Outline - APPM 5460 Proposal

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0.1   needs

- 2-4 pages

- Lit review

- dynamical system modeled by ordinary differential equations

- material from class

0.2   outline

- Intro (don)

  - In this proposal, we will be investigating homoclinic orbits in the Circular Restricted Three-Body Problem
  - (tie to competition history)
  - Homoclinic orbits are ...
  - They are important because ...

- History / Lit Review (luke)

  - Competition basics ... 4 problems
  - 1st problem was n-body problem
  - Poincare went for 3-body since it was the first unsolved... settled for CR3BP
  - (description of CR3BP) (Figure 1)
  -
  - $\ddot{x} = 2\dot{y} + x - (1 - \mu)\left(\dfrac{x + \mu}{R_1^3}\right) - \mu\left(\dfrac{x - 1 + \mu}{R_2^3}\right)$

    $\ddot{y} = -2\dot{x} + y\left(-\dfrac{1 - \mu}{R_1^3} - \dfrac{\mu}{R_2^3} + 1\right)$

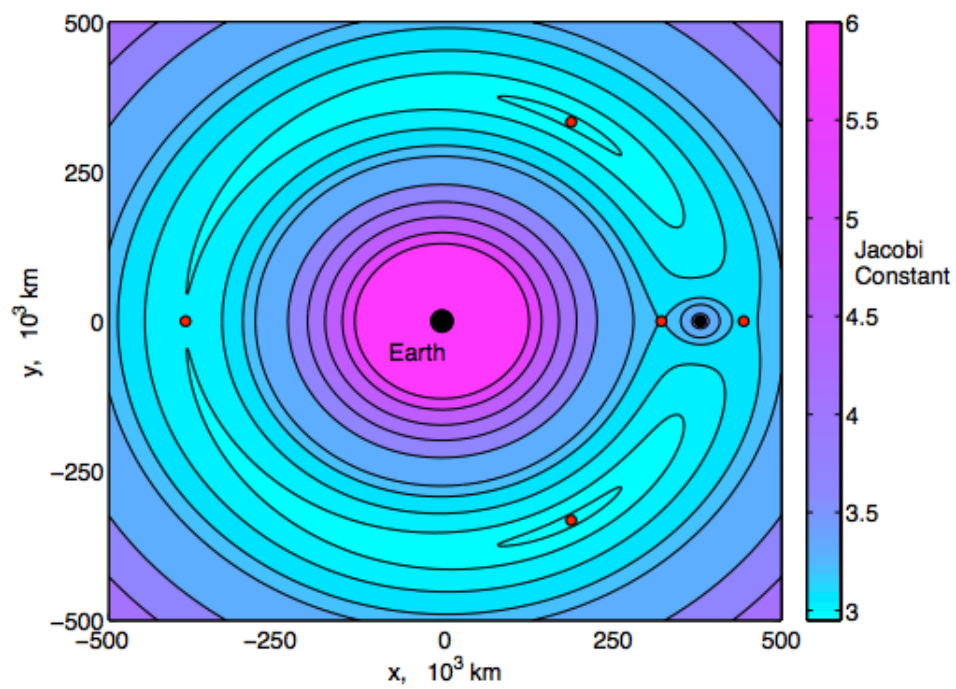 $\ddot{z} = z\left(-\dfrac{1 - \mu}{R_1^3} - \dfrac{\mu}{R_2^3}\right)$

Figure 1: CR3BP (from CU CR3BP handout)

- – (a bit on the error ... discuss the math)
- – as a result, found homoclinic points/orbits

- • Application
  - – Much research has been conducted in this field since (references, references, references)
  - – (pg 72+ of book)
  - – we will look at / recreate Poincare's work
  - – we will create homoclinic orbits in the CR3BP using intersections of stable and unstable orbits in Poincare plots

[1]

References

[1] Lo M. Marsden J. Ross S. Sang Koon, W. *Dynamical Systems, The Three-Body Problem, and Space Mission Design.* Marsden Books, 2011.