

RENATO VOLPE

renato.volpe@uniroma1.it

Gender: Male

Nationality: Italian

Marital Status: Single

Driving License: Italian A and B licenses

PERSONAL SUMMARY

I am a multi-skilled aerospace engineer, eager to develop projects and new designs in aerospace fields. I am self-motivated, problem-solver, organized and capable of working in a team environment. My attitude to hard-working allows me to work to deadlines and target any objectives.

I have got many interests in space system engineering topics. Mostly I am really passionate about navigation, guidance and control systems of a spacecraft in all their aspects. As a Ph.D. student in Sapienza University of Rome, I do researches on optical navigation for on-orbit, proximity operations. In my everyday work I deal with topics such as image processing, features extraction and matching, navigation filters development (Extended and Unscented Kalman Filters, Unscented H-Infinity Filters), non-cooperative pose estimation and shape reconstruction through images, trajectory optimization for non-cooperative rendezvous, orbital dynamics for formation flying and attitude dynamics.

Additionally, I am really keen on system engineering and designing of a space mission in its global vision. When I deal with attitude, orbital and robotics navigation, guidance and control problems I am used to taking into account how an eventually proposed solution would interface with the requirements of other spacecraft subsystems.

WORKING EXPERIENCE

- (11/2016 to 02/2020) During my Ph.D. in Aeronautical and Space Engineering at “Sapienza, University of Rome” I have been focusing on digital image processing, features extraction and matching, non-cooperative motion and shape reconstruction via images, filtering and GNC for space rendezvous and docking.
- (05/2019 and 06/2019) Internship in GMV Madrid. In this period of internship I tested the optical navigation algorithms developed during the Ph.D. research by making use of the facilities available at GMV. In particular, I was able to test a monocular pose and shape reconstruction algorithm over a set of images captured at *platform-art*© from a realistic CAD model of the Didymos asteroid, and using a camera simulating the model that is going to be used in the real mission. Moreover, I also was able to test the algorithm on a set of images captured from a scale mock-up of the Proba-2 satellite.
- (09/2015 - 03/2016) I wrote my Space Engineering master’s dissertation at University of Strathclyde under Prof. Massimiliano Vasile’s supervision on autonomous GNC for approach and docking trajectory and attitude maneuver with non-cooperative, random shaped targets.
- (2015) Member of HECATE team. We took part in the ESA Moon Challenge competition designing a lunar mission respecting precise requirements given by ESA. The team was recognized to be the best out of 28 participants and was awarded with the first prize at ESA ESTEC (Noordwijk) the 16th December 2015 during the “International Symposium on Moon 2020 - 2030”.
- (2014-2015) Leader of SASA (Sapienza Aerospace Student Association) Sapienza Technology Team. The team was involved in a project funded by Mathworks in which an automatized rover was created using an Arduino board.
- (2013) Internship in Rucker Aerospace (Donauwörth, Germany) for a period of a month and a half. In this occasion I learned how to use CATIA and Hyperworks softwares and applied them to the design and structural analysis of Airbus A320 and A350 passenger and cargo doors.

- (2012) Member of a team composed of aerospace engineers involved in designing and building a rocket model which was then launched during a competition enjoyed by ESA's launchers section President Antonio Fabrizi.

EDUCATION

- Ph.D. in Aeronautical and Space Engineering at “La Sapienza, Università di Roma” with the following thesis: “Visual Navigation for Optimal Rendezvous in Space Proximity Operations.” (27/02/2020)
- Master in Space Engineering with 110/110 cum laude grade at “La Sapienza, Università di Roma” by presenting the following thesis: “Choreography on Elliptical Orbit.” (16/03/2016)
- Bachelor in Aerospace Engineering with 110/110 cum laude grade at “La Sapienza, Università di Roma” in 2013 by presenting the following thesis: “Orbital determination methods through optical observations.” (25/11/2013)
- Diploma in Scientific High School with 95/100 grade in 2010
- First Certificate in English (FCE) in 2008

AWARDS

- Qualified as one out of the five finalists of the *Luigi G. Napolitano* award in the 70th International Astronautical Congress (IAC) in Washington (USA), 21-25 October 2019, with the paper “GNC Architecture for an Optimal Rendezvous to an Uncooperative Tumbling Target Using Passive Monocular Camera”.
- Winner of the *Chiara Valente* award for having presented one of the best student papers at the Italian Association of Aeronautics and Astronautics (AI-DAA) XXV International Congress, 9-12 September 2019, Rome, Italy, with the paper “Testing and Validation of an Image-Based, Pose and Shape Reconstruction Algorithm for Didymos Mission”.

