51st IAF STUDENT CONFERENCE (E2)
Student Conference - Part 1 (1)

Author: Mr. Luís Gonçalves
Instituto de Telecomunicações (Portugal), Portugal

A NEW SPACE DATA PROCESSING PIPELINE PROTOTYPE FOR PASO

Abstract

The ever growing competition in space exploration has led to the accumulation of a great number of space debris in orbit, which may constitute a threat to active satellites or manned missions. As such, there has been a growing effort worldwide in monitoring capacity of these debris through the use of radar and optical sensors. In Space Surveillance and tracking (SST) optical telescopes typically acquire thousands of images per night requiring an automatic pipeline for real-time data analysis. Here we present the data processing pipeline (SPADE) prototype, entirely written in Python, to process, configure, and tag data collected by the new Wide Field-of-View (WFOV) double telescope with a 2.3 2.3 FOV per unit, which has been recently installed at the PAmpilhosa da Serra Space Observatory (PASO), in Portugal, as part of the Portuguese SST network. SPADE will be the data analysis back-bone of the PASO's double telescope platform. The telescope platform is equipped with two 40964096 CMOS cameras that can operate in white light or with B, V, R, I, H and [OIII] filters, and is designed to conduct automatic space debris surveillance and tracking operations. The main goal of this sensor will be to track objects in LEO orbits, but will also be capable of targeting objects in MEO and GEO orbits. The pipeline consists of 3 main segments: Reduction where image corrections such as flat/dark/background are performed; Detection where all sources in the image are identified; and Classification where all detections are classified to find the Resident Space Objects among them. Every step in each segment can be easily controlled and enabled/disabled in the configuration, making it very user-friendly. It also comes with the option of multi-threading to speed up the pipeline to cope with the very demanding SST operations. SPADE can be used to process images of other telescopes, provides astrometry and photometry measurements of sources, and can process white light or multifilter images amplifying object characterization possibilities, including through light curves. In this work, we present SPADE simulations and the first results.