Hello Daping,

Yes of course ! I attach the slide and the code. All was in pyqtrod so I put in in a separate file for you.  If you want to use the last version of pyqtrod let me know and I will clean it and upload it. A few notes :

1- For helicopters it's still better to use the arctan formula.

2- For trajectories which **are a circle**in the anisotropy space  but not centered, it is usually because of a  background. Just find the constant on each channel to be removed to center the circle and apply the arc tan. Tell me if you want code for that

3- For other tajectories (bretzel etc) you can use the attached code. It as four parts : **1**. averaging (100 points window by default), **2.**PCA, **3**. cycle detection, **4**. line fitting and **5**. phase assignment.

4- Parameters are on top of the files.

5- Cycle detection does not work all the time. So the code prints a debug file with the period in red like in the the file below. If yo are not happy with it, add a file named filename+"\_phase\_indices\_ui.txt" containing the indices for the start and end of the cycle and it will take those instead of trying to compute them.

A group of graphs and diagrams

AI-generated content may be incorrect.

This is still experimental, I aim to finish in a few weeks to publish the whole pipeline. Any suggestion for ameliorating the code is welcome if you want to paticipate !

Also as a quality check I advise you to look through to compare through the whole file X\_PCA[:,0] and smooth\_loop[phase[:]],[0]]. If they overlap reasonably well everywhere, it's good. I use pyqtrod for visualization because it allows browsing large files fast. Below are two good examples. The thrid one clearly has spurious phase jump. Maybe a drift broke it.

A screenshot of a computer screen

AI-generated content may be incorrect.A screenshot of a computer screen

AI-generated content may be incorrect.A screen shot of a graph

AI-generated content may be incorrect.

FINALLY, I didn't give you how to extract the speeds from the phase but I have several methods.

1. Most basic, simple convolution, typically up to 10.000 points. Will average the pauses with the speed ... 2. Change phi so that the speed does not depend on angle (non linearity correction). 3. Detect pauses . To do that I do non linear fitting of the phase, looking every where for the best "flat fit" rather than averaging all the speeds. It separates well traces alternating between pauses and high speeds. Tell me if you want to know more about it.

At the end all of those will work if you have traces of reasonable quality. If you have two golds, or a neighbor rotating, or huge drifts, it will always be hard to correct .

Keen on hearing your feedback !

Martin