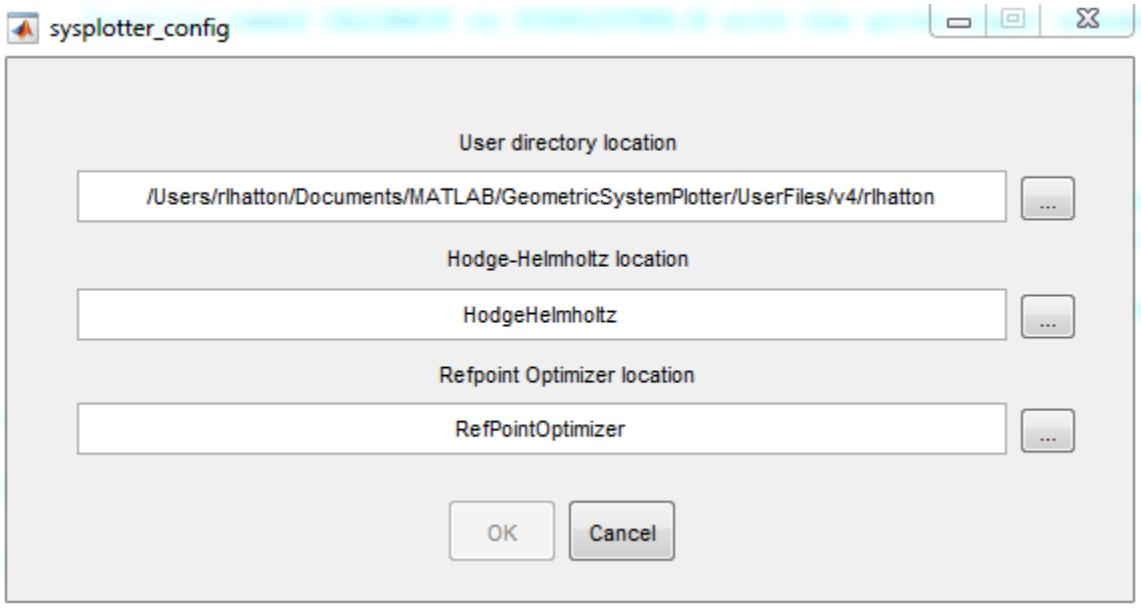
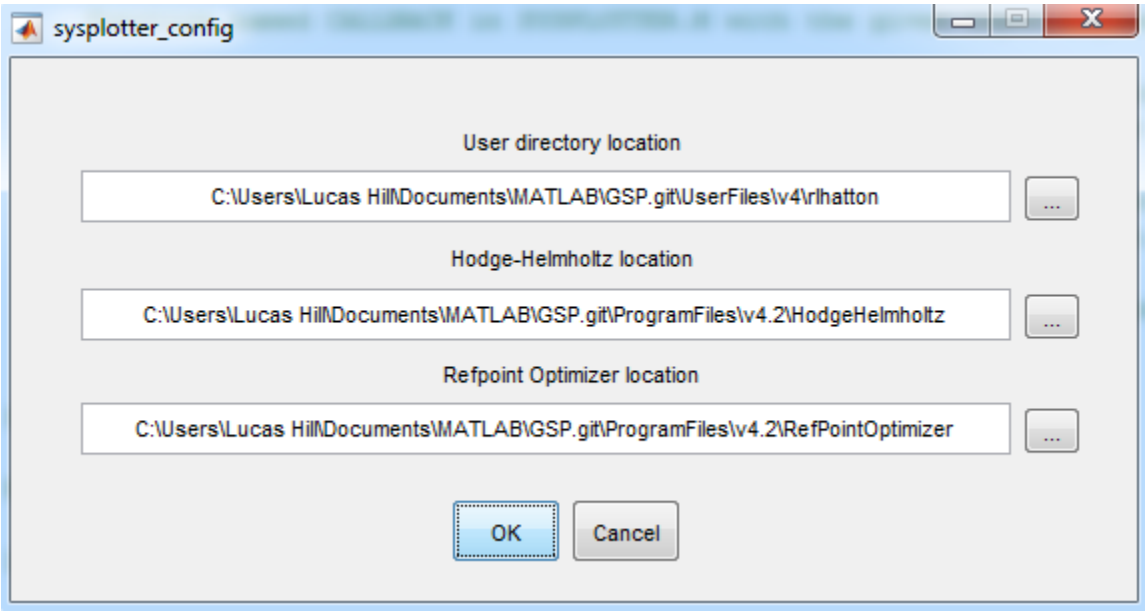
Start-up

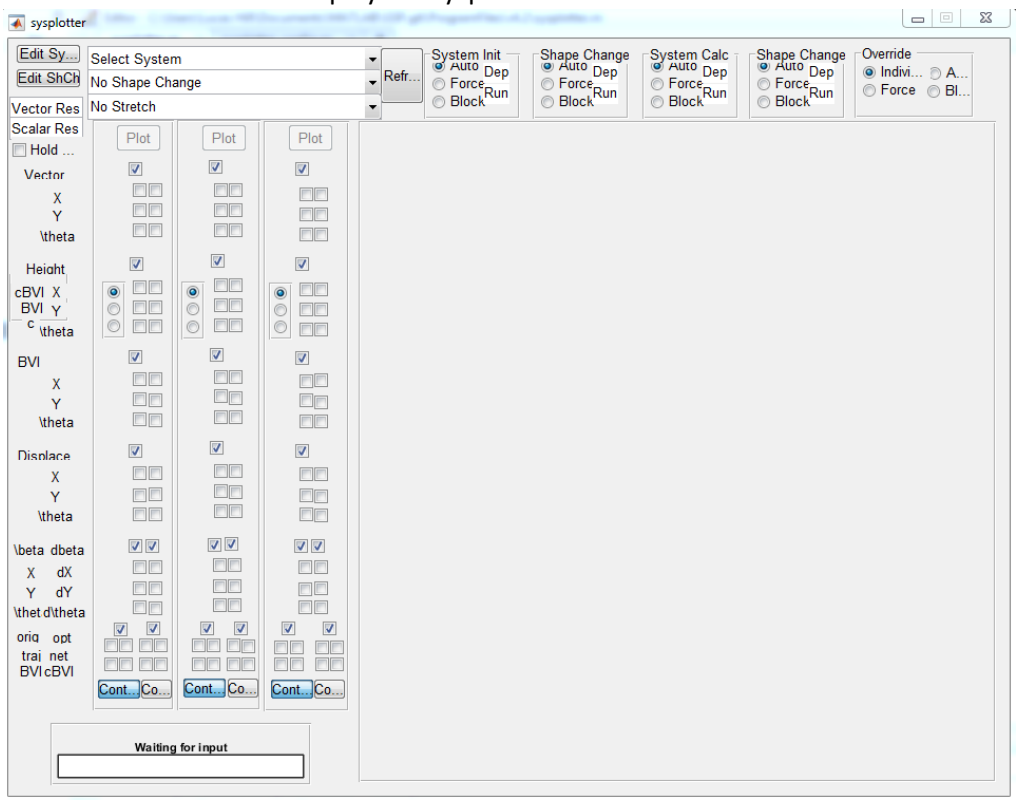
1. Run sysplotter.m, which is in …/GSP/ProgramFiles/v4.2
2. The first time you start it up, the following screen will appear.



