Project Number: 4

Project Title: Optical Tracking Pipeline for UNSW C14 Telescope System

Project Clients: Yang Yang

Project specializations: Software Development;Big data Analytics and Visualization;Astronautical instrumentation and astrodynamics;

Number of groups: 1

Main contact: Yang Yang

Background:

To integrate and refine different modules of image processing and orbit determination for an automated pipeline for optical tracking of resident space objects by using UNSW's C14 telescope system.

Requirements and Scope:

With the growing number of satellites and debris orbiting the Earth, there is an urgent need for effective space tracking and controlling capabilities. However, current Space Situational Awareness (SSA) research lacks the capacity, capability, and diversity to fully track and identify objects with sufficient accuracy for space traffic management. To improve SSA observations and provide more accurate information about resident space objects (RSOs), the existing 14-inch Schmidt Cassegrain Telescope (C14) located on the Kensington Campus is being upgraded. Besides the hardware development, a software pipeline is also under development, including the target selection, telescope control, image processing and orbit determination. This project aims to refine an existing prototype software pipeline to work with the telescope for all model integration, testing and operation.

Required Knowledge and skills:

This project requires students to understand and test the satellite streak detection, astrometric positioning and orbit determination modules within the existing optical tracking software. The software package is written in Python and can be run via Docker. Students may need to develop additional code snippets, if necessary, under the guidance and instructions provided by the supervisor. The project also involves visiting the UNSW observatory multiple times to conduct rigorous testing and validate the software using satellite tracking data. The project will culminate in an observation campaign demonstration by operating the telescope using the software pipeline.

Expected outcomes/deliverables:

A refined optical tracking pipeline software package validated by using UNSW telescope data.