

**Statement of Work for
Research in Industrial Projects for Students ("RIPS") Summer Project/Task**

Project Title: Long-Term Behaviors of Trajectories that Impact a Sphere in R3

Project Timeframe: The work will be performed during the period June 27-August 27, 2004

Project Description:

Given a sphere in R3 (such as the surface of a planet) around the smaller body in the restricted 3 body problem (R3BP), for an interval of energy levels, what are the long-term behaviors of trajectories that impact that sphere? The tasks would be to accomplish the following:

1. Theoretical Background: Study and report on the McGehee analysis of the singularity in R3BP. This may help us classify solutions.
2. Perform numerical exploration of the global families of long-term trajectories emanating from the sphere. E.g., select solid spheres in phase space (6D) around points on the planet surface and integrate them forward and see what patterns they leave.
3. Study and on a best effort basis implement Item 2 on a parallel machine or a distributed system.
4. Use OpenInventor (a very high level, free, 3D visualization language) to provide 3-D visualization of the results.

Project Staffing: Overall direction of the project would be by Dr. Martin Lo. Student mentoring would be provided by Benjamin Villac from Caltech. Administrative support, student selection and other miscellaneous tasks will be performed by the scientific and administrative staff of the Institute for Pure and Applied Mathematics at UCLA.

Deliverables: There are two primary deliverables for the Project:

Oral presentation of research and results to the other teams, mentors and director on Projects Day. This report is a Powerpoint (or equivalent) presentation shared by the 4 members of the team, each member contributing approximately 5 minutes to the total. Projects Day will be on August 20, 2004

Final Report and Presentation.

Written report providing information on the background, actual research, results and associated information about the project. It is done as a team and submitted to IPAM on August 27, 2004.