We recommend you make your own user directory (in the …/GSP/v4/UserFiles folder), which must contain 3 folders, “Shape_Changes”, “Stretches”, and “Systems”. The location of the Hodge-Helmholtz, and Refpoint Optimizer folders should be in …/GSP/Programfiles/v4.2/ Before you hit “OK”, your screen will look something like this



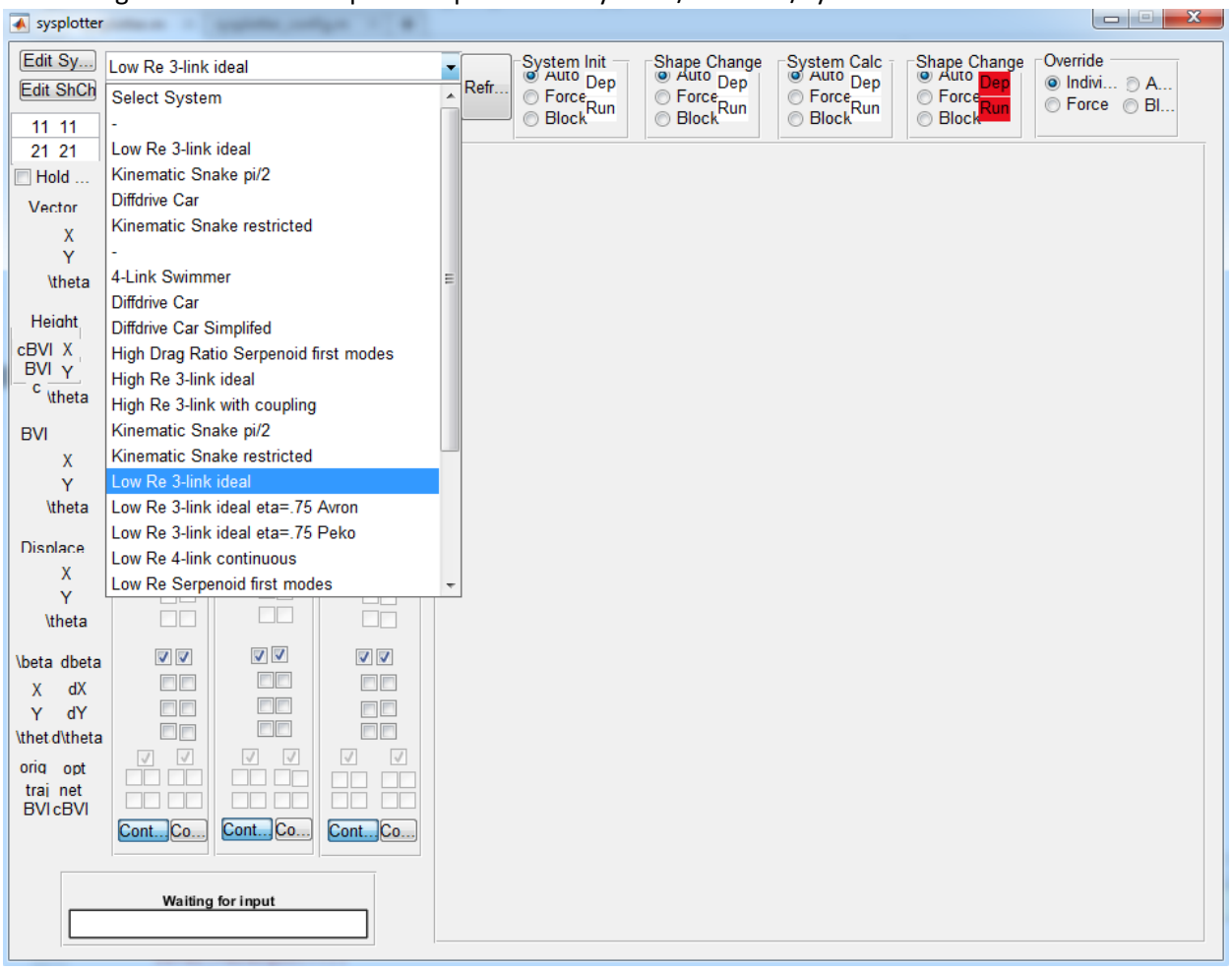
3. Your screen should now display the sysplotter



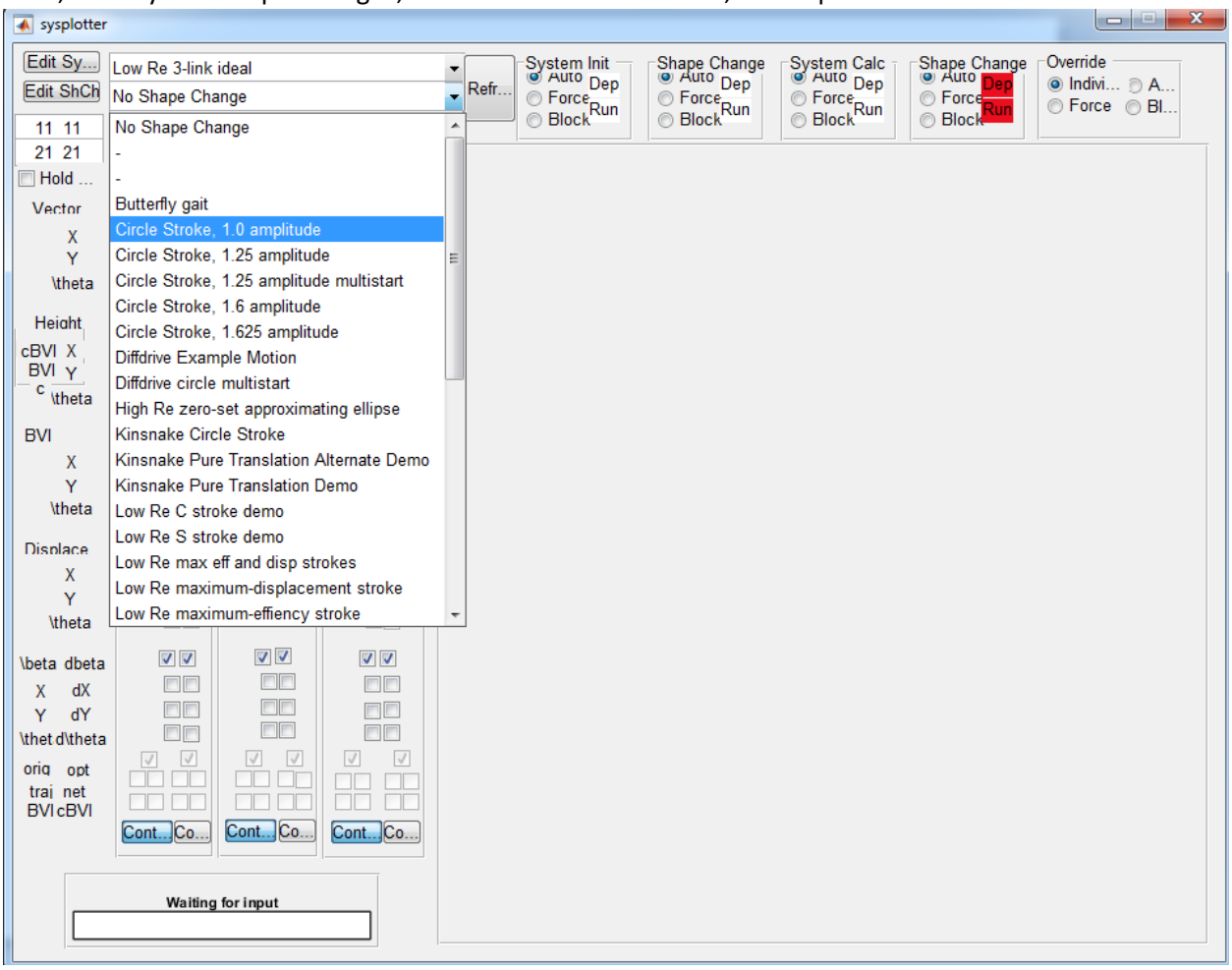
Loading a System

1. Select the system you want to analyze from the “Select System” menu, we’ll go with the “Low Re 3-link ideal” swimming snake system. For making your own systems, just follow the

