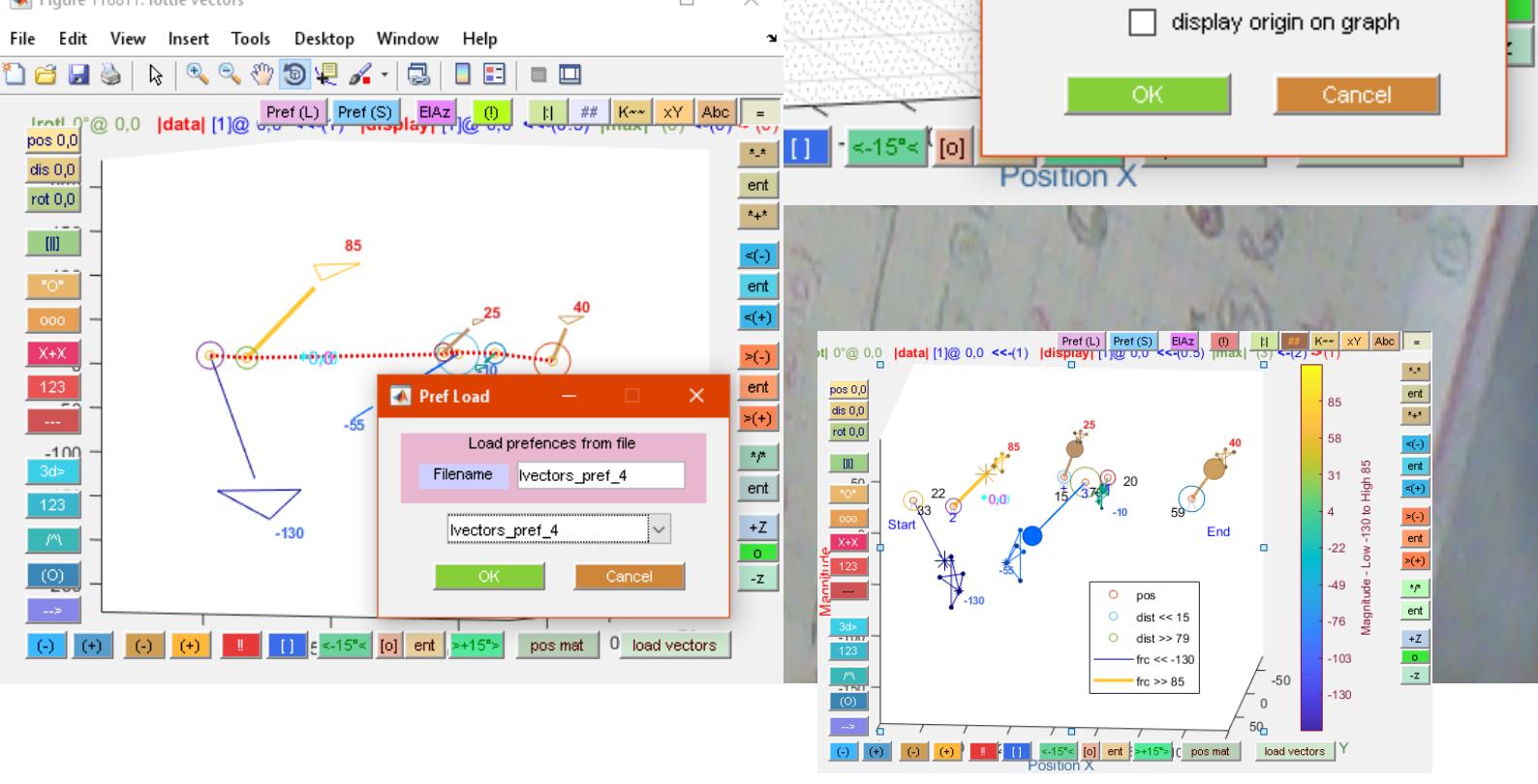
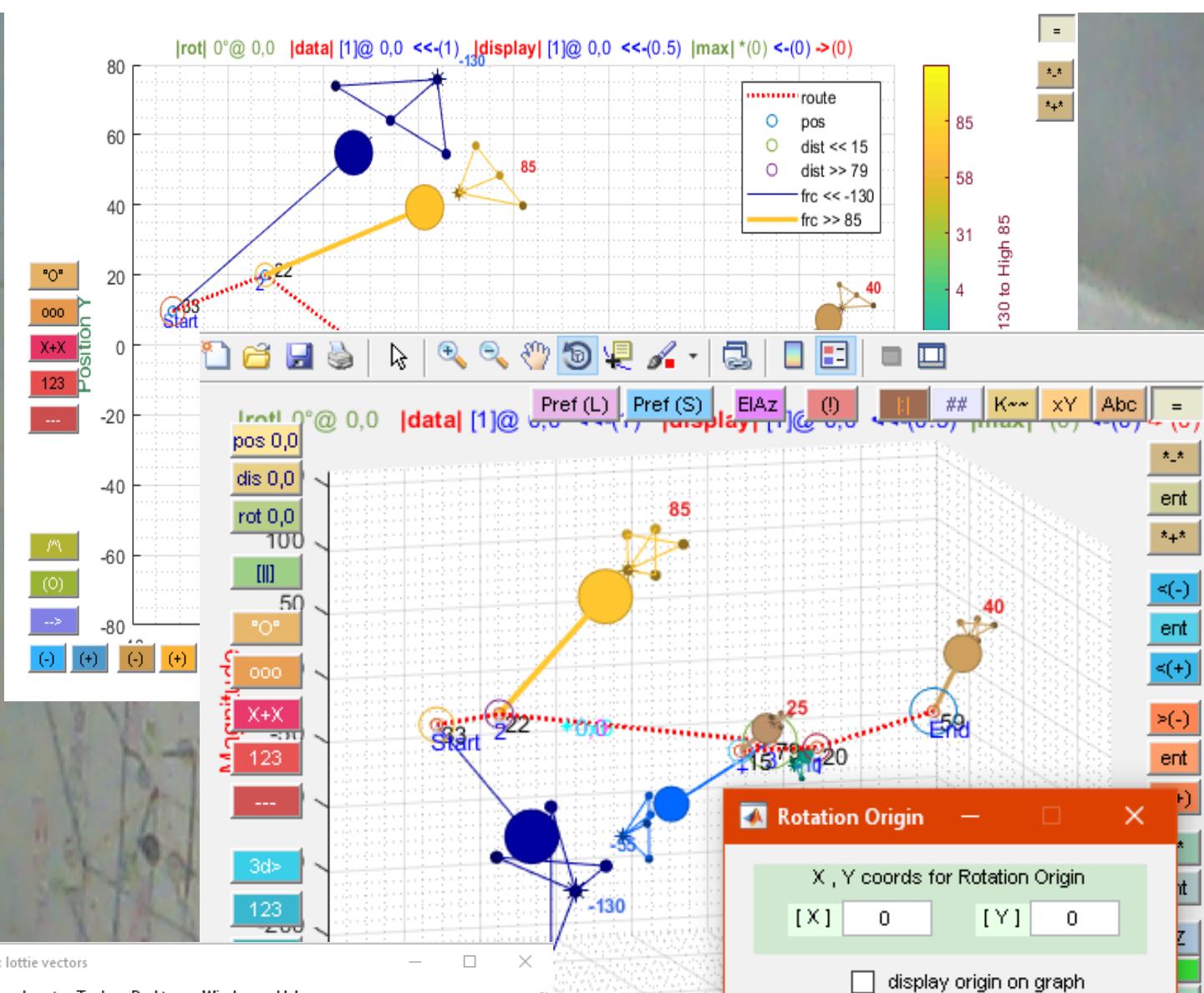


# Lottie Vectors

A Great Way To Display Vectors !

— [twitter.com/mathlottie](https://twitter.com/mathlottie)

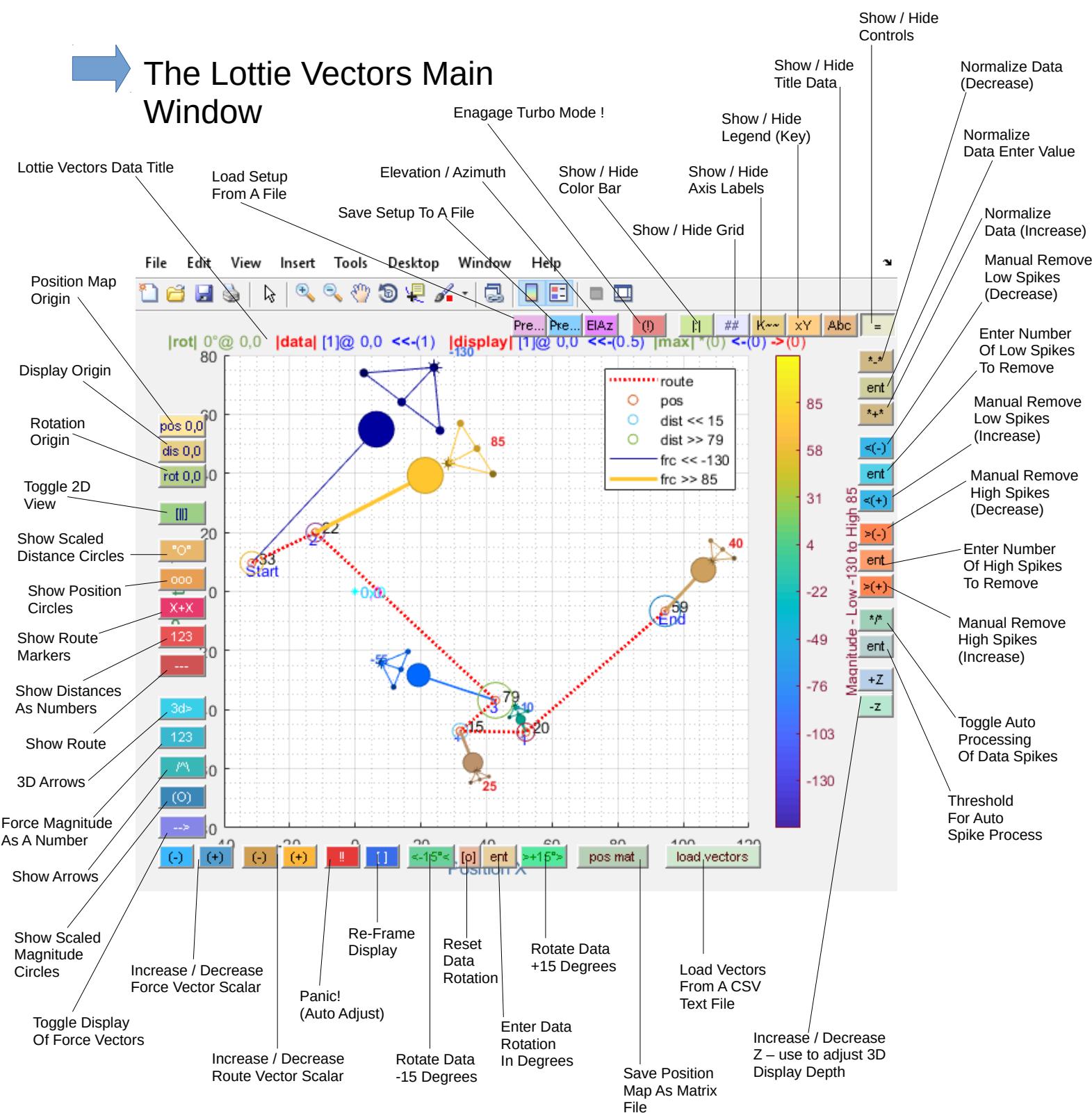


# Lottie Vectors

A Great Way To Display Vectors !

— [twitter.com/mathlottie](http://twitter.com/mathlottie)

## The Lottie Vectors Main Window



## What Is Lottie Vectors?

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Lottie Vectors is an application for Matlab(tm) that allows you to do some pretty neat things -with vectors. More exactly -displaying them in ways that hopefully will allow you to explore and better understand your vector data. It's also a great tool for students to learn about vectors and gives you the chance to explore different forms of representation.

The basic idea is simple. Take a vector defined in one of a few different types of data formats and mat it on the screen. Add another vector and you start to form a 'route'.

Vectors which make the route are called position vectors. As well as these for each step along the route, a force vector can be assigned. This can be used to show something acting on a position with a direction and positive or negative magnitude. More force vectors can be added though.

Finally you can give each position a tag to display on screen. This could be a common math symbol or greek letter, start/end signposts, or a number of the position. Either from the beginning or after a 'reset'.

After all the information has been loaded for your dataset. Either passed on the command line as a matrix, or in a text file. Lottie Vectors displays inside a figure that you can resize, rotate, and turn 2D positions into a 3D picture with forces.

Check out the files on the official page have fun!

