Carl De Vries

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EDUCATION

Master of Engineering, Aerospace Engineering Expected: December 2021
Bachelor of Science, Aerospace Engineering May 2020
Iowa State University College of Engineering | Ames, IA
Graduate GPA: 4.00
Undergraduate GPA: 3.85
Senior Overall Academic Achievement Award

EXPERIENCE

Earth, Moon, and Mars GN&C Graduate Intern
The Charles Stark Draper Laboratory, Inc | Houston, TX June 2020 - August 2020
- Recommended safe lunar landing site selection algorithm inputs to satisfy broad mission objectives
- Developed a safe lunar landing site selection algorithm for the ispace autonomous lunar lander
- Implemented a selection algorithm with mission customized objective and weighting capabilities
- Developed tunable cost functions to capture geographic hazards as a function of distance using cost maps

Research Intern
MIT Lincoln Laboratory | Lexington, MA May 2019 - August 2019
- Implemented a 3 degree of freedom missile model and integrated it into an aircraft engagement simulation
- Updated the engagement simulation from a 2-D flat Earth model to a 3-D spherical Earth model
- Implemented proportional navigation, gravity bias, and lofting schemes for missile guidance

Engineering Co-op
The Charles Stark Draper Laboratory, Inc. | Cambridge, MA January 2018 - July 2018
- Implemented guidance computer simulation software in MATLAB and Simulink
- Verified performance characteristics between system level models and engineering level gyroscope models
- Integrated a new gyroscope model into a system simulation and generated data for performance verification
- Automated data analysis and unit tests to verify a gyroscope model's scale factor and bias implementation

Software Engineering Co-op
Collins Aerospace (formerly Rockwell Collins) | Cedar Rapids, IA January 2017 - August 2017
- Verified functional and DO-178B Level A compliance for 75 upgraded Simulink models (2007a - 2016b)
- Developed graphical and functional flight display software using Simulink and Simulink Coder
- Decreased build times via script enhancements which omitted unchanged models from the build process

PROJECTS

Guidance and Navigation of Aerospace Vehicles
- 3DoF Mars entry simulation using two-phase Zero-Effort-Miss/Zero-Effort-Velocity (ZEM/ZEV) guidance
- Ballistic missile intercept simulation using true, pulsed proportional navigation and ZEM guidance
- Orbital rendezvous using Clohessy-Wiltshire equations, linearized perturbed guidance, and ZEM/ZEV
- Strapdown inertial navigation IMU simulation verified using 3DOF Mars entry flight dynamics

Random Signals Analysis and Kalman Filtering
- Kalman Filter estimation of four aircraft longitudinal states from two measurements using elevator input
- Extended Kalman Filter estimation of two-dimensional motion model

Automatic Control of Flight Vehicles
- PID and LQR controller design for longitudinal and lateral modes of a Cessna T-37 (Simulink)

Advanced Engineering Dynamics
- Space-based solar power satellite in a gravity gradient with quaternions and modified Rodrigues parameters
- Nonlinear Lyapunov feedback controller developed for satellite pointing and attitude disturbance rejection
- Developed EoM using D'Alembert's principle, Lagrange's equation, and Hamilton's principle

Astrodynamics II
- Orbital insertion simulation and trajectory design for a two stage, solid-fuel gravity turn rocket
- Lunar free return trajectory simulation using circular, restricted three body (CR3BP) dynamics

Spacecraft Dynamics and Control
- Three-axis quaternion feedback CMG controller for satellite multi-target rest-to-rest maneuvers

Additional Projects
- Black Brant sounding rocket simulations to analyze single and multi-stage motor performance (C++)
- Runge-Kutta-Fehlberg (RK45) adaptive step-size integrator verified using CR3BP solution (C++)
- Developed an autonomous vehicle to navigate around a 12 foot track 5 times in 60 seconds (C++)

Current Coursework

- **Orbital Mechanics**
- **Remote Sensing Technologies**
- **Multi-Disciplinary Optimization**
- **Computational Methods for Fluid Mechanics and Heat Transfer**

ORGANIZATIONS

ISU Spaceflight Operations Workshop — August 2018
Vermeer International Leadership Program — August 2018 - May 2019
NASA National Community College Aerospace Scholars — September 2013 - February 2014