PUBLICATIONS

Journal Publications

- Volpe R. and Cenci C. "Optical-aided, autonomous and optimal space rendezvous with a non-cooperative target." *Acta Astronautica* (2019).
- Volpe R., Palmerini G.B. and Sabatini M. "A passive camera based determination of a non-cooperative and unknown satellite's pose and shape." *Acta Astronautica* 151 (2018): 805-817.
- Volpe R., Cenci C. and Palmerini G.B. "Selecting Optimal Inspection Trajectories For Target Observation." *Aerotecnica Missili & Spazio* 97.2 (2018): 60-67.
- Volpe R., Sabatini M. and Palmerini G.B. "Pose and Shape Reconstruction of a Non-cooperative Spacecraft Using Camera and Range Measurements." *International Journal of Aerospace Engineering* 2017 (2017).

Conference Publications

- Volpe R., Cenci C., Sabatini M., Palmerini G.B. "GNC Architecture for an Optimal Rendezvous to an Uncooperative Tumbling Target Using Passive Monocular Camera." *Proceedings of the 70th International Astronautical Congress (IAC)*, 21-25 October 2019, Washington, USA.
- Volpe R., Sabatini M., Palmerini G.B. "Centralized Visual Based Navigation and Control of a Swarm of Satellites for On Orbit Servicing." *Proceedings of the 70th International Astronautical Congress (IAC)*, 21-25 October 2019, Washington, USA.
- Volpe R., Sabatini M., Palmerini G.B., Mora D. "Testing and Validation of an Image-Based, Pose and Shape Reconstruction Algorithm for Didymos Mission." *Italian Association of Aeronautics and Astronautics (AIDAA) XXV International Congress*, 9-12 September 2019, Rome, Italy.

- Volpe R., Palmerini G.B., Sabatini M. “Shape reconstruction of a tumbling unknown orbital target by passive imaging.” IAA SciTech Forum 2018 November 13-15, 2018. Moscow, Russia.
- Volpe R., Sabatini M. and Palmerini G.B. “Evaluation of a camera-based pose and shape reconstruction technique for an unknown tumbling target.” Proceedings of the 69th International Astronautical Congress (IAC), 1-5 October 2018, Bremen, Germany.
- Conte D. et al. “Mission architecture for human exploration of cis-lunar space via tele-operated assets.” Proceedings of the 69th International Astronautical Congress (IAC), 1-5 October 2018, Bremen, Germany.
- Volpe R., Carpentiero M. and Stolfi A. “A Small Platform Application for Close Inspection of an Out of Control Satellite.” 4th International Academy Astronautics Conference (IAA), 2017, Rome, Italy.
- Volpe R., Palmerini G.B and Sabatini M. "Monocular and lidar based determination of shape, relative attitude and position of a non-cooperative unknown satellite." Proceedings of the 68th International Astronautical Congress (IAC), 25-29 September 2017, Adelaide, Australia.
- Volpe R., Palmerini G.B. and Circi C. "Preliminary analysis of visual navigation performance in close formation flying." Aerospace Conference, 2017 IEEE.

PERSONAL SKILLS

Language

- Italian: native
- English: fluent speaking and writing (skills acquired through FCE, working experience abroad and frequent travels)

Computer & Softwares

- Expert MATLAB and SPICE kernels user: gained through academic studies, thesis researches and work experience

- Expert CATIA user: gained through the internship at Rucker Aerospace
- Advanced Simulink user: gained through Space Robotic System course
- Advanced Microsoft Word, Excel and Power Point user: gained through both academic and working experiences
- Advanced LaTeX user: gained through academic experience
- Advanced C/C++ user: acquired through Programming course and thesis writing
- Advanced Microsoft and iOS user
- Advanced Python user
- Advanced Blender user
- Intermediate ADINA user: gained through Space Constructions course
- Intermediate Hyperview, Hypermesh and Patran user: gained through the internship at Rucker Aerospace
- Intermediate Arduino board user: acquired through the SASA project
- Beginner knowledge of Java language

HOBBY & SPORT

- Music: I play drums in a prog-rock band and guitar in a post-rock band.
- Sport: I play football with friends, go running and becoming highly passionate about Mountain Biking. I usually go skiing for a week every winter.
- Travel: I travelled extensively in Europe, spent a long time in London and lived in Glasgow for six months. I love to travel by car, in fact I organized a car trip from Rome to Nordkapp (Norway) and back.
- Literature: I am an enthusiastic reader of fantasy novels, philosophical essays (Kant, Voltaire, Rousseau, Feuerbach) and thrillers.