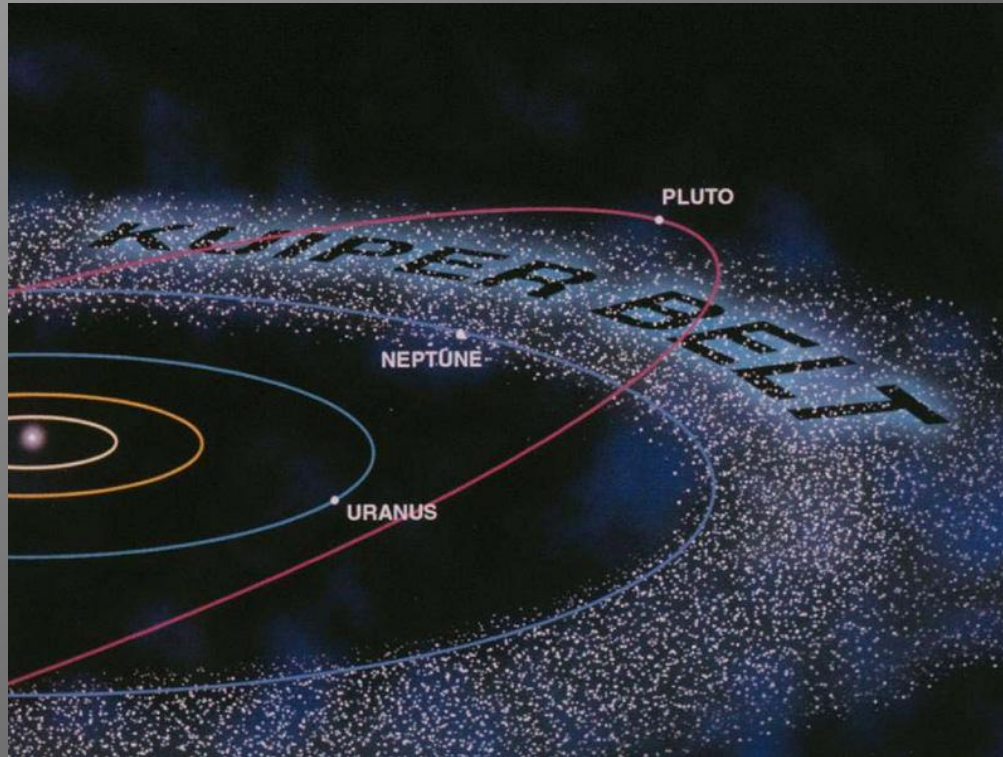# Team Andromeda
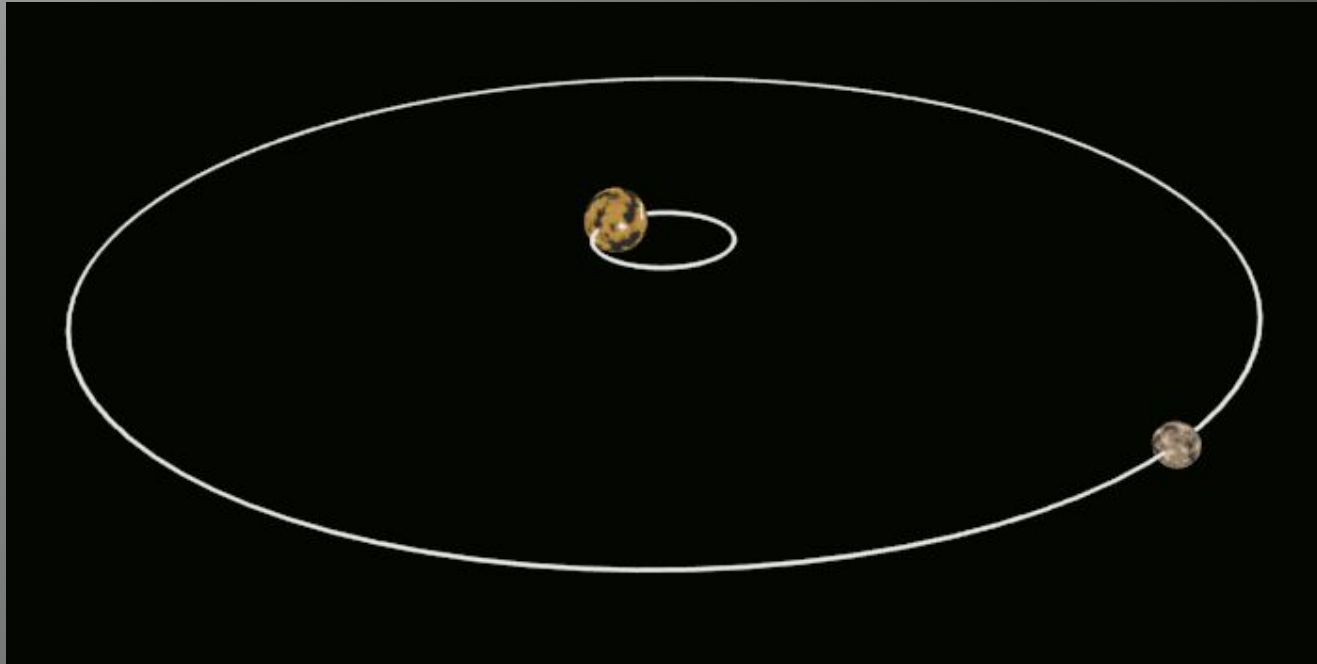
Team Members: Matthew Amato-Yarbrough, Batai Finley, John Jacobelli, Bradley Kukuk, and Jessica Smith

Team Mentor: Isaac Shaffer
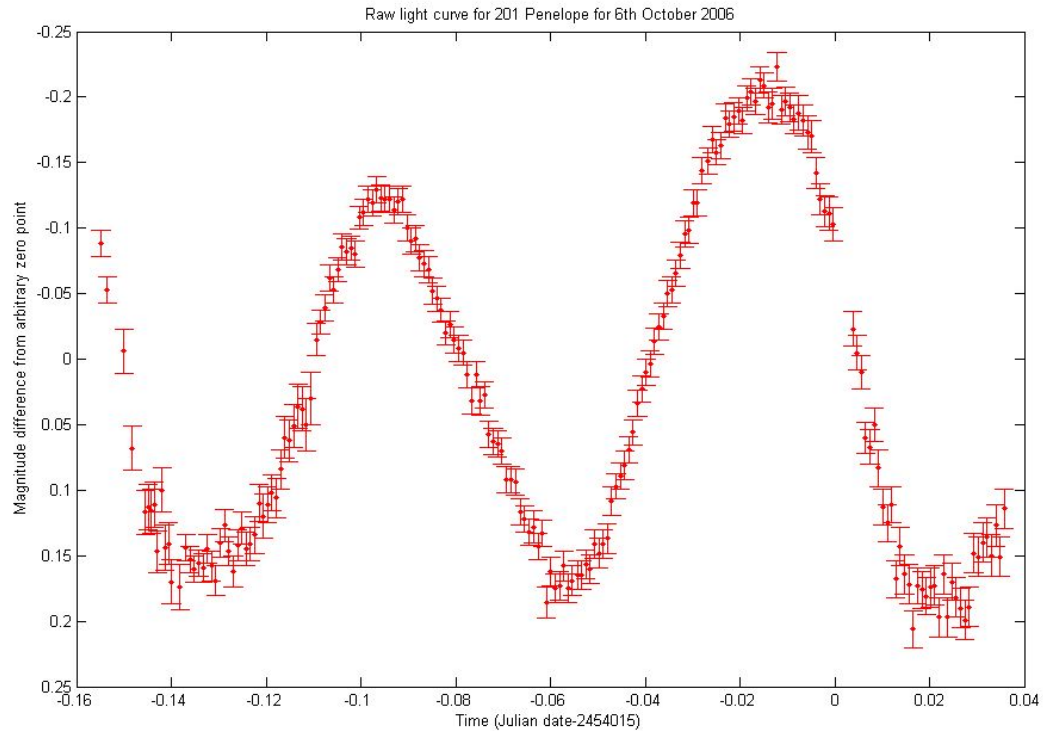
The Kuiper Belt

