

DeDUST: DETECTION, TRACKING, and CHARACTERISING SPACE DEBRIS IN STAR TRACKER IMAGES

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This report serves to present the initial on-ground hardware-in-the-loop verification results for DeDUST project. Arcsec has successfully detected, tracked, and characterized RSO's using the Sagitta star tracker located in their on-ground testing facilities. The tests were performed on the night of April 16th and 30th. Figure 1 highlights the algorithm procedure for an SSA capable star tracker.

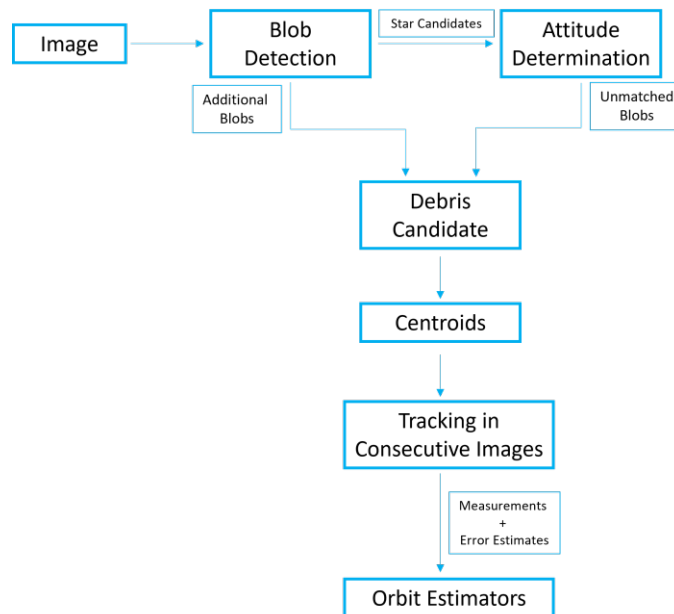


Figure 1: DeDUST debris tracking process.

RSO measurements are distinguished from stars based on their velocity in the field of view. Figure 2 presents a sample of space debris measurements identified and tracked during the Sagitta star tracker night sky operation. The isolated centroid observations are converted to angular measurements consisting of right ascension and declination in an Earth-centered inertial reference frame.

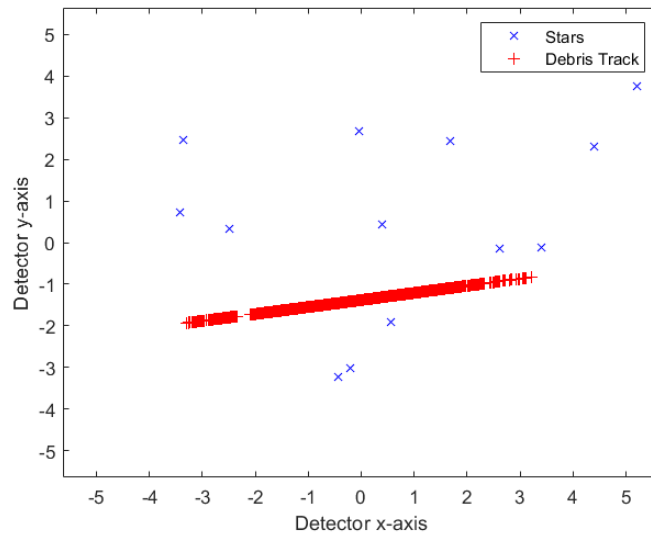


Figure 2: Space debris detected in star tracker images.

The angular measurements were input into an orbit determination algorithm to obtain the best fitting orbit. Two observations were matched to existing satellites from a catalogue of known bright objects. On April 16th, the matched object was an Iridium mass dummy launched in 1997 by a Long March rocket. On April 30th a defunct Japