Outline - APPM 5460 Proposal

Luke Bury & Don Kuettel

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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
  - 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
  - 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)
  - $\ddot{x} = 2\dot{y}+x+\left(\frac{1-\mu}{r_1^3} - \frac{3R_1^2 J_{2,1}(1-\mu)}{2r_1^7}(5z^2-r_1^2)\right)(x_1-x)+\left(\frac{\mu}{r_2^3} - \frac{3\mu R_2^2 J_{2,2}}{2r_2^7}(5z^2-r_2^2)\right)(x_2-x)$

    $\ddot{y} = -2\dot{x} + y\left(-\frac{1-\mu}{r_1^3} - \frac{\mu}{r_2^3} + \frac{3R_1^2 J_{2,1}(1-\mu)}{2r_1^7}(5z^2-r_1^2) + \frac{3\mu R_2^2 J_{2,2}}{2r_2^7}(5z^2-r_2^2) + 1\right)$

    $\ddot{z} = z\left(-\frac{1-\mu}{r_1^3} - \frac{\mu}{r_2^3} + \frac{3R_1^2 J_{2,1}(1-\mu)}{2r_1^7}(5z^2-3r_1^2) + \frac{3\mu R_2^2 J_{2,2}}{2r_2^7}(5z^2-3r_2^2)\right)$

  - (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