formatting found in the examples and put them in your …/Userfiles/Systems folder



2. Next, select your “Shape Change”, we’ll use the “Circle Stroke, 1.0 amplitude”



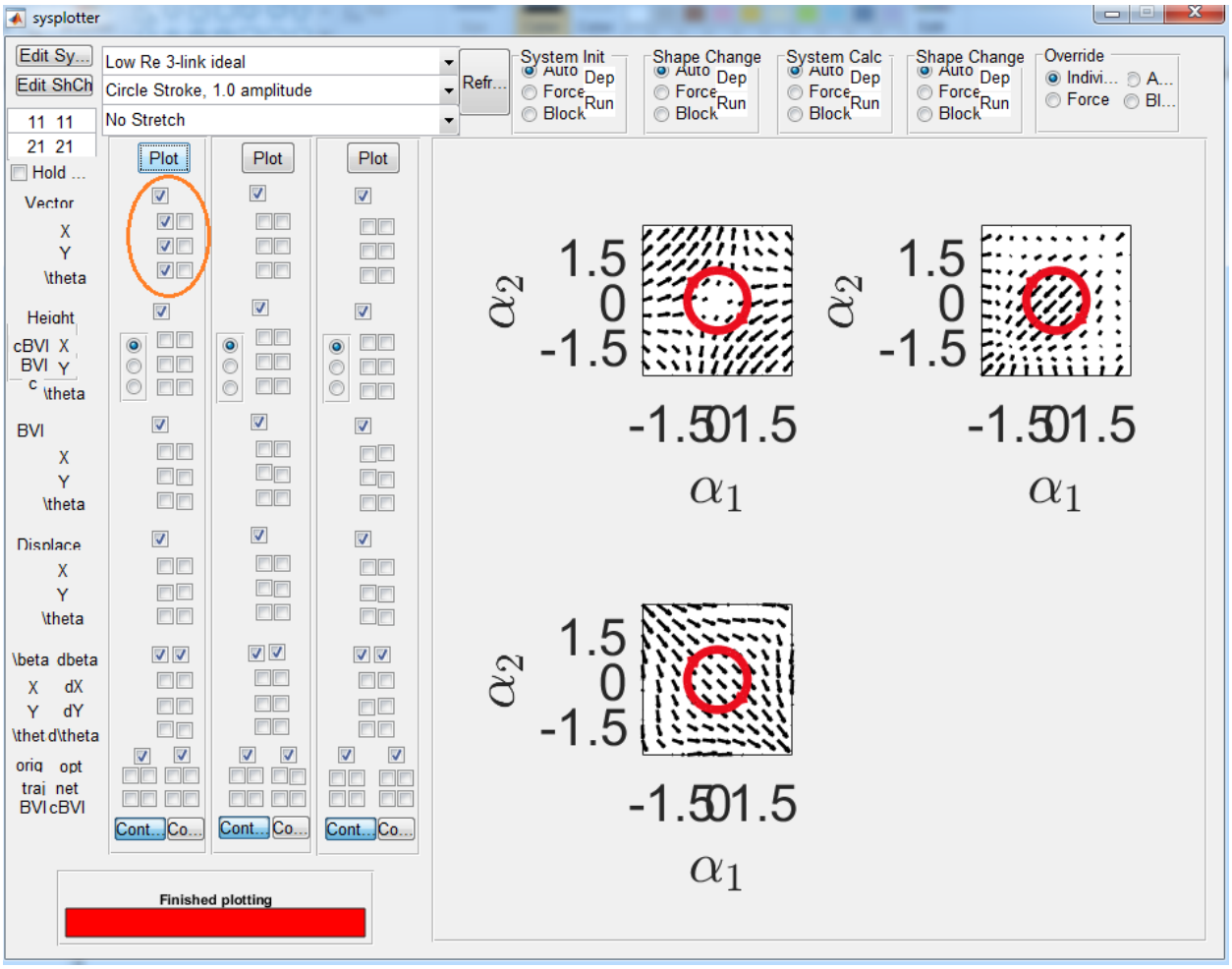
3. If you have a Stretch you’d like to apply to your system, repeat the process with the “Stretch” menu.
4. Now you’re ready to start plotting and analyzing.

Notes: To quickly find or edit your system or shape change files, the “Edit Sys” and “Edit ShCh” buttons to the left of the drop-down menus are handy. Also, if you have sysplotter running, and you add new files to your UserFiles folder, hit the “Refresh” button to the right of the menus to see them.

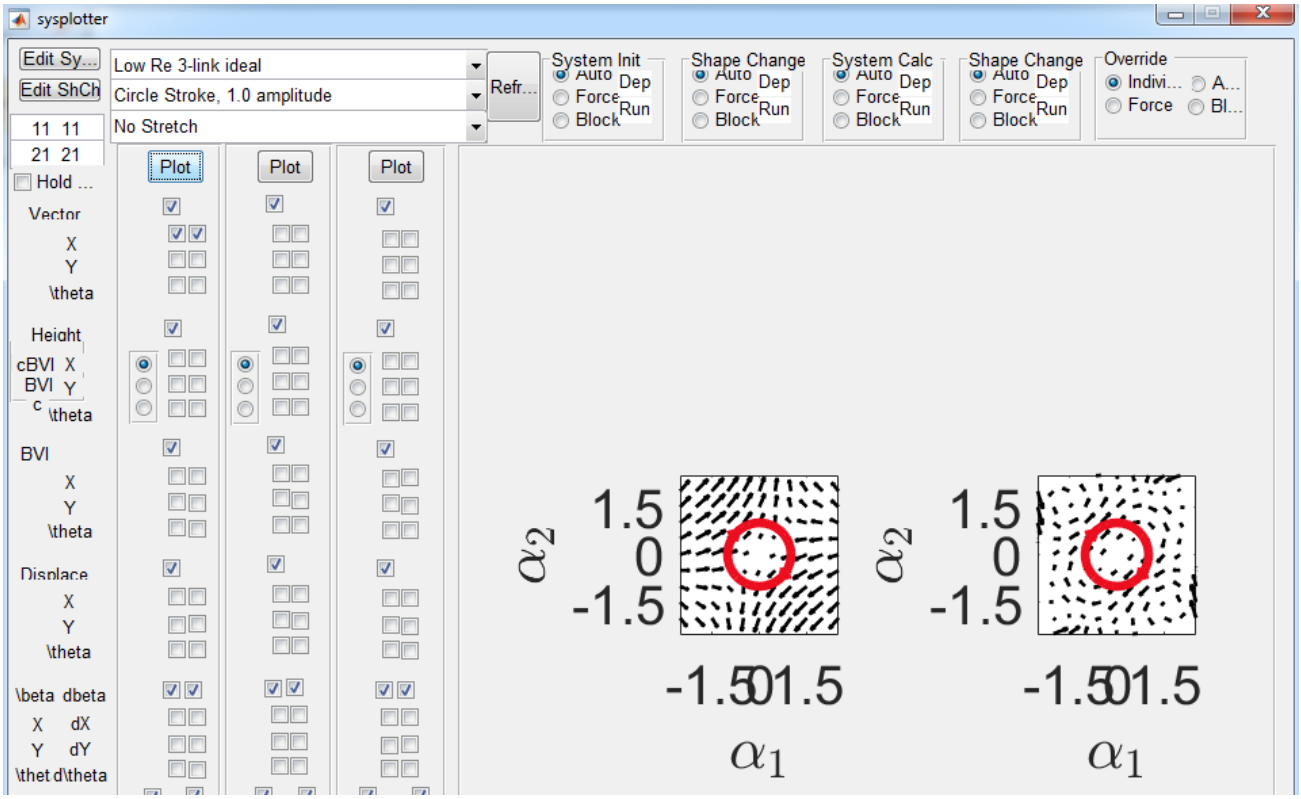
Plotting and Visualizing

Vector Fields

For looking at the vector field of the system's local connection, use the check boxes in the Vector Row, and hit the "Plot" button in its column. **Note:** The unchecked boxes to the immediate right of the checked boxes highlighted in the circle are for visualizing the vector field in optimal coordinates (using the Hodge-Helmholtz and the Refpoint Optimizer). This is the case for all three of the plotting columns.