Charlotte Élisabeth Ameil - August 2018

( Manual 1.0 please lookout for the next version of these instructions, I had to rush a bit in writing these and am hoping to have something more polished soon!)

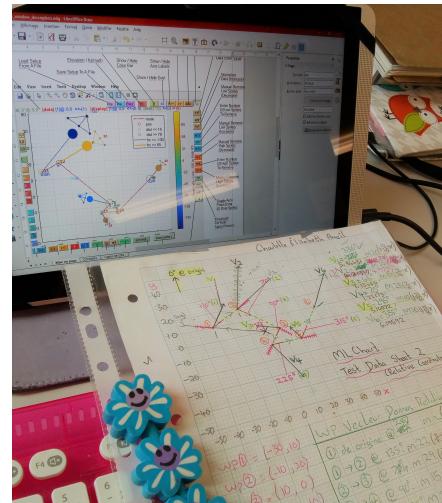
[twitter.com/mathlottie](http://twitter.com/mathlottie)

- download the latest version with the filename  
[Lottie Vectors.mlappinstall](https://github.com/lottiemath/lottie_vectors)  
in 'release\_current' at either

[https://github.com/lottiemath/lottie\\_vectors](https://github.com/lottiemath/lottie_vectors)

or

<https://sourceforge.net/projects/lottie-vectors/>



## Lottie Vectors – File Formats

```
=====
Example 1
=====
(Position vectors only with references)
33, 288, 1
22, 63, 0
79, 134, 0
15, 228, 3
20, 90, 4
29, 43, 2
```

By default the filenames location is wherever MatLab(tm) looks for files, this is probably the directory you loaded Lottie Vectors from. You can load in vectors right from the window, just click on the Load Vectors button at the bottom. If you cant see the button you may have to undock the figure window to get to a size where all the buttons are available.

The format of the file is CSV. This means there is only numbers sperated by commas, and no text. Save the file in .TXT format, use a text editor like Notepad to create the files.

Lottie Vectors regonizes a few different types of file and each is listed below. The reason for different types is to help speed up entering vectors. Each format adds another field giving you more flexibility in the type of data you want to use.

---

- **Format 1**

Simple Magitude and Degree Vectors

1 Magnitude of position 2 Degree of position 3 Magnitude of force 4 Degree of force

---

- **Format 2**

As format 1 but with a reference number at the end (see a later page for what the reference numbers display).

---

- **Format 3**

1 Position vector type 2 Position vector data 1 3 Position vector data 2 4 Force vector type 5 Force vector data 1 6 Force vector data 2

---

- **Format 4**

As format 3 but with a reference number at the end

---

## Lottie Vectors – File Formats Continued

A typical vector data file looks like the listing below

**6, 33, 5.00909, 3, -130, 40, 1**

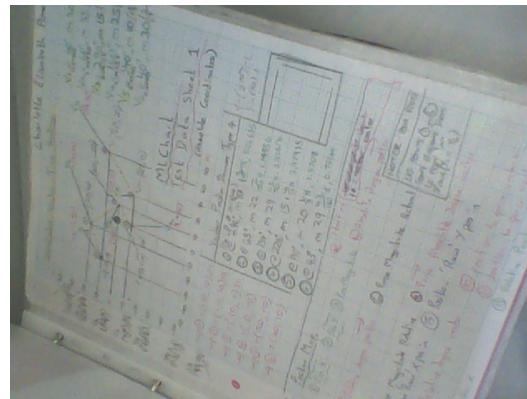
**6, 22, 2.35619, 3, 85, 60, 5**

**6, 79, 1.29154, 3, -55, 290, 5**

**6, 15, 1.57080, 3, 25, 160, 7**

**6, 20, 3.92699, 3, -10, 340, 8**

**6, 59, 5.49779, 3, 40, 40, 2**



Each line has the data for two vectors. The first is the position vector, and the second as a force vector. The format shown contains all the fields that could be used in a file.

The first column is the Vector Type for the position vector, then there is the magnitude, and in the 3rd column it's angle in radians.

The 4th, 5th, and 6th columns repeat the same information but for the force vector.

The final 7th column is a reference number that is shown onscreen. It's number refers to a table of symbols that could be displayed at the position.

### Vector Types

There are 6 different Vector Types or ways of expressing them. Some are common, others less so and are more for educational purposes as they are not really vectors !

There are two basic types. The vectors with magnitude and angle, either in degrees or radians. There are also two others where the vector's position is expressed in either fixed, or relative cartesian coordinates.

The Vector Type numbers are listed below and are seen in columns 1 and 4 or the example file above. You can mix types and change them at any point in the data.

### List of vector type numbers

**0 = ignore vector**

**1 = vector is a global cartesian coordinate as position**

**2 = vector is a relative cartesian coordinate to the position**

**3 = vector is a magnitude first then global angle in degrees**

**4 = vector is a magnitude first then global angle in radians**

**5 = vector is a magnitude first then relative angle in degrees**

**6 = vector is a magnitude first then relative angle in radians**

## Lottie Vectors – File Formats Continued

### Vector References for use in files

---

The following are the number to displayed results for the vector references in files. This is always the final column. You do not need to specify a reference, but if you do then you need to include one at the end of each line.

**0 = nothing is displayed**  
**1 = display the position vector number from the start**  
**2 = display the position number from last text**  
**(resets to 1 on any other input)**

<b>3 = start</b>	<b>21 = alpha (lower case)</b>
<b>4 = end</b>	<b>22 = beta (lower case)</b>
<b>5 = x</b>	<b>23 = gamma (lower case)</b>
<b>6 = X</b>	<b>24 = Alpha (upper case)</b>
<b>7 = o</b>	<b>25 = Beta (upper case)</b>
<b>8 = O</b>	<b>26 = Gamma (upper case)</b>
<b>9 = a</b>	<b>27 = delta (lower case)</b>
<b>10 = b</b>	<b>28 = phi (lower case)</b>
<b>11 = c</b>	<b>29 = omega (lower case)</b>
<b>12 = A</b>	<b>30 = Delta (upper case)</b>
<b>13 = B</b>	<b>31 = Phi (upper case)</b>
<b>14 = C</b>	<b>32 = Omega (upper case)</b>
<b>15 = i</b>	<b>33 = theta (lower case)</b>
<b>16 = j</b>	<b>34 = lambda (lower case)</b>
<b>17 = k</b>	<b>35 = sigma (lower case)</b>
<b>18 = I</b>	<b>36 = Theta (upper case)</b>
<b>19 = J</b>	<b>37 = Lamda (upper case)</b>
<b>20 = K</b>	<b>38 = Sigma (upper case)</b>

### Examples of vector files

The following are all entered in a basic Word Processor such as Notepad and then saved in .TXT format. When saving files the format might be shown as Raw, ASCII, Text or TXT in your word processor. You can find demo data online. See the back of the first page for web addresses. By default I chose to use the .dat extension to the datafiles but you can specify a .txt file if the .dat extension causes problems when editing.

<u>Default position only data</u>	<u>Position and Force data</u>	<u>Position, Force and References</u>
100, 45	3, 50, 90, 3, 20, 120	1, 30, 25, 3, 100, 90, 3
50,90	6, 100, 3.92699, 1, 50, 40	3, 50, 90, 3, -40, 80, 34
25, 180		
30, 12		
go 100 points @ 45 degrees	go 50 points @ 90 degrees	go to x=30, y=25
go 50 points @ 90 degrees	force of 20 points @ 120 deg	force of 100 points @ 90 deg
go 25 points @ 180 degrees		display the word 'Start'
go 30 points @ 12 degrees	go 100 points @3.92699 rad	go 50 points @ 90 deg
	connect 'force' to x=50, y=40	force -40 points @ 80 deg
	(the use of cartesien coordinates here is	display lower-case lamda
	obviously not a true vector, but it could be used	
	for particlar applications of data to be displayed)	

## Lottie Vectors - Position Map

The position map is a matrix of data that Lottie Vectors stores in the Matlab(tm) workspace after computing the vectors.

The data consists of cartesien coordinates of the vectors route, along with forces and copies of both sets of vectors magnitude and degrees.

A typical position map is shown below

### POSITION MAP DATA

```
position_map =  
Columns 1 through 10  
-31.5581 9.6481 33.0000 286.9997 286.9997 0 0 0 0 0  
-12.1334 19.9767 22.0000 61.9995 134.9997 -20.0000 -38.5437 40.0000 338.0005 12.8558  
42.7454 -36.8505 79.0000 135.9993 73.9998 85.0000 105.5644 60.0000 284.0007 73.6122  
31.9554 -47.2704 15.0000 225.9995 90.0002 -15.0000 -21.5754 290.0000 64.0005 -14.0954  
51.9524 -47.6193 20.0000 90.9994 225.0000 25.0000 33.9590 160.0000 69.0006 8.5505  
72.8131 -27.4740 29.0000 45.9996 315.0002 10.0000 14.0674 340.0000 294.0004 -3.4202  
0 0 0 0 0 30.0000 52.9813 40.0000 354.0004 19.2836  
Columns 11 through 13  
0 -31.5581 9.6481  
15.3209 19.4247 10.3286  
42.5000 54.8788 -56.8271  
5.1303 -10.7900 -10.4200  
-23.4923 19.9970 -0.3488  
9.3969 20.8607 20.1452  
22.9813 0 0  
  
Position Map Data:
```

This is a typical position map output for 6 vectors. The data is in column order as :

Column 1 : Position X Coordinate

Column 2 : Position Y Coordinate

Column 3 : Position Magnitude

Column 4 : Position Degree Absolute (Where 0 degree is  $x=x$   $y=+\infty$ )

Column 5 : Position Degree Relative (Where 0 degree is direction of last heading)

Column 6 : Force Magnitude Absolute

Column 7 : Force Magnitude Relative (Relative to force's direction with last heading and position magnitude)

Column 8 : Force Degree Absolute (Where 0 degree is  $x=x$   $y=+\infty$ )

Column 9 : Force Degree Relative (Where 0 degree is direction of last heading)

Column 10 : Position to Force vector tip X Coordinate

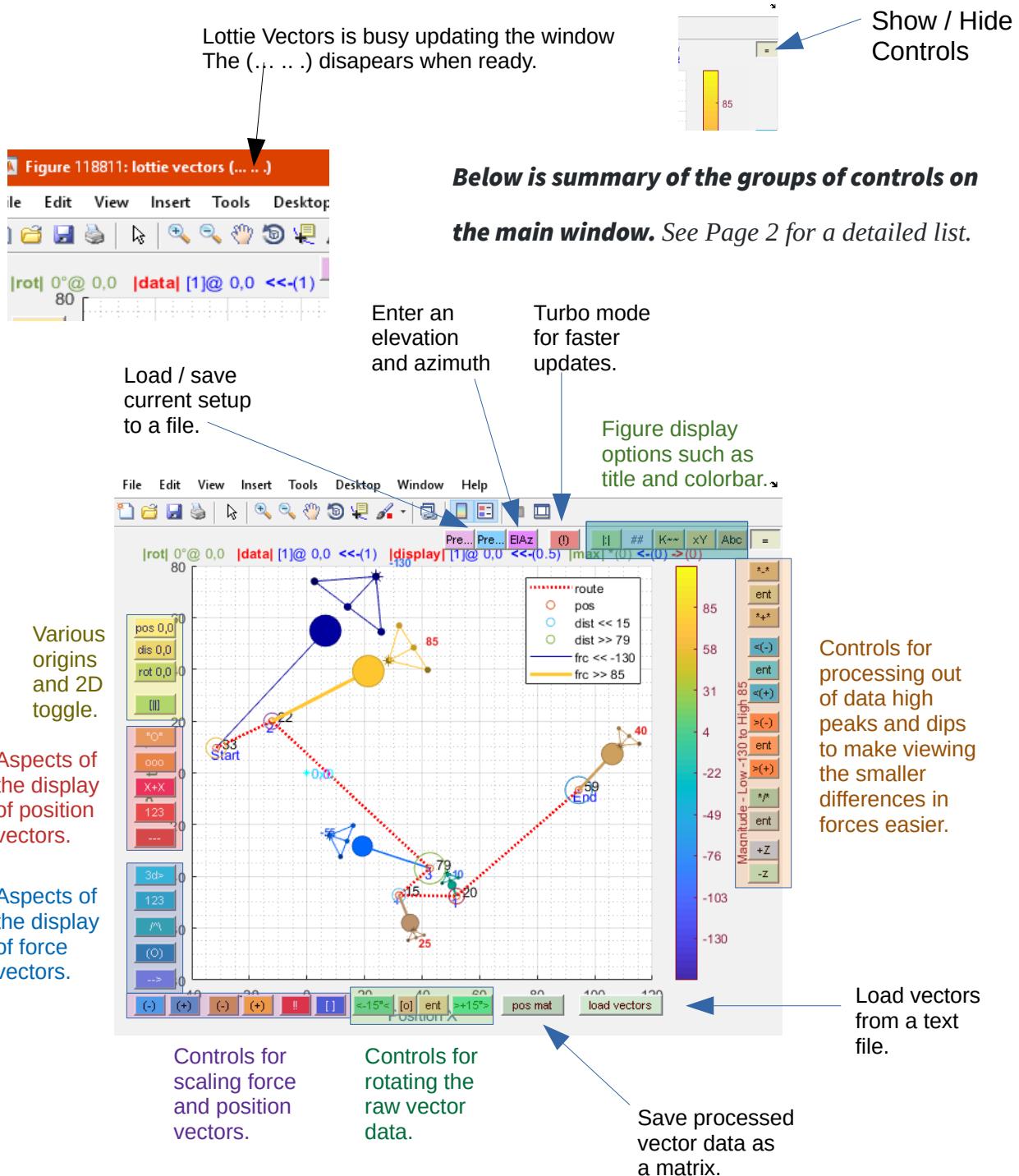
Column 11 : Position to Force vector tip Y Coordinate

