Helen Clare Henninger

Curriculum Vitae

Education

2012-2015 **PhD**, *École Doctorale Sciences Fondamentales et Appliquées, Université Nice Sophia-Antipolis*, France.
Mention: Très honorable

2010–2012 **Masters of Science**, *Rhodes University*, South Africa.
Distinction

2006–2009 **Bachelor of Science**, *Rhodes University*, South Africa.
First class Honours. Majored in Mathematics

Experience

December 2020-present **RTD-A** , Free University of Bozen-Bolzano, Italy.
Teaching courses in Fundamentals of Programming and Fundamentals of Information Science. Assisting with masters and undergraduate student projects and courses

May 2018 -December 2020 **Assistant researcher (AR)** , Free University of Bozen-Bolzano, Italy.
Carrying out research on shared control techniques. Assisting with masters and undergraduate student projects and courses

June 2016 - April 2018 **Postdoctoral fellow** , Politecnico di Milano, Italy.
Setting, explaining and assisting students at weekly laboratory lectures.

Sept-Nov 2011 **Temporary lecturer**, Rhodes University, South Africa.
Taught a course on Mathematical Modelling to second-year students. Included presenting course lectures, preparing course notes,setting and marking class tests and exams and setting and facilitating weekly tutorials.

Jan-April 2010 **Mathematics 1 tutor**, Rhodes University, South Africa.
Provided assistance to first-year students in Mathematics during once-weekly tutorial sessions

Publications

Publications in registered journals

- H. Henninger, J. Biggs and K. von Ellenrieder. Safety-Aware Optimal Attitude Pointing for Low-Thrust Satellites. *Applied Sciences* 11.7, 2021
- J.D. Biggs and H. C. Henninger. Motion planning on a class of 6-D Lie groups via a covering map. *IEEE Transactions on Automatic Control* 64.9, 3544-3554, 2018
- H. C. Henninger and J. D. Biggs. Optimal under-actuated kinematic motion planning on the epsilon-group. *Automatica*, 90: 185-195,2018
- J.D. Biggs, H. C. Henninger and A. Narula. Enhancing Station-Keeping Control With the Use of Extended State Observers. *Frontiers in Applied Mathematics and Statistics*, 4, 24, 2018
- H. C. Henninger and J. D. Biggs. Near time-minimal Earth to L1 transfers for low-thrust spacecraft. *Journal of Guidance, Control and Dynamics*, June 2017
- J. D. Biggs, Y. Bai and H. C. Henninger. Attitude guidance and tracking for spacecraft with two reaction wheels. *International Journal of Control, March 2017 INdAM Series, Vol. 11, 2015, Springer-verlag, Berlin*.

- B. Bonnard, H. Henninger, J-B. Pomet and J. Nemčova. Time versus energy in the averaged optimal coplanar Kepler transfer towards circular orbits. *Acta Appl. Math.*, 135: 47-80, 2015

Conference proceedings

- H. C. Henninger and K.D. von Ellenrieder. Generating maneuverable trajectories for a reconfigurable underactuated agricultural robot. *Metrology for Agriculture and Forestry 2021* IEEE, 2021.
- K. D. von Ellenrieder and Helen C. Henninger. Improving the Robustness of Trajectory Tracking Dynamic Surface Control. *2019 American Control Conference (ACC).* IEEE, 2019.
- Henninger, H. C., K. D. von Ellenrieder, and S. C. Licht. Energy-minimal target retrieval for quadrotor UAVs: trajectory generation and tracking. *IEEE Transactions on Automatic Control* 64.9 (2018): 3544-3554.
- H. C. Henninger, K. D. von Ellenrieder, and J. D. Biggs. Trajectory generation and tracking on SE (3) for an underactuated AUV with disturbances. *IFAC-PapersOnLine* 52.21 (2019): 242-247.
- R. Belotti, K. D. von Ellenrieder, and H. C. Henninger. A Deadband-Based Method for User Effort Reduction in Human-Robot Shared Control. *IFAC-PapersOnLine* 52.15 (2019): 519-524.
- K. D. von Ellenrieder, H. C. Henninger and R. Belotti. Homogeneity for Shared Control in the Presence of Disturbances. 11th IFAC Symposium on Nonlinear Control Systems *accepted May 2019*
- K. D. von Ellenrieder and H. C. Henninger. Augmented Filters for Robust Dynamic Surface Control. 2019 American Control Conference *accepted January 2019*
- K. D. von Ellenrieder, H. C. Henninger. A Higher Order Sliding Mode Controller-Observer for Marine Vehicles. Joint CAMS and WROCO 2019 *accepted June 2019*
- H. C. Henninger and J. D. Biggs. Semi-analytic motion planning with actuator constraints on 3-D Lie groups. 5th International Conference on Control, Decision and Information Technologies , Thessaloniki, Greece, The Netherlands, 10-13 April 2018.
- H. C. Henninger and J. D. Biggs. A semi-analytic approach to spacecraft attitude guidance. 25th Mediterranean Conference on Control and Automation, Valletta, Malta, July 2017
- H. Henninger, B. Bonnard and J-B. Pomet. Time minimization versus energy minimization in the one-input controlled Kepler problem with weak propulsion. 21st MTNS, Groningen, The Netherlands, July 7-11.

