Roshan Thomas Eapen

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"Truly innovative science demands a leap into the unknown"

Education

Texas A&M University — *College Station, TX*

PH.D. AEROSPACE ENGINEERING — *Aug. 2017 - Present*

Advisors: Kyle T. Alfriend, Manoranjan Majji

Research involves multiple projects dealing with dynamical systems theory: stability, chaos and bifurcations, spacecraft attitude motion: analytical theory, resonant motions and averaged solutions, computer vision: physics based image generation. Research also focuses on application of such developed theories to orbit design, constellation design, orbit & attitude determination techniques and optimal control, specifically, low thrust trajectory optimization.

Purdue University — *West Lafayette, IN*

MS AERONAUTICS & ASTRONAUTICS — *Aug. 2015 - May 2017*

Advisor: Carolin E. Frueh

Research focused on studying the high area-to-mass ratio class of objects which are sensitive to very small changes in perturbations, particularly the attitude dependent solar radiation pressure. Introduced a new model that averages the solar radiation pressure force experienced by multi-layer insulation foil in geosynchronous orbits. Sped up the computational time by 66%, and produced errors that are small enough to stay within the field of view of surveying telescopes over the propagation period of four days as compared with special perturbations methods.

Karunya University — *Tamil Nadu, India*

B.TECH AEROSPACE ENGINEERING — *Aug. 2010 - May 2014*

Advisor: Ram K. Sharma

Research focused on developing a trajectory to Mars using the Lagrangian points of the Sun-Earth system and the Sun-Mars system under the framework of the photo-gravitational restricted three-body problem keeping Sun as a source of radiation. The invariant manifolds of the halo orbits were used for halo orbit insertion and the intermediate transfer arcs were designed using Lambert's solution. Also studied the variation in the behaviour of invariant manifolds with change in radiation pressure. Found delay in transition from Mars-centric path to heliocentric path as the radiation pressure increases

Experience

Space Physics Lab, Vikram Sarabhai Space Center *(Advisor: Anil Bhardwaj)* — *Thiruvananthapuram, India*

INVERSTGATION OF ΔV USAGE IN A SAMPLE MARS CAPTURE AT THE WEAK STABILITY BOUNDARIES TRANSFER — *May 2016 - Jul. 2016*

Research focused on investigating the delta-V usage in a sample mars trajectory design with weak ballistic capture in the framework of the planar elliptic restricted three body problem. Obtained major savings in delta-V at capture compared to traditional approaches by developing algorithm to exploit Weak Stability Boundaries at Mars.

Rolta India Ltd — *Mumbai, India*

CAD AND IMAGE INTERPRETATION ENGINEER — *Dec. 2014 - Feb. 2015*

Performed geospatial parcel mapping. Applied AutoCAD techniques to create a framework for Geographical Information Systems. Worked on Phase 1 and 2 of a three-phase project aimed at using aerial and satellite images of the French countryside to map farmlands for subsidies distribution to farmers.

Publications

Eapen, R.T., Majji, M., Alfriend, K.T., 2019. *Extended Phase-Space Realization for Attitude Dynamics of an Axisymmetric Body in Eccentric Orbit.* AAS/AIAA Astrodynamics Specialist Conference, Portland, Maine.

Eapen, R.T., Majji, M., Alfriend, K.T., Singla, P., 2019. *Canonical Transformations via a Sparse Approximation-based Collocation Method for Dynamical Systems.* AAS/AIAA Astrodynamics Specialist Conference, Portland, Maine.

Eapen, R.T., Majji, M., Alfriend, K.T., 2018. *Equilibria Associated with the attitude dynamics of a rigid body in Keplerian orbit.* AAS/AIAA Astrodynamics Specialist Conference, Snowbird, Utah.

Eapen, R.T., Frueh, C., 2018. *Averaged solar radiation pressure modeling for high area-to-mass ratio objects in geosynchronous orbits.* Advances in Space Research, 62(1), pp.127-141.

Eapen, R.T., Sharma, R.K., 2014. *A study of halo orbits at the Sun–Mars L 1 Lagrangian point in the photogravitational restricted three-body problem.* Astrophysics and Space Science, 352(2), pp.437-441.

Eapen, R.T., Sharma, R.K., 2014. *Mars interplanetary trajectory design via Lagrangian points.* Astrophysics and Space Science, 353(1), pp.65-71.

Honors & Awards

2020	**Heep Graduate Fellowship**, Hagler Institute of Advanced Studies	*TAMU*
2018	**Travel Grant**, AAS/AIAA Astrodynamics Specialist Conference	*Snowbird, Utah*
2015	**JN Tata Scholar**, The Jamsetji Nusserwanji Tata Endowment for the Higher Education of Indians	*Mumbai, India*
2014	**Best Paper Award**, 18th National Space Science Symposium, ISRO	*Dibrugarh, India*

Workshops & Conferences

2019	**2019 AAS/AIAA Astrodynamics Specialist Conference**, Texas A&M University, College Station	*Portland, Maine*
2018	**2018 AAS/AIAA Astrodynamics Specialist Conference**, Texas A&M University, College Station	*Snowbird, Utah*
2012	**Flight Training Program**, INDIAN INSTITUTE OF TECHNOLOGY	*Kanpur, India*
2012	**National workshop on Evolutionary Optimization Techniques in Multi-disciplinary Research Problems**, IEEE STUDENT CHAPTER OF KARUNYA UNIVERSITY	*Tamil Nadu, India*

Volunteer Work

2015	**Activity Crew**, Water Rocketry, Purdue Space Day	*West Lafayette, IN*
2013	**Student Coordinator**, Astronomy Club, Karunya University	*Tamil Nadu, India*
2012	**Event Organizer**, Event Mayday for Machyard, a National Level Aerospace Technical Symposium	*Tamil Nadu, India*
2012	**Event Organizer**, Event Glido-wars for Mindkraft, a National Level Technical Festival	*Tamil Nadu, India*