ASEN 6060
ADVANCED ASTRODYNAMICS
Week 9 Discussion

Objectives:

- Further explore hyperbolic invariant manifolds of equilibrium points and periodic orbits
- Understand connection between theory and computational results

Question 1

Question 1: Assuming a correct implementation, how can you assess the accuracy of your numerical computations for:

1) The monodromy matrix
2) The eigenvalues of the monodromy matrix?

And when are the results ‘accurate enough’?

Group Brainstorming:

Question 2

Question 2: Consider a monodromy matrix generated along a periodic orbit with large T and close passes of the primaries. How could you potentially increase the accuracy of computing **M**?

Group Brainstorming:

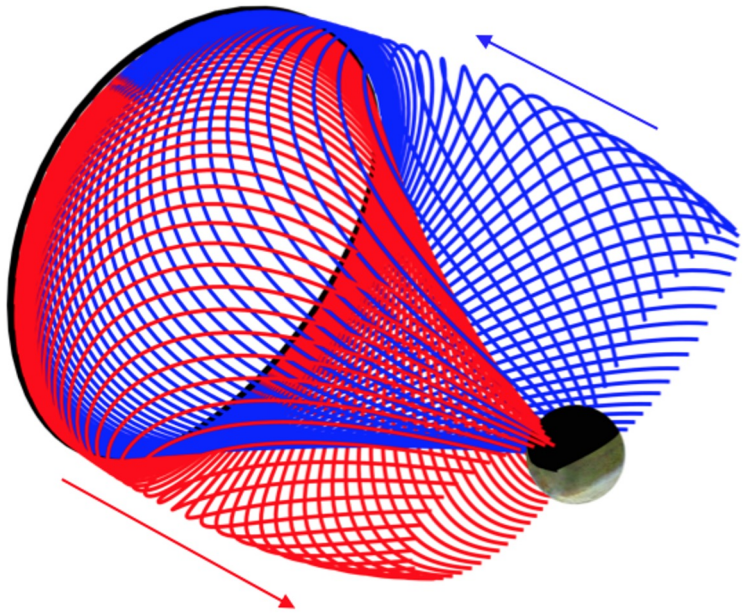
Question 3

In Homework 4, you are generating segments along the stable and unstable manifolds associated with a periodic orbit in the Earth-Moon CR3BP.

$$\bar{x}^S = \bar{x}_{PO} \pm d\bar{v}^S(\bar{x}_{PO})$$

$$\bar{x}^U = \bar{x}_{PO} \pm d\bar{v}^U(\bar{x}_{PO})$$

→ Requires selecting a value of *d*



Question 3: How can you justify that you are, indeed, generating a close approximation of the stable and unstable manifolds associated with a periodic orbit?

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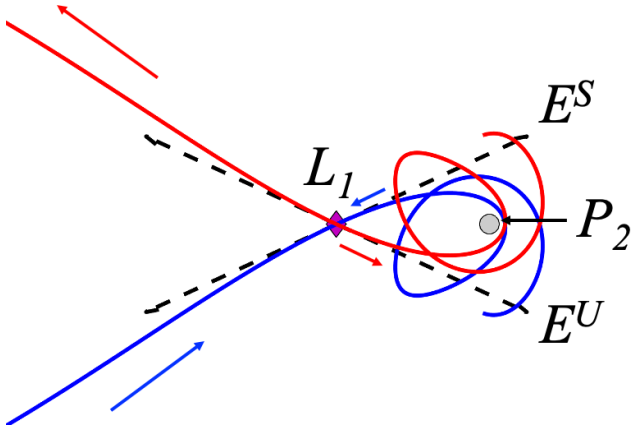
Group Brainstorming:

Question 4

Question 4: Why are the stable and unstable manifolds of EM L_1 symmetric about the x-axis?



Eigenvalues: +/-2.9321, +/- 2.3344i, **+/- 2.2688i**

Eigenvectors for in-plane stable and unstable modes (trunc.):

+2.9321: [0.29325, -0.13493, 0, 0.859815, -0.39562, 0]

-2.9321 : [0.29325, 0.13493, 0, -0.859815, -0.39562, 0]

Question 4

Question 4: Why are the stable and unstable manifolds of EM L_1 symmetric about the x-axis?

Group Brainstorming:

Question 5

Stable/unstable manifolds of periodic orbits approach them asymptotically.

Question 5: How can stable/unstable manifolds of two periodic orbits be useful in constructing finite time transfers between those two periodic orbits?

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Group Brainstorming: