PHD Scholarship in Space Tracking and Space Manoeuvre Characterisation

It has become a concern in recent years that the near-Earth space is turning into a congested and contaminated environment with the proliferation of orbital debris. So far, approximately 34,000 objects larger than 10 cm in diameter lie in this region, about 900,000 pieces of debris 1-10 cm. Any impact or collision of space debris with the operational satellites can jeopardise or even end their life, yield significant loss to the space economy, and trigger the so-called Kessler Syndrome which refers to the possibility that collisions will create more debris collisions.

An exciting opportunity is available to develop smart and robust algorithms for space tracking and space manoeuvre characterisation for a safer, securer, and more sustainable space environment. This project is funded by the University of New South Wales. The Scholarship is valued at about $33,0960 per year (tax-free), with $12,000 project funding per year to cover experiments, consumables, and travel.

This project aims to establish a filtering framework for estimating space manoeuvres by taking the non-Gaussian initial manoeuvre parameter, orbital propagation uncertainty and observability of the state to be estimated into account, which enables fast track-to-track association and track-to-orbit association. Constraints based on astrodynamics (e.g., Keplerian and Lambert problems) will be leveraged to determine the validity of the admissible region (a region contains all hypothetical orbits) constructed from tracking data (e.g., optical angles) and compete association of optical tracks in a fast manner.

This project highlights the key contribution that Australia can make, and is making, to the space community and represents a reminder to the rest of the world about the benefits of space tracking activities down under. The research outcomes will form an excellent platform for reliable space tracking. This project will also contribute to the protection of space assets for everyday applications, including critical communications, positioning, navigation & timing, etc., and sustainable exploitation of the near-Earth environment for all human beings.

As part of a project team consisting of leading scientists from UNSW and industrial partners, the successful PHD student will develop space manoeuvre characterisation algorithms and validate them by utilising real-world tracking data, e.g., optical angles from telescopes or cameras.

If you would like to know more about this project, please feel free to contact Dr Yang Yang (yang.yang16@unsw.edu.au).