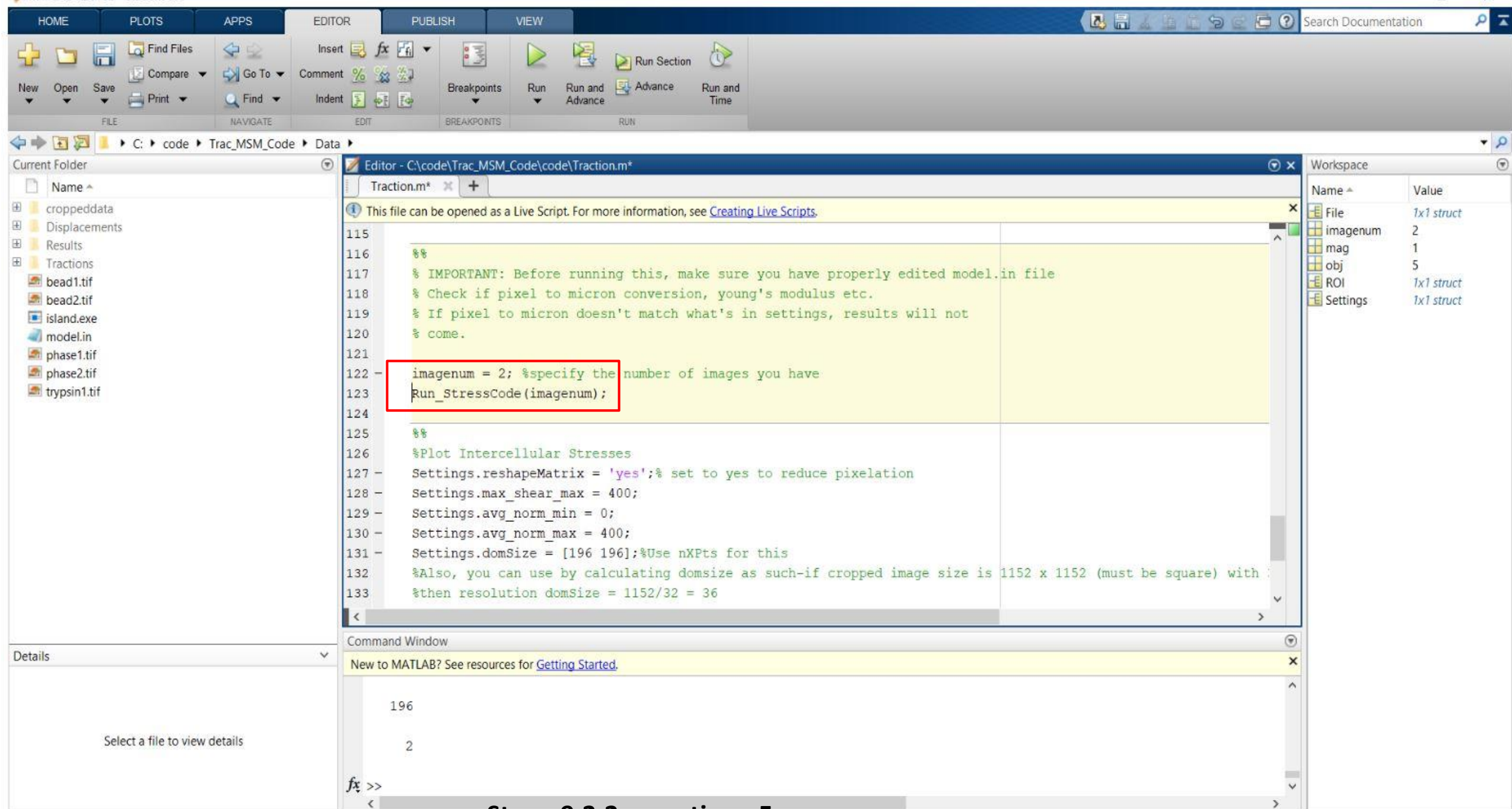
Step : 9.3.1

time: 10 secs



Step : 9.3.2

time: 10 secs



The MATLAB R2016b interface is shown with the following components:

- Home Tab:** Includes buttons for New, Open, Save, Compare, Print, Find, Go To, and Find Files.
- Editor Tab:** Includes buttons for Insert, Comment, Indent, Breakpoints, Run, Run and Advance, Run Section, Advance, and Run and Time.
- Current Folder:** Displays the file structure of the current folder, including files like bead1.tif, bead2.tif, island.exe, model.in, phase1.tif, phase2.tif, and trypsin1.tif.
- Editor - C:\code\Trac_MSM_Code\code\Traction.m:** The main script window. The code is as follows:

```
115  
116 %%  
117 % IMPORTANT: Before running this, make sure you have properly edited model.in file  
118 % Check if pixel to micron conversion, young's modulus etc.  
119 % If pixel to micron doesn't match what's in settings, results will not  
120 % come.  
121  
122 imagenum = 2; %specify the number of images you have  
123 Run_StressCode(imagenum);  
124  
125 %%  
126 %Plot Intercellular Stresses  
127 Settings.reshapeMatrix = 'yes'; % set to yes to reduce pixelation  
128 Settings.max_shear_max = 400;  
129 Settings.avg_norm_min = 0;  
130 Settings.avg_norm_max = 400;  
131 Settings.domSize = [196 196]; %Use nXpts for this  
132 %Also, you can use by calculating domsize as such-if cropped image size is 1152 x 1152 (must be square) with  
133 %then resolution domSize = 1152/32 = 36
```
- Command Window:** Displays the output of the script, showing the values 196 and 2.

```
196  
2
```
- Workspace:** Displays the current state of the workspace, including variables like File, imagenum, mag, obj, ROI, and Settings.

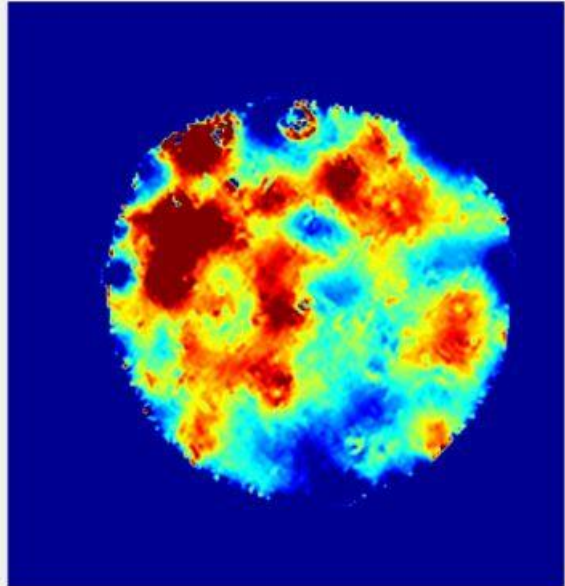
Step : 9.3.2

time: 5 secs

HOME PLOTS APPS EDITOR PUBLISH

File Edit View Insert Tools Desktop Window Help

Average Normal Stress (Pa)



400
300
200
100
0

Current Folder: C:\code\Trac_MSM_Code>Data

Editor - C:\code\Trac_MSM_Code\Traction.m

```
124  
125 %%  
126 %Plot Int  
127 - Settings.  
128 - Settings.  
129 - Settings.  
130 - Settings.  
131 - Settings.  
132 %Also, yo  
133 %then res  
134  
135 - Settings.  
136 - Settings.  
137  
138 %tic  
139 plot_FEM_results(File,Settings);  
140 %toc  
141 %%  
142
```

Workspace

Name	Value
File	1x1 struct
imagenum	2
mag	1
obj	5
ROI	1x1 struct
Settings	1x1 struct

x 1152 (must be square) with

Command Window

New to MATLAB? See resources for [Getting Started](#).

```
max_shear_stress =  
  
132.9264
```

fx

Step : 9.3.3 time: 5 secs