



HASKELL SPACEFLIGHT WORKSHOP JONATHAN MERRITT & LUKE CLIFTON 2019

💶 HASKELL SPACEFLIGHT WORKSHOP I

DEPENDENCIES

The workshop is on GitHub, but has many dependencies:
https://www.github.com/lancelet/space-workshop
stack will fetch and build dependencies (slowly)
Docker image available on USB flash drives



Main objectives:

- Solve spaceflight problems
- Promote numerical programming to FP people
- Get feedback on ideas and approaches

General approach:

- "Traditional" ODE solving, but with Haskell
- Initial value problems
- Engineering focus:
 - Development and interpretation of ODEs
 - Rich states, with typed vector components
 - Units (example only)
 - ODEs include control signals



Outline:

Introduction to numerical integration of ODEs

- Euler's method
- 4th-Order Runge Kutta
- Apollo lunar ascent guidance example
- Tsiolkovsky Rocket Equation
 - Propellant mass fraction / mass budget
 - Specific impulse
 - Staging example
 - Tsiolkovsky Rocket Equation
- Hohmann transfers
 - Kepler's Problem and Keplerian Motion
 - Instantaneous impulse approximation
 - Finite impulse numerical simulations
- Suggestions for further projects