Model of a Binary System (Pluto and Charon)
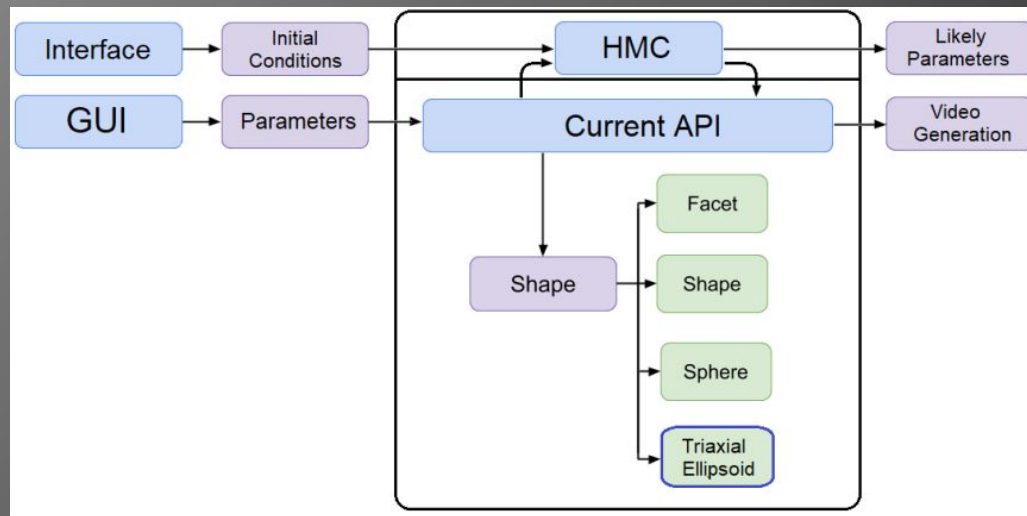
Light Curve

Problem Statement

- Numerous parameters must entered on a command line

- The current solution needs a middle ground between the runtime and accuracy of simulations

- Our clients need a way to determine best fit parameters based upon observed parameters
- The current solution lacks the ability to create animations from rendered images

Solution Overview

- Implement HMC

- Accelerate forward model

- Create GUI for parameter input

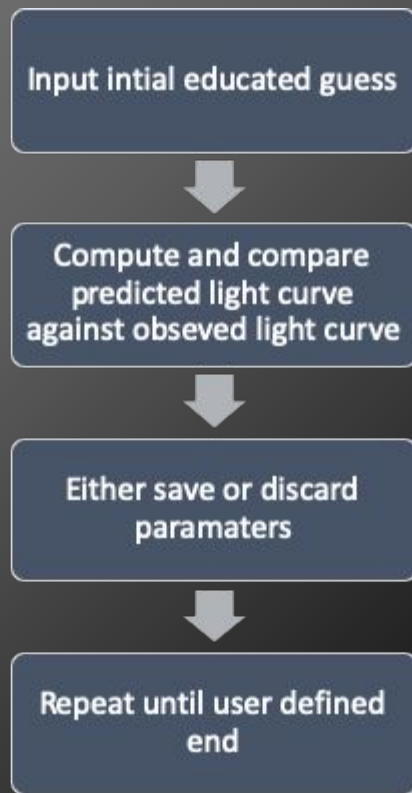- Integrate video generator

Key Requirements Overview

- GUI for the Forward Model

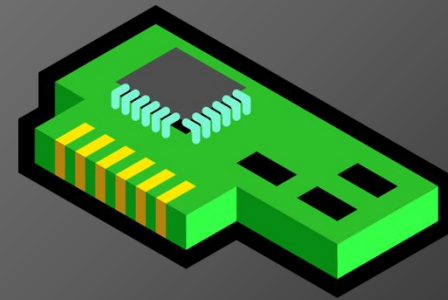- API Acceleration

- Hamiltonian Monte Carlo

Key Requirements: HMC

- Produce likely parameters that best fit the observed light curve
  - Comparing parameters to find possible solutions
  - Way of annealing extreme solutions

- Display the range of solutions using a model
  - Visualizing the solutions using a Corner Plot

- Saving the produced solutions to an external file
  - Data produced by the algorithm is saved to a data file, such as a .csv file

Input intial educated guess

↓

Compute and compare predicted light curve against obseved light curve

↓

Either save or discard paramaters

↓

Repeat until user defined end

Risks and Feasibility

Challenge	Severity (1 - 10)	Likelihood (.01-.99)	Risk Value	Mitigation
Scope Expansion: Shape Class	3	.4	1.2	Not a problem
Scope Expansion: Cluster Parallelization	5	.8	4.0	Modular design
HMC: Learning Curve	9	.99	8.91	Heavy communication
Triaxial Ellipsoid: Rotation	8	0.1	.8	Not a problem