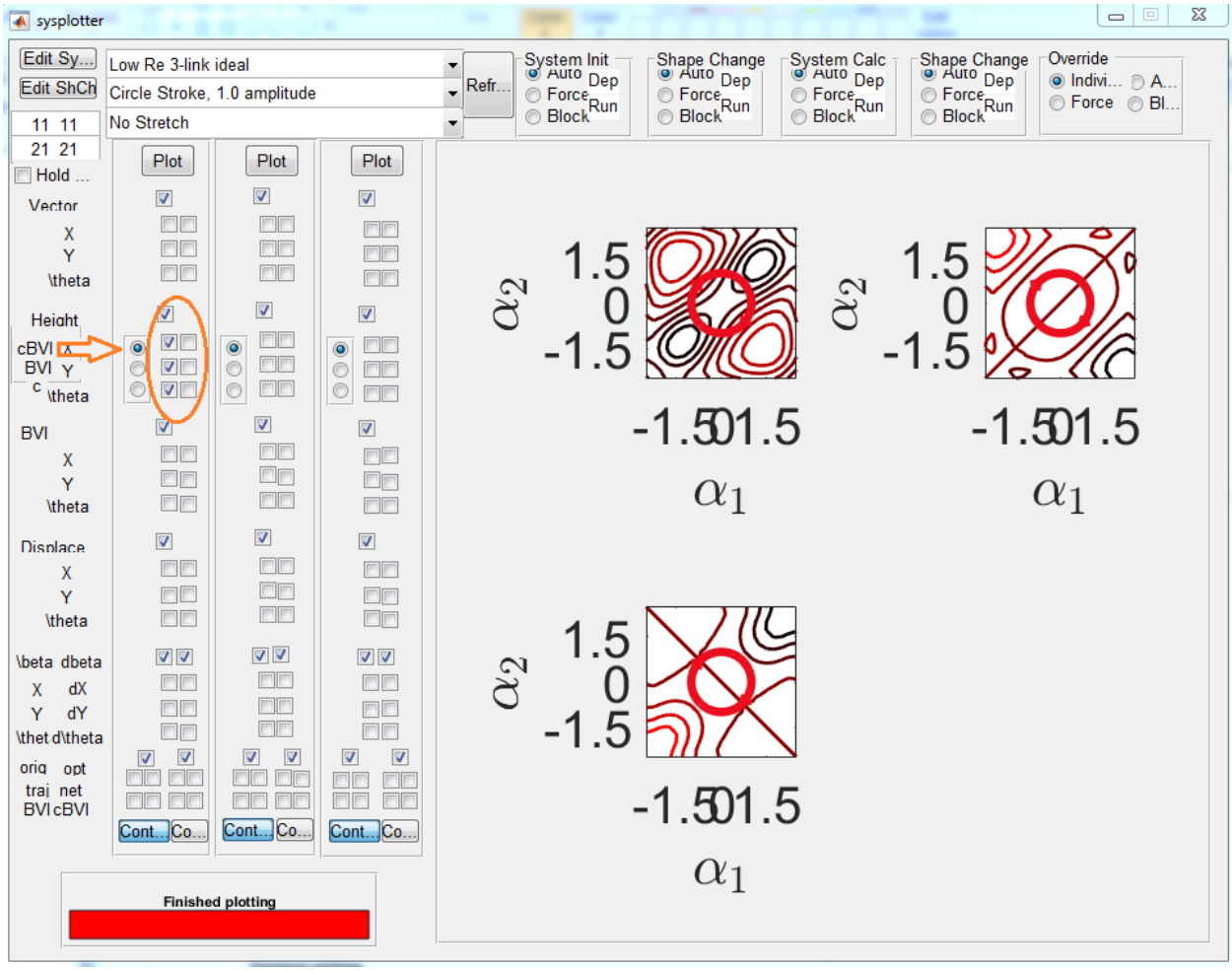


The lonesome top checkbox in the circle indicates if any of the 6 boxes below it will be displayed when the "Plot" button is hit. The first row of check boxes below the top one are for showing vector field graphs for motion in the x direction. As seen below, where we plot the normal and optimal coordinate vector fields for motion in the x direction. The next row corresponds to the y direction, and the final third row, the theta direction.


sysplotter
Edit Sy...
Edit ShCh
Low Re 3-link ideal
Circle Stroke, 1.0 amplitude
No Stretch
Refr...
System Init
Shape Change
System Calc
Shape Change
Override
Auto Dep
Force Run
Block
Indivi...
Force
11 11
21 21
Hold ...
Plot
Vector
X
Y
\theta
Height
cBVI X
BVI Y
c \theta
BVI
Displace
\beta dbeta
X dX
Y dY
\thet d\theta
1.5
0
-1.5
α_2
α_1

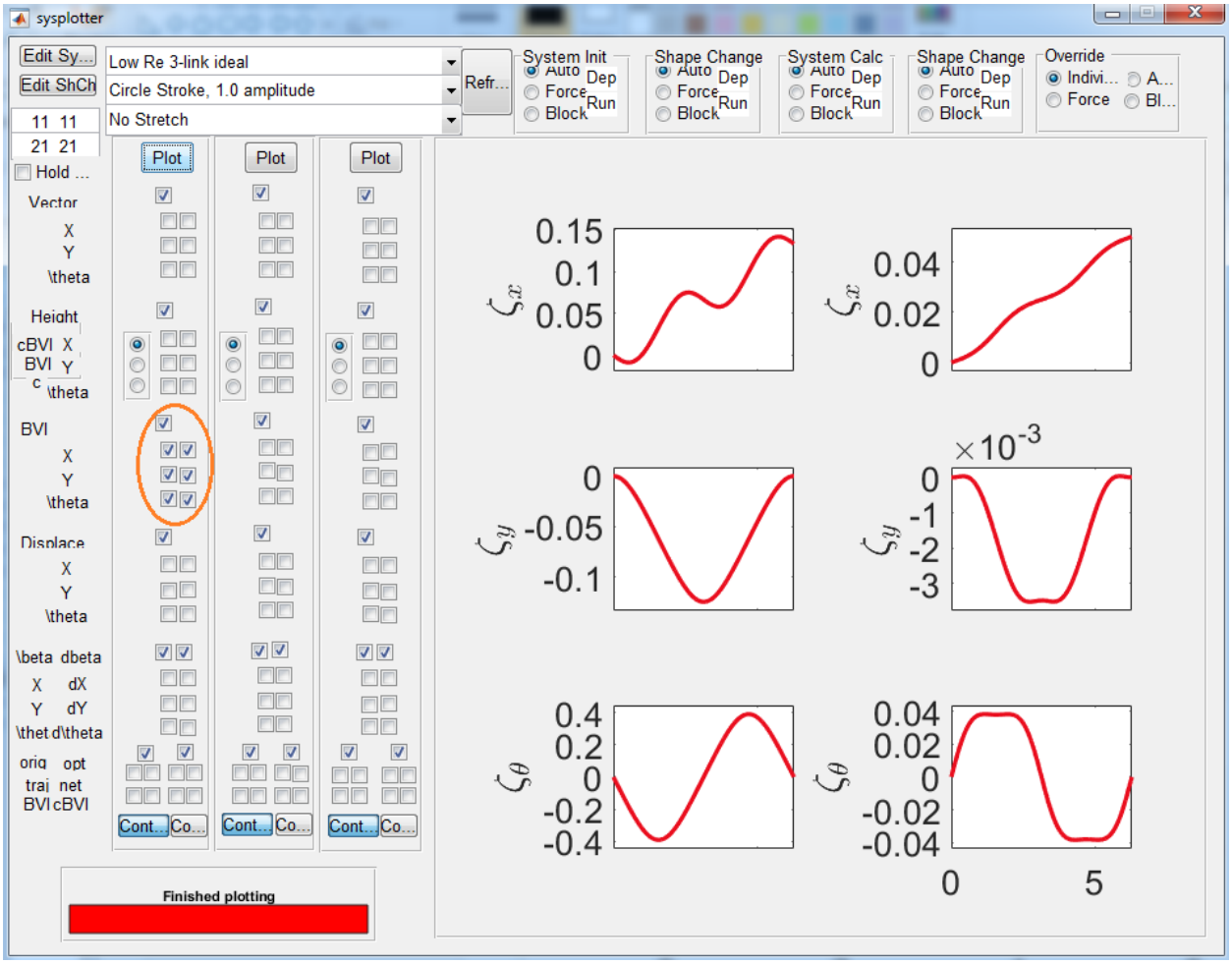
Height Functions

Similar to the vector field visualizations, height functions can be visualized using sysplotter as well. Their check boxes are below the vector field check boxes, highlighted in the image below. The one difference between these check boxes however, is the presence of 3 radio buttons to the left. The top one (see orange arrow) selected here, displays the height function for the corrected-body-velocity-integral (cBVI). The one immediately below it only shows the BVI (not incorporating Lie-Bracket effects). The bottom radio button causes the plots to only display the integral of the Lie-Bracket, the correction factor.



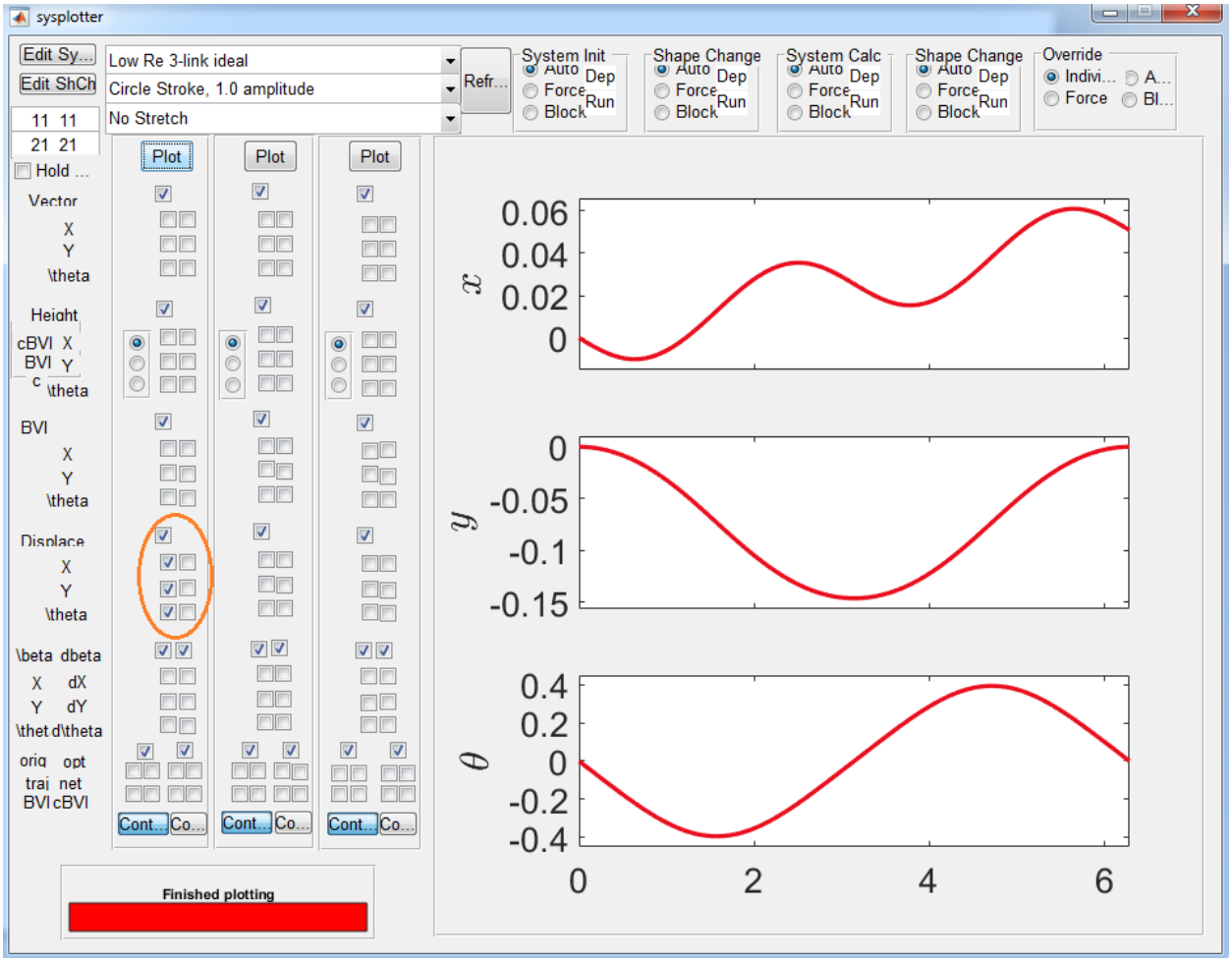
BVI (Body-Velocity-Integral)

Similar to plotting the vector fields. However, in the image below, we demonstrate plotting the BVI in both normal coordinates (the left check boxes and the left plots), and optimized (right check boxes and right plots). **Note:** To give a body velocity integral, a shape change must be specified. The system needs a set of joint motions to integrate over.



