

Joey Carpinelli | Technical Résumé

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Professional Experience

GN&C Engineer @ NASA Johnson Space Center (JSC) July 2021 — Present

- Supports Orion's Launch Abort System GN&C development, analysis, and verification
- Reduced, analyzed, and implemented flexible body (structure) model (MATLAB, C++)
- Uses monte-carlo simulations for parameter tuning; improved vehicle performance noticeably
- Uses linear analysis to analyze vehicle performance, verify stability margins; validates linear models
- Serves as backup regression data approver for simulated Orion Launch Abort System performance
- Led development for polarity tests; created novel 6DOF kinematics simulation (Julia, Python); represented Orion GN&C at multiple lab tests in three states: Texas, Colorado, Florida

Research Assistant @ Space Systems Laboratory (SSL) August 2019 — May 2021

- Graduate Assistant under Dr. Dave Akin; led manipulator software development (C++)
- Developed novel Julia package to generate symbolic manipulator kinematics models; implemented and merged required changes to `ModelingToolkit.jl`; intermediate Jacobian performance substantially improved over Orocos iterative solvers; implemented fast inverse-kinematics algorithm
- Created C++ templates, and controller implementations, including force/torque and Cartesian control
- Maintained operator GUI for all manipulators; primary operator for neutral-buoyancy testing
- Maintained neutral buoyancy facility as diver; received open water certification in 2017

Inertial & Viscous Friction Compensation Project January 2017 — August 2017

- Independent study to implement Dr. Carignan's inertial and viscous friction compensation for Maryland-Georgetown-Army (MGA) exoskeleton within SSL; used Galil, Python, ROS, UART

Intern @ Harris Corporation May 2016 — August 2016

- Automated Excel task with VBA; 20 worker hours → 2 minute runtime
- Worked with one other intern to implement rain attenuation ITU Propagation Model; MATLAB functions written to implement model calculations, C# used to gather terrain data

Intern @ SRI International May 2015 — December 2015

- Collected and annotated data to train deep-learning algorithms; improved process with scripting
- Designed LED Array and circuit layouts for gaze tracking project using Eagle CAD

Education

M.S. in Aerospace Engineering @ University of Maryland

- Research assistant under Dr. Akin; space robotics (manipulator) software lead, primary operator
- Halo orbit & invariant-manifold research project with Professor Barbee; released as open source tools
- Emphasis in space systems, prioritized dynamics & controls in coursework

B.S. in Electrical Engineering @ University of Maryland

- Emphasis in control theory, prioritized software in coursework through four computer science classes
- Undergraduate Research Assistant under Dr. Akin at SSL; manipulator software lead as junior

Technical Skills

Computer Programming

- Productive in C++, used for robotic manipulator control software
- Experienced with Julia, used for astrodynamics research; hobbyist FOSS
- Experienced with Python, used for post-simulation analysis & scripting at NASA JSC; hobbyist FOSS

Circuit Design

- Undergraduate digital & analog lab experience, including Verilog, SPICE, PSpice, Xilinx, oscilloscopes
- Internship experience using Eagle CAD to design PCB for gaze-tracking project

Modeling & Simulation

- Experienced with linear model reduction, linear analysis, and nonlinear analysis methods

FOSS Projects

SolarSystemSurrogates.jl

An ongoing experiment that I'm excited about. This package will provide surrogate models for solar system ephemeris data. Fingers crossed!

AstrodynamicalModels.jl

Model generation — with optional state transition matrix dynamics — through `ModelingToolkit.jl`.

GeneralAstrodynamics.jl

General calculations, visualizations, iterative & analytical periodic orbit solvers, and orbit-manifold solvers.

HorizonsAPI.jl

A word-for-word wrapper for the JPL Horizons REST API. Fetch solar system ephemeris for free!

HorizonsEphemeris.jl

A user-friendly wrapper around the word-for-word wrapper for the JPL Horizons REST API.

PolynomialGTM.jl

Implements publicly available polynomial models for NASA's Generic Transport Model using `ModelingToolkit.jl`.

module-hygiene

Provides an `__export__` key, and an associated `cleanup` function to reduce namespace clutter.

block-scopes

Provides a single context manager, `only`, which creates block-style scopes within Python. This package isn't unique — it's just for fun!

rich-admonitions

Extends the excellent terminal formatting package `rich` with Julia-style Markdown admonition blocks!

Social Media

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