Column 12 : Position relative X Coordinate (relative from the last position)

Column 13 : Position relative Y Coordinate (relative from the last position)

## Lottie Vectors - Quick Tour Summary of Main Window Controls

When you start Lottie Vectors it defaults to its built-in demo data. This gives you the chance to work with it right away! However you can load in your own vector data by clicking on the Load Vectors button on the bottom on the window. If you can't see the buttons you may need to undock and maximize the figure window. If there are no buttons around the figure window you'll need to click on the hide/show controls button inside the figure are the top right.

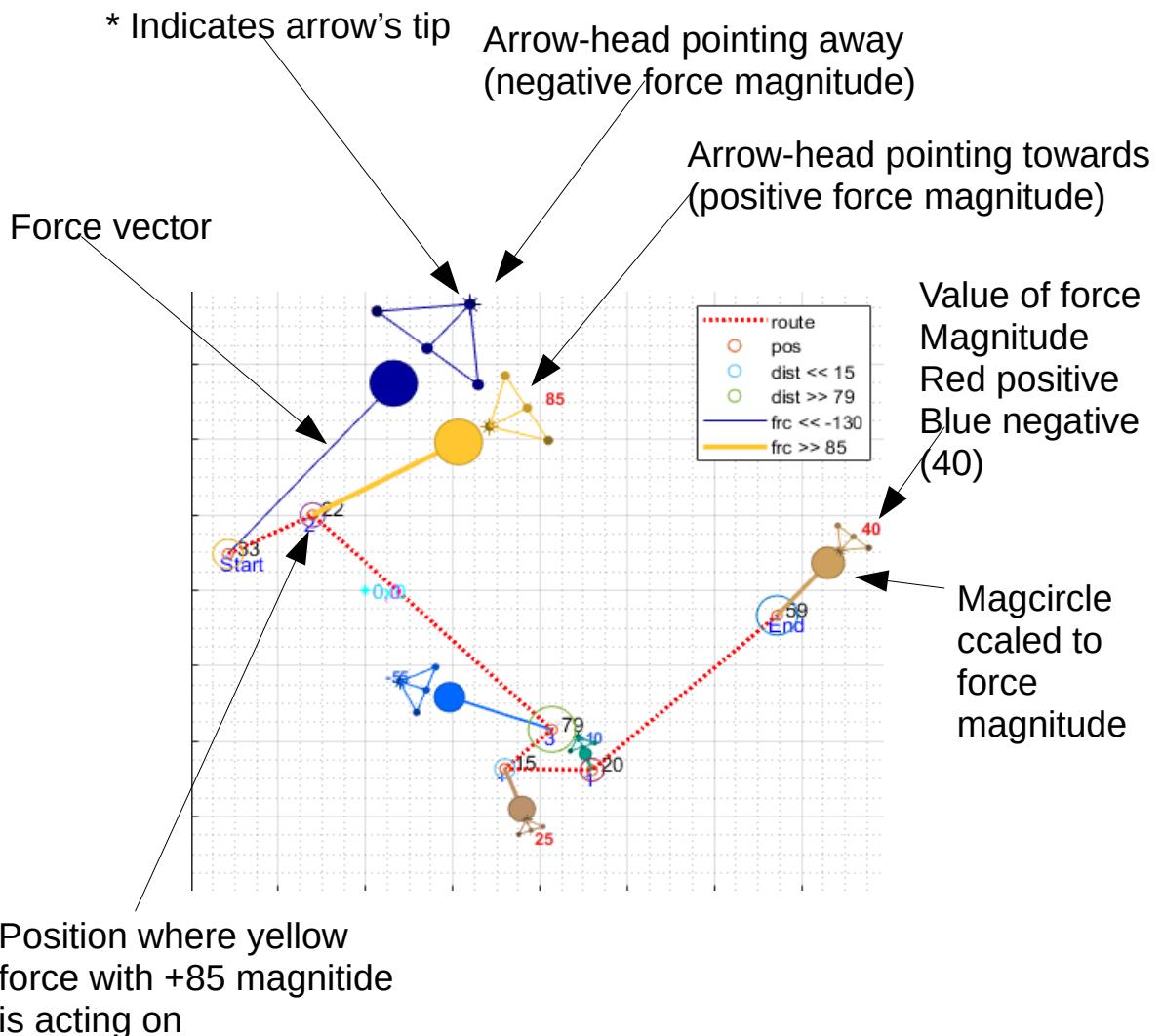


## Lottie Vectors - Quick Tour Displaying Forces

The program will try and fit all your vector data on one screen. You can choose to either use the normal methods of zooming in and out from the figure toolbar, or use the program's options. Many of the controls only effect the display of the vectors and not the vector data itself (if you wish to save the position map as a matrix changes such as the rotate buttons will be shown in what is saved).

Descriptions of the display, and what it shows, is given below. You can use the demonstration data at the start to explore.

**Below shows how force vectors are displayed**



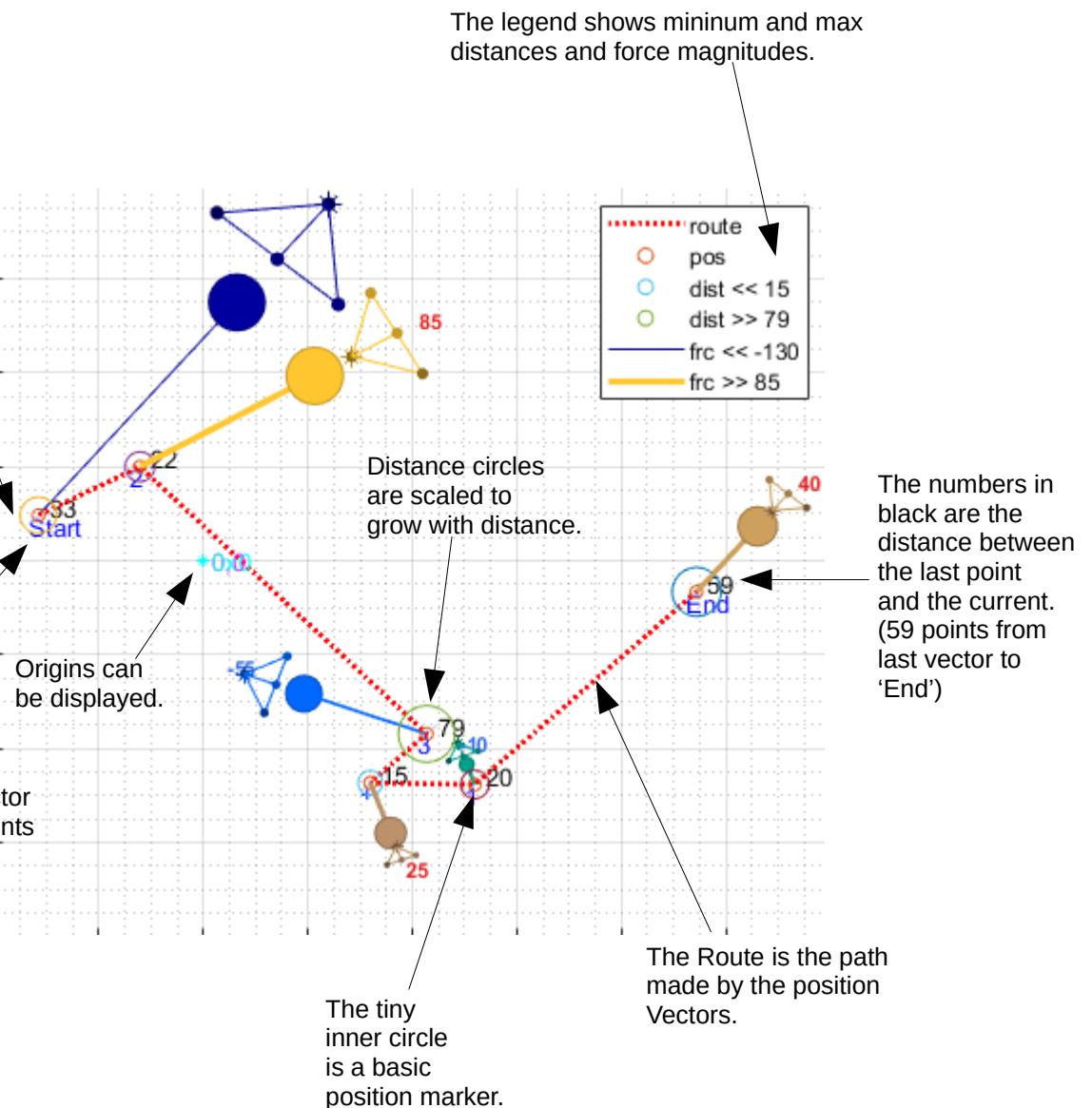
## Lottie Vectors - Quick Tour Displaying Positions

The positions can be displayed and a route mapped, or you can switch off the route leaving something like a vector field with only forces displayed from various positions. I tried to keep the program as flexible as possible so you could end up with some strange combinations !

**Below shows how Positions are displayed in the figure window.**

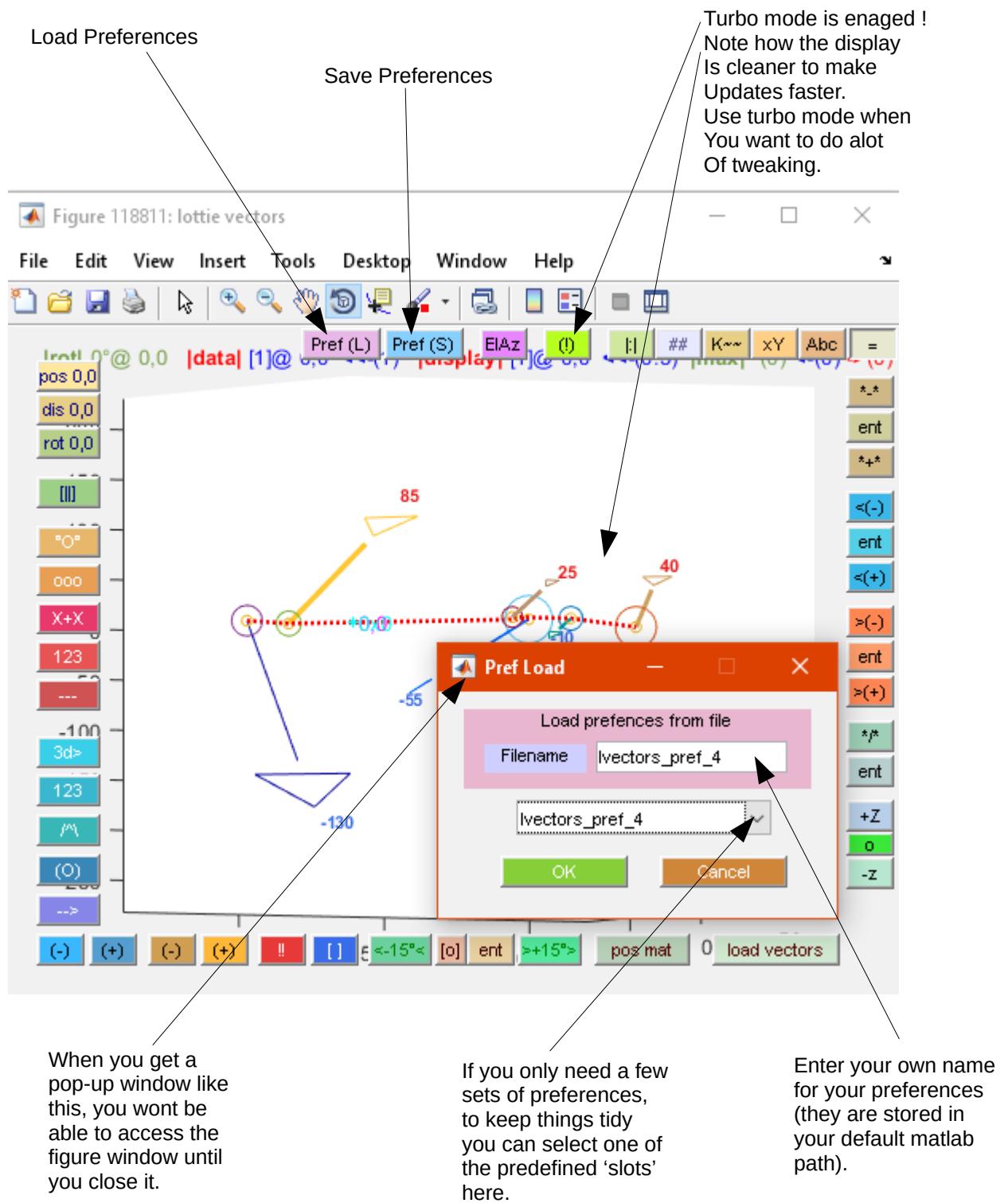
The word Start  
is an example  
of a position  
reference.