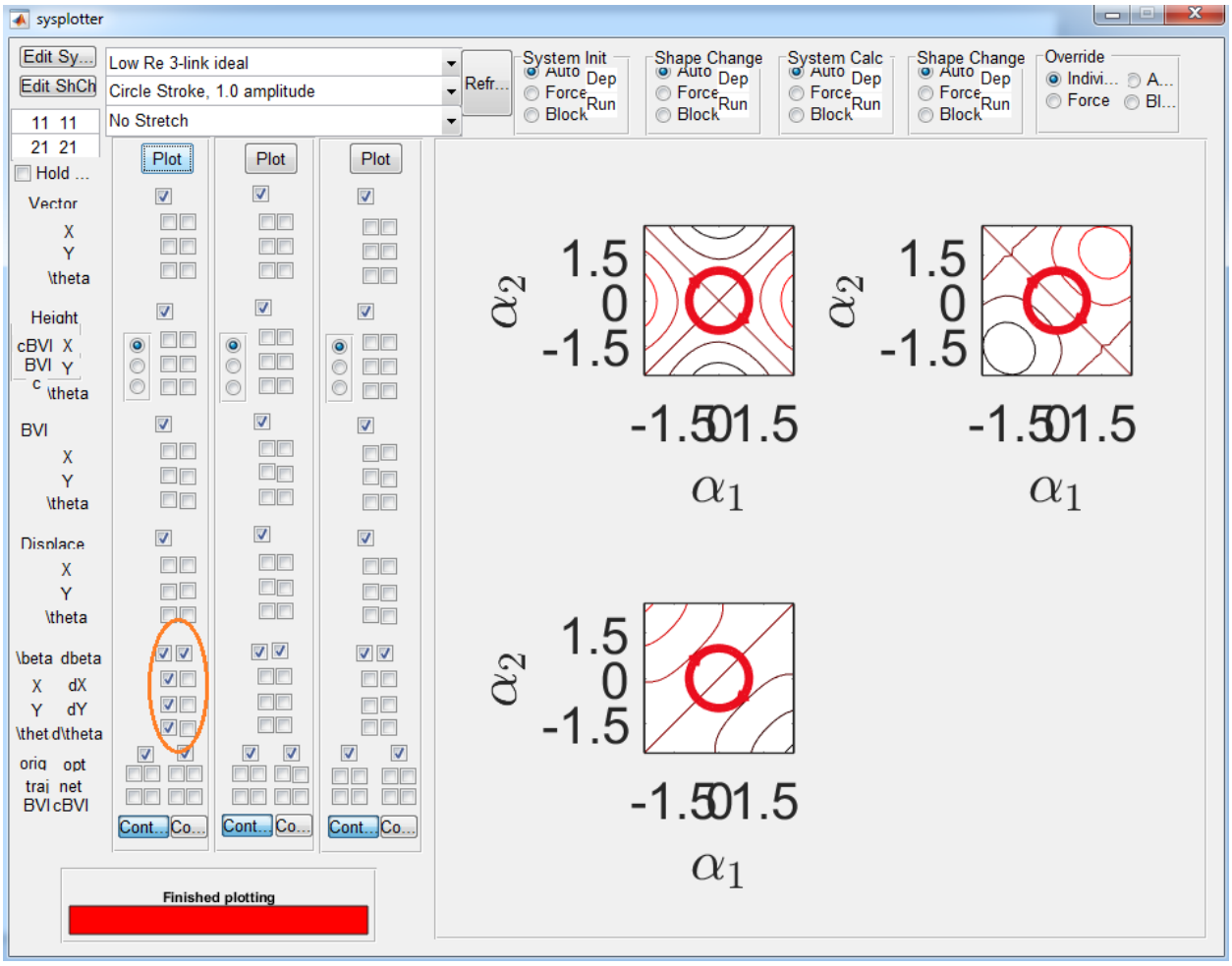
Displacement

To see the displacement of the center of mass, use the displacement visualizations.



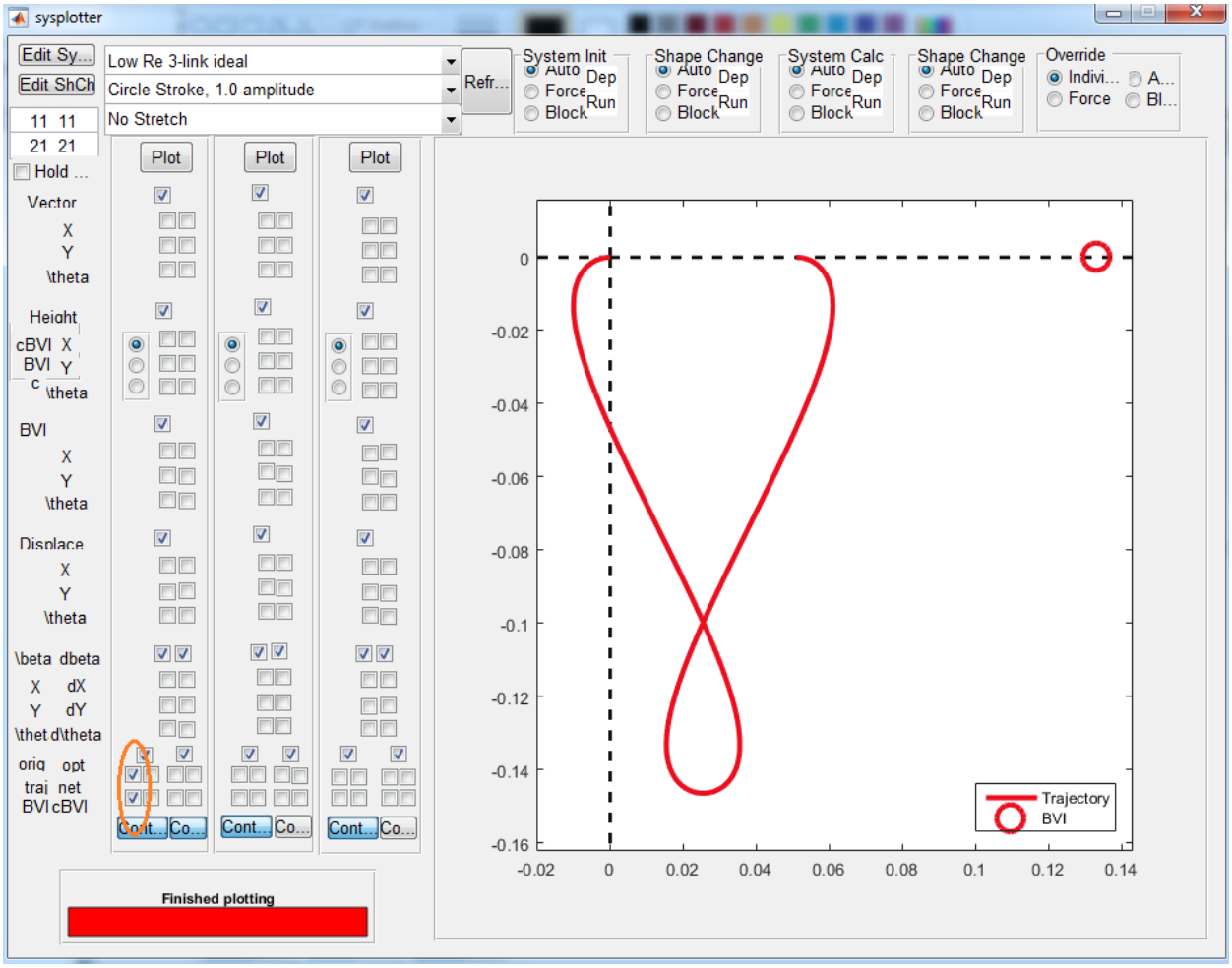
Beta\Beta

This shows the height-function of the beta variable (and its derivative, not shown below) used to create the optimal coordinate.