Book chapters

- B. Bonnard, H. Henninger and J. Rouot. Lunar perturbations of the metric associated to the averaged orbital transfer. *In: Analysis and geometry in control theory and its applications. Springer, Cham, 2015. p. 65-84.*

Non-referreed/magazine articles

- H. Henninger. Tiny technology reaching for the stars. Quest, 9(3): 34-37, 2013

Awards

2006, 2008	Dean's merit list (Science Faculty, Rhodes University)
2009	Academic Honours (Rhodes University)
2010,2011	NRF (National Research Fund, South Africa) Prestigious/Equity scholarship

PhD Thesis

Title *Study of the solutions of orbital transfers with low thrust in the problem of two and three bodies*

Supervisors Prof. Bernard Bonnard & Dr Jean-Baptiste Pomet

Description Involved a theoretical component in assessing the applications of averaging to low-thrust optimal transfers in the two-and three-body system, as well as a numerical component, adapting the software T3-D designed by Thales Alenia Space to adjust from optimization of an averaged low-thrust system to optimization of a non-averaged system to coincide with the exit from the earth's sphere of influence to the region of the L_1- libration point in a small-time Earth-L_1 transfer.

MSc Thesis

Title *The symmetry group of a model of Hyperbolic plane geometry and some associated invariant optimal control problems*

Supervisor Dr Claudiu Remsing

Description An investigation of the geometry of the group SO(1,2)0 and applied invariant optimal control problems. This included classifying all the unique left-invariant problems (Riemannian and sub-Riemannian) on SO(1,2)0, a theorem on the controllability of each class of problems and using Jacobi integrals to express the optimal trajectories of these left-invariant problems.

Seminars, Posters and Conference presentations.

2016 *A semi-analytic approach to spacecraft attitude guidance* 25th Mediterranean conference on automation and control, Valetta, Malta, July 3-6

2014 *Propulsion requirement for time-minimal transfers in quasi-circular planar low-earth orbits under J2-perturbation* (Poster), RICAM Special Semester on New Trends in Calculus of Variations, Linz, Austria, Nov 7-11

2012 *The Minkowski metric in Optimal Control on the Matrix Lie Group* $SO(1,2)_0$ McTao day, INRIA Sophia Antipolis, 23 Oct.

2011 *A Controllability Criterion on* $SO(1,2)_0$, SAMS/AMS conference, NMMU, Port Elizabeth, RSA, 2 Dec.

2011 *Controllability on the Lorentz Group*, Rhodes University seminar, 26 Sept.

2010 *Hyperbolic Geometry on Two Geometric Surfaces*, Rhodes University seminar, 15 Sept.

2010 *Hyperbolic Geometry on Geometric Surfaces*, Postgraduate Seminar in Mathematics, NMMU, Port Elizabeth, RSA, 24 Sept.

Languages

English Mothertongue C2

Afrikaans Full professional proficiency C1

Italian Full professional proficiency B2