Here the 'Start' vector  
has traveled 33 points  
from the origin.



## Lottie Vectors - Preferences

When you have tweaked the display for your vector data you can save the setup in a file and recall it later. You can have multiple files with different preferences which can be loaded in on the main window.

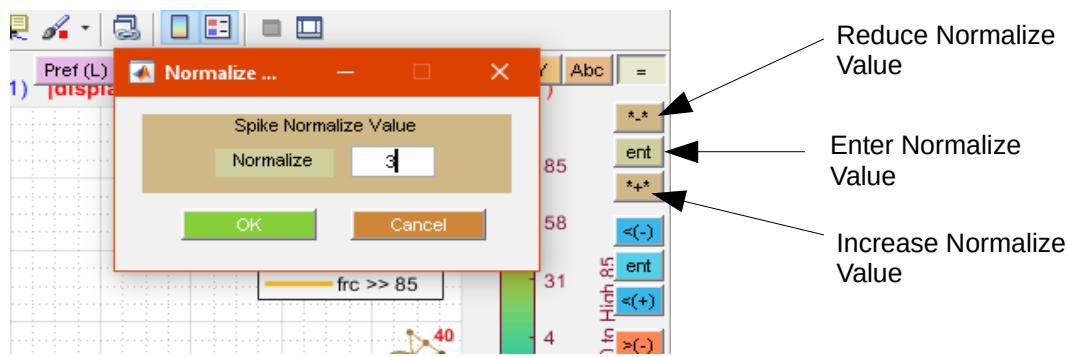


## Lottie Vectors - Data Processing / Smoothing Spikes

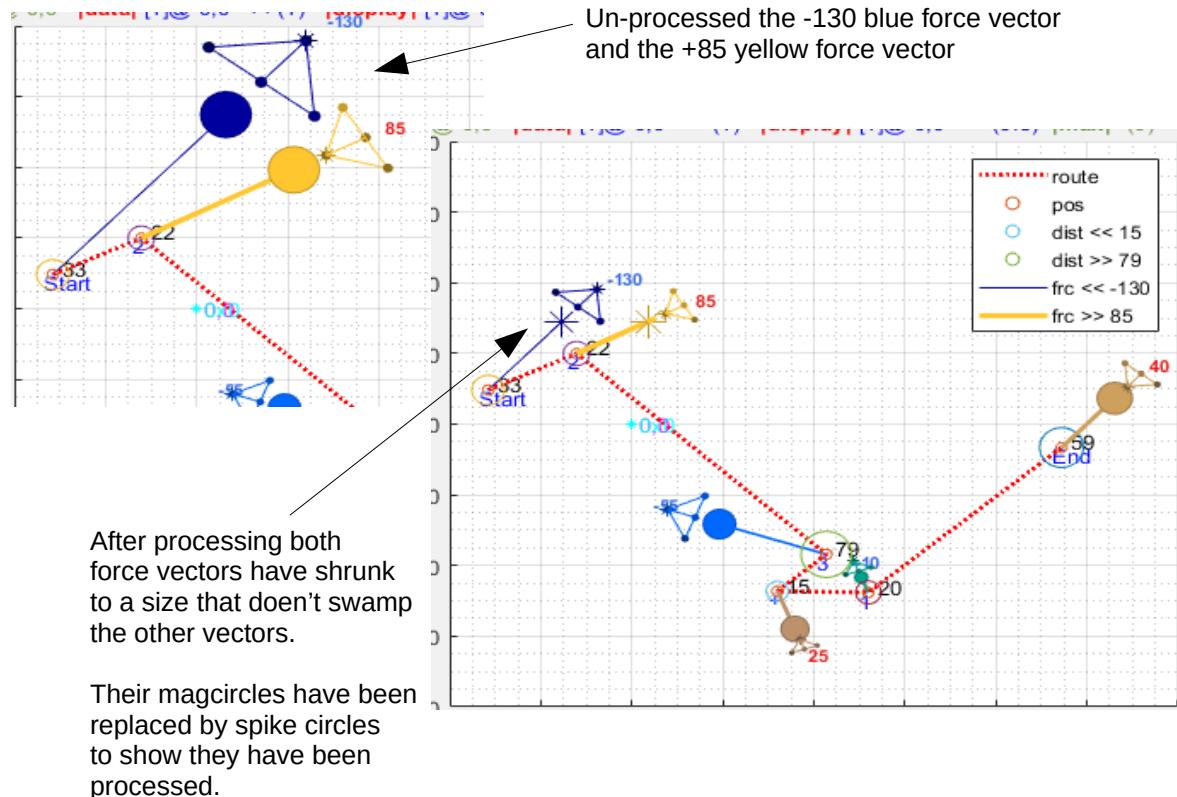
If you have a vector data where the majority of the force data is within a small range, but you have a few points where the magnitudes are much higher or lower. These kind forces can take up most of the display, making it harder to see trends in the rest of the data.

No fear ! Lottie Vectors has a handful of processing devices you can apply to your data directly from the window. Allowing you to smooth off the peaks and troughs and along with the other controls to explore and go deep !