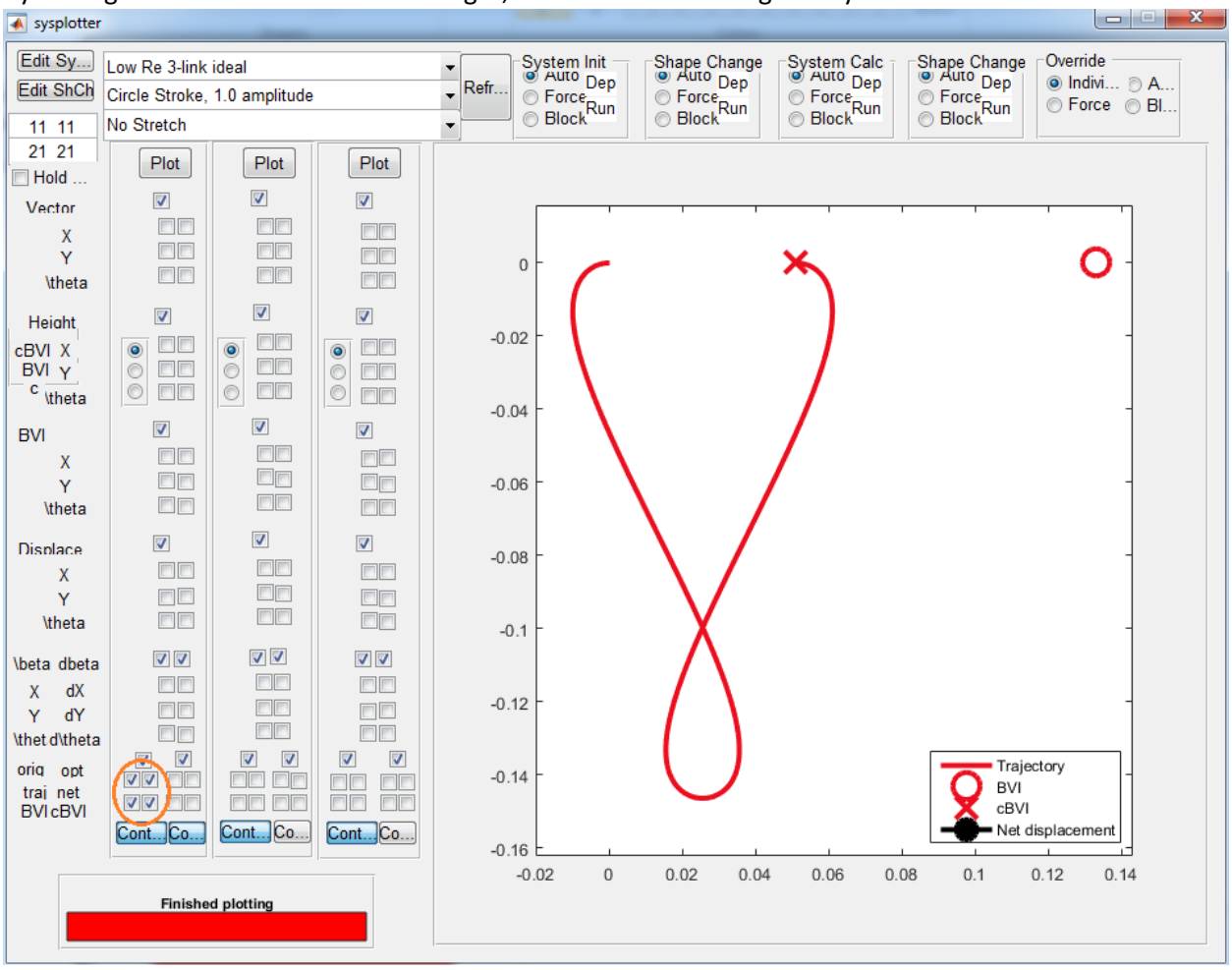


Trajectories and Displacements

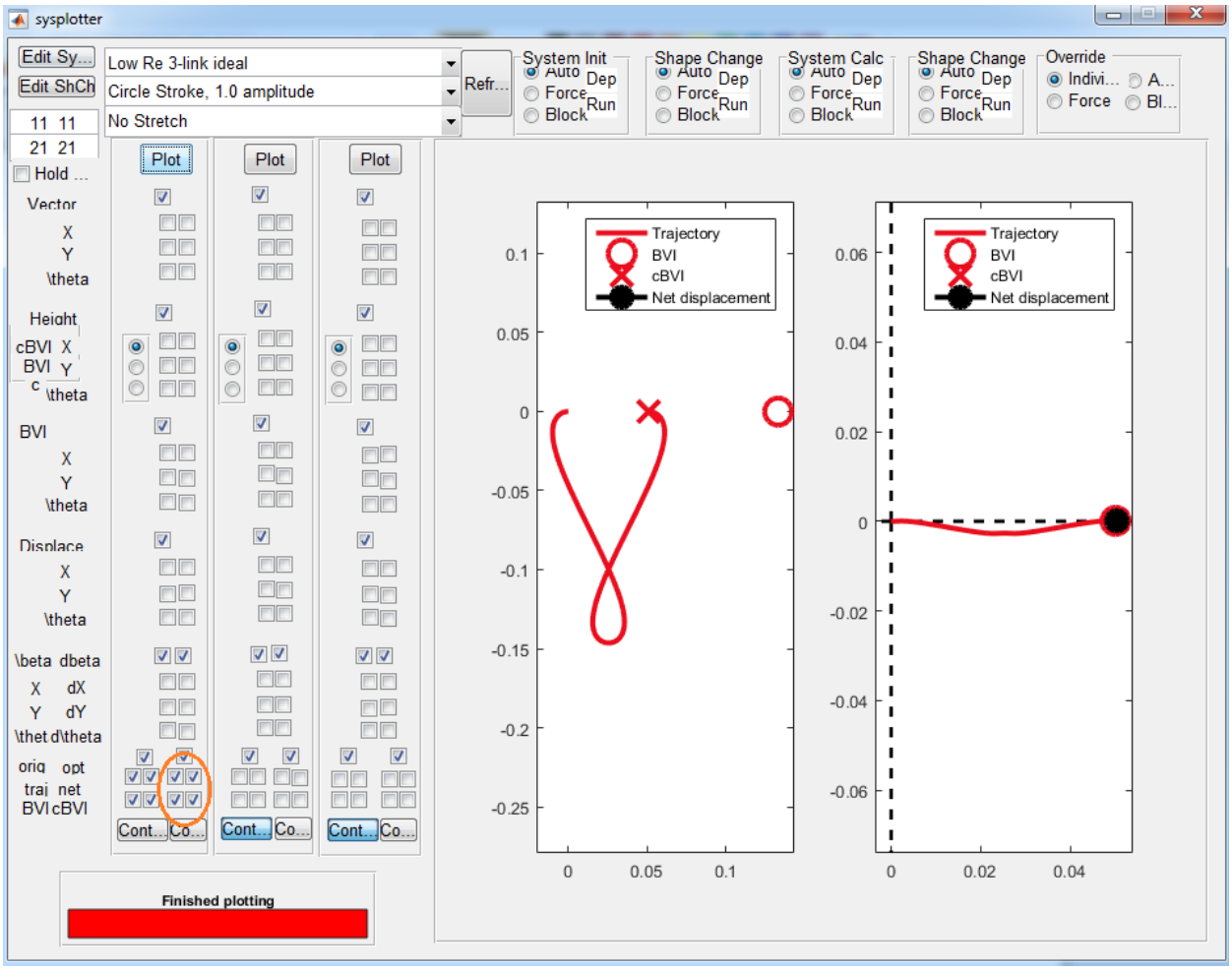
The bottom set of check operates somewhat differently from the rest. They are organized into two, 2x2 clusters. The image below, shows the trajectory taken by the normal coordinate frame, and the estimate the BVI gives for the displacement. (Notice the error).



By adding the two check boxes to the right, we see the estimate given by the corrected-BVI.