Schedule
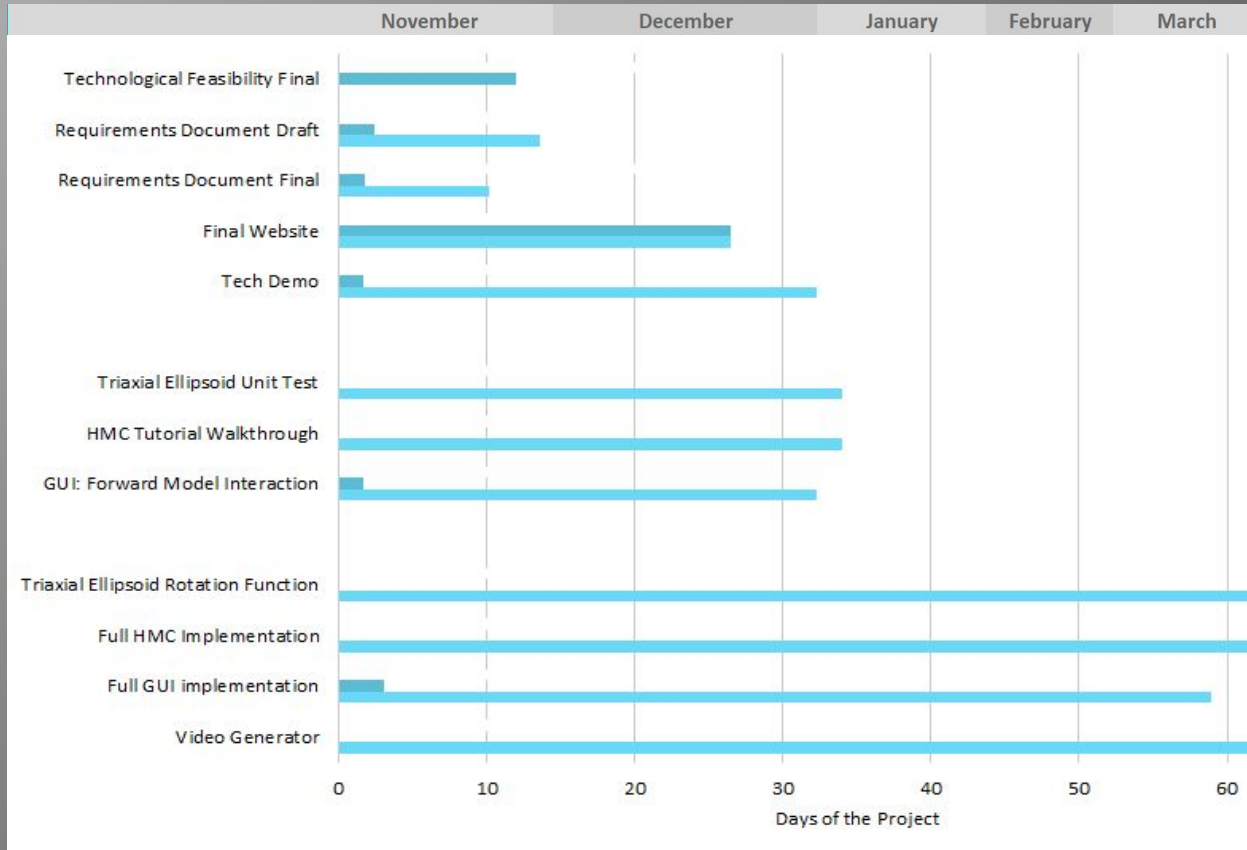
- Documentation

- Tech Demo

- Alpha Prototype
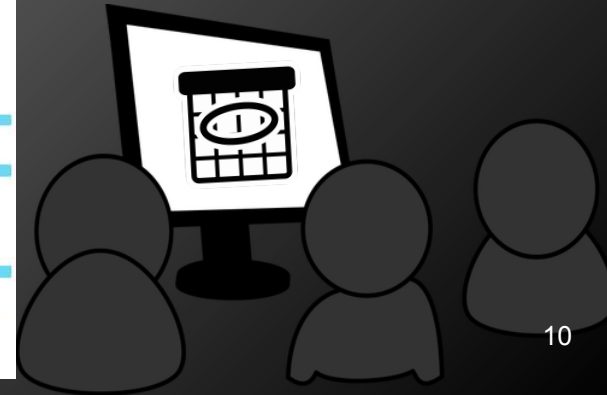
Conclusion

- Space and the Unknown

- Improve, Accelerate, Compare

- Ready for the challenge

Discovery Channel Telescope