Joseph D. Carpinelli

Technical Résumé
https://resume.loopy.codes

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Professional Experience

NASA Johnson Space Center (JSC)
August 2017 — Present
Integrated GN&C Analysis Engineer, Pathways Intern, USRA Intern
- FTE in July 2021; supported Orion's Launch Abort System GN&C development, analysis, verification
- Integrated flexible structure model with linear and nonlinear simulation frameworks (MATLAB, C++)
- Used massively parallel monte-carlo simulations with `slurm`; improved vehicle performance
- Used linear analysis to analyze vehicle performance, verify stability margins; validates linear models
- Served 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
- Developed LaTeX packages and classes to improve technical writing workflows

Space Systems Laboratory (SSL)
August 2016 — May 2021
Graduate Research Assistant, Undergraduate Research Assistant
- Led core robot software development (C++, ROS) as Graduate Assistant under Dr. Dave Akin
- Developed novel Julia package to generate symbolic manipulator kinematics models; implemented and merged required changes to `Symbolics.jl`; intermediate Jacobian performance substantially improved over **Orocos** iterative solvers; implemented improved inverse-kinematics algorithm
- Created C++ interfaces (templates) and implementations for control, including force/torque control
- Maintained operator GUI (Python); diver for Neutral Buoyancy Research Facility Maintenance

Harris Corporation
May 2016 — August 2016
Electrical Engineering Intern
- 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

SRI International
May 2015 — December 2015
Data Annotation Intern
- 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. Aerospace Engineering
May 2021
University of Maryland, College Park
- Research assistant under Dr. Akin; space robotics (manipulator) software lead, primary operator
- Halo orbit & invariant-manifold research project with Instructor Barbee; now open source
- Emphasis in space systems, prioritized dynamics & controls in coursework

B.S. Electrical Engineering
May 2019
University of Maryland, College Park
- Four control theory courses, four computer science courses; major emphasis in control theory
- Undergraduate Research Assistant under Dr. Akin at SSL; ROS/Orocos software lead in third year
- Implemented inertial and viscous friction compensation for SSL's MGA Exoskeleton (Galil, UART)

Technical Skills

Computer Programming
- Experienced Julia & Python developer; aerospace dynamics, simulation, and analysis applications
- Experienced C/C++ developer; robot core software, dynamical simulation applications
- Currently tutoring student seeking C/C++ certification, and graduate manipulator dynamics students

Modeling & Simulation
- Utilized linear model reduction, linear analysis, and nonlinear dynamical analysis techniques
- Frequent 6DOF monte-carlo simulations (NASA, Trick, `slurm`), stiff differential equation solves (Julia)

Personal Projects

GeneralAstrodynamics.jl

*General calculations, visualizations, and halo & manifold solvers. Presented at **JuliaCon**!*

AstrodynamicalModels.jl

*Model generation, with optional state transition matrix dynamics. See also: **AstrodynamicalCalculations.jl**.*

SPICEKernels.jl

*All generic kernels provided by NASA, exposed and cached through Julia functions. See also: **SPICEApplications.jl**, **SPICEBodies.jl**.*

HorizonsEphemeris.jl

*Request JPL Horizons ephemeris data from within Julia, with a simplified interface! For a verbatim wrapper, see **HorizonsAPI.jl**.*

PolynomialGTM.jl

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

CommonLicenses.jl

*Inline any **standard license** into your executable document! For example: CommonLicenses.MIT().*

dimples

An ongoing experiment in improved Python packaging and environment replication, with inspiration from Julia's Pkg.jl.

module-hygiene

*Provides an __export__ key for namespace hygiene. See also: **block-scopes**.*

rich-admonitions

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

Personal Media

🐙 **@cadojo**

in **in/joeycarp**

🌐 **https://loopy.codes**