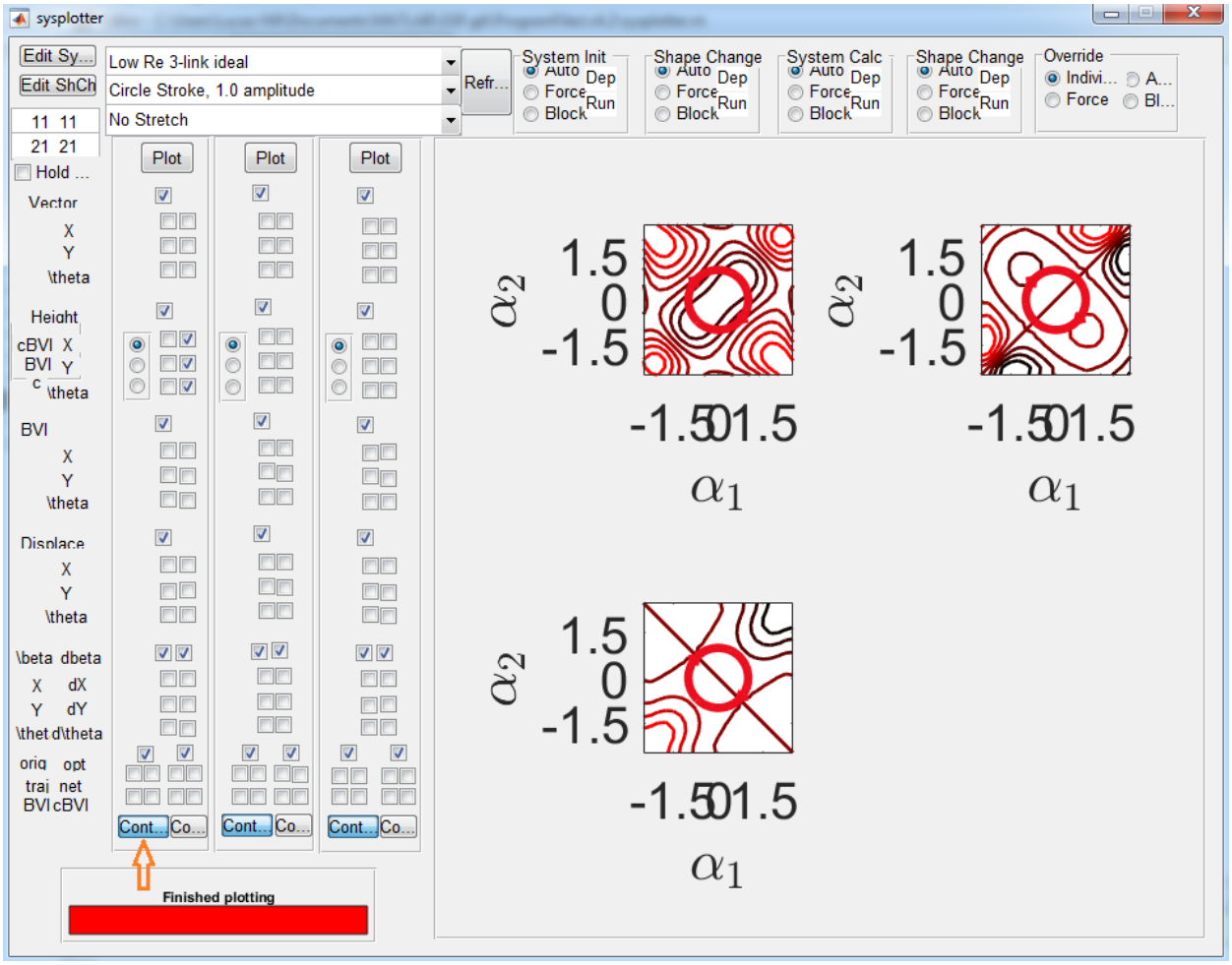


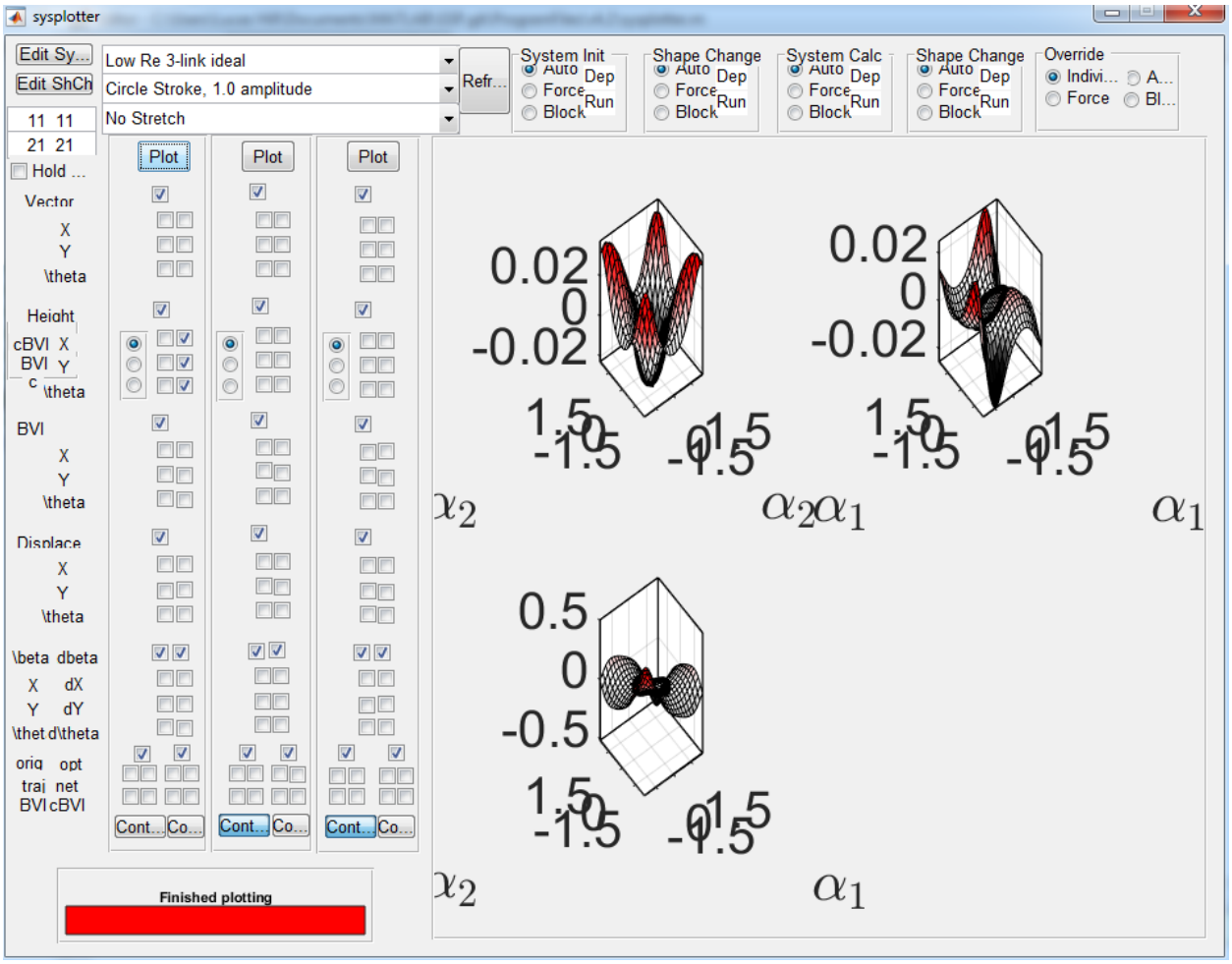
The other 2x2 cluster to the right shows the trajectory taken by the optimized coordinate, as well as the estimates from the BVI and cBVI.



Odds and Ends

Use this button to change the height function from 2-D to 3-D representations




sysplotter
Edit Sy...
Edit ShCh
Low Re 3-link ideal
Circle Stroke, 1.0 amplitude
No Stretch
Refr...
System Init
Shape Change
System Calc
Shape Change
Override
Auto Dep
Force Run
Block
Indivi...
Force
11 11
21 21
Hold ...
Vector
X
Y
\theta
Height
cBVI X
BVI Y
c \theta
BVI
X
Y
\theta
Displace
X
Y
\theta
\beta dbeta
X dX
Y dY
\thet d\theta
orig opt
traj net
BVI cBVI
Plot
Cont...
Co...
Finished plotting
0.02
0
-0.02
1.5
-1.5
α_2
α_1
0.5
-0.5

Also, all graphs can be clicked on to produce a single figure containing that graph.