**Normalizing trims off spikes from the top and bottom of the dataset starting with the largest. The value is the actual number of spikes to cut. Even if the spike isn't really a spike, normalize will go on until the value is reached.**

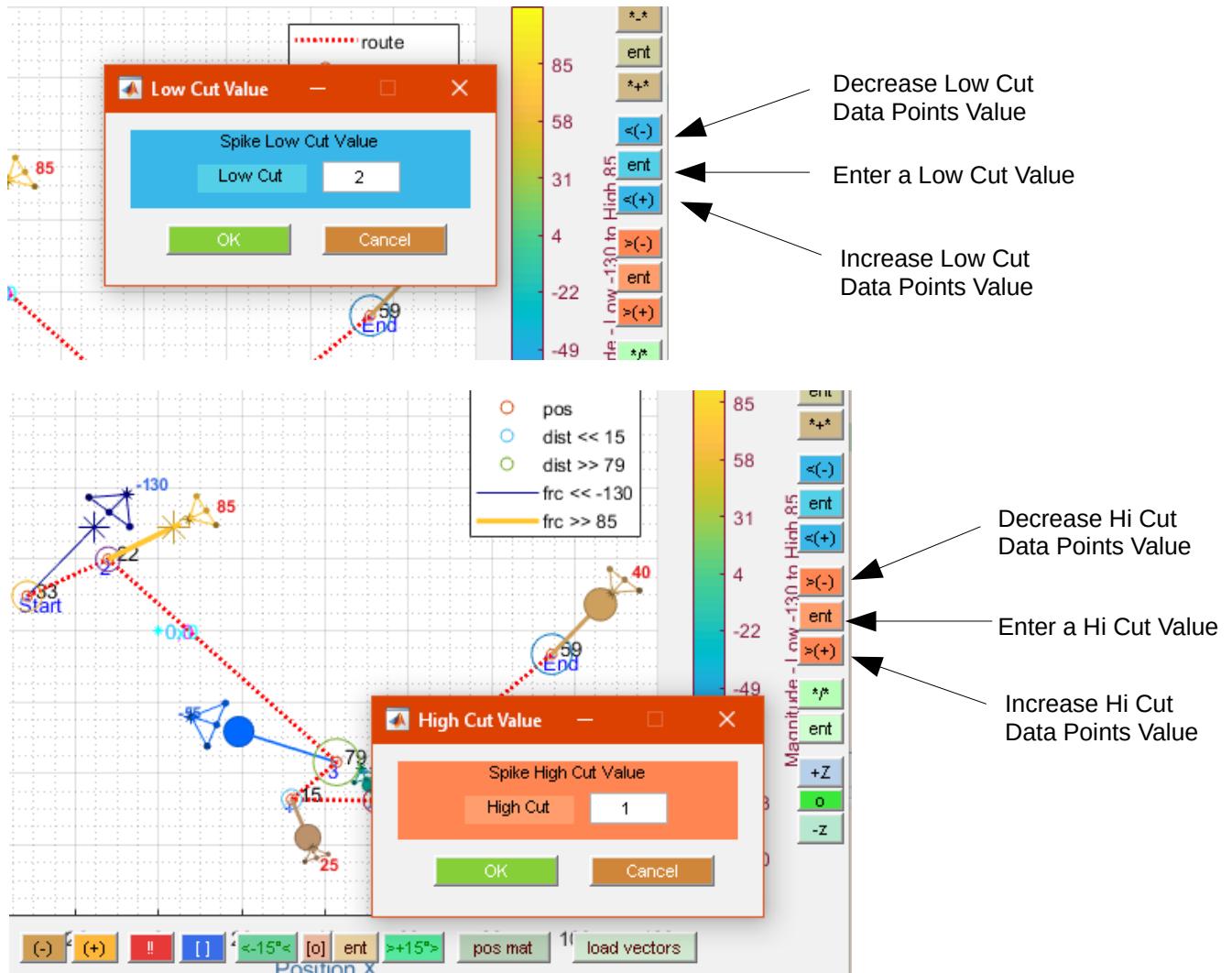


The results of methods of cutting is to remove the spike, keeping it's displayed magnitude, but giving it the length of the next greatest force vector.

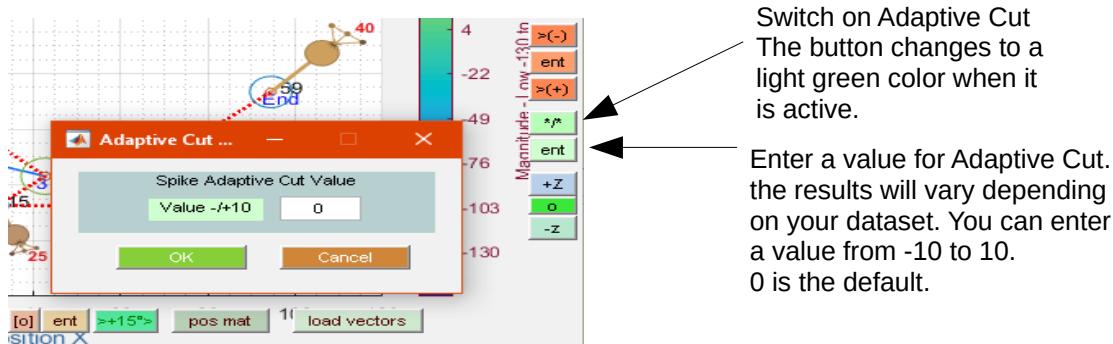


## Lottie Vectors - Data Processing / Smoothing Spikes Continued

**Hi and Low cutting removes data points ‘manually’ from the top end (Hi) or the low end (Low) of the dataset.**



You can combine all of the methods together. The order of processing is Normalize, Low Cut, High Cut and then the final Adaptive Cut, which is a more automatic method shown next.



Adaptive tries to ‘guess’ where the spikes are in your dataset. It’s in it’s first version here, but it can still be useful and is included in this version.

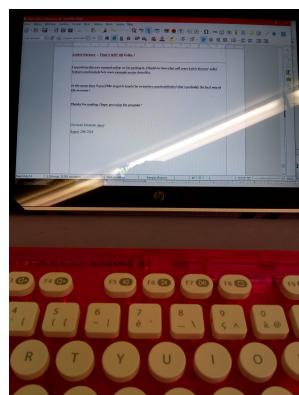
## **Lottie Vectors – That's NOT All Folks !**

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**I'm putting this user manual online as I'm writing it. I'll add sections that will cover Lottie Vectors' other features and include lots more example vector data files.**

**In the mean time if you'd like to get in touch I'm on [twitter.com/mathlottie/](https://twitter.com/mathlottie) that's probably the best way at the moment !**

**Thanks for reading, I hope you enjoy the program !**



*Charlotte Élisabeth Ameil*

*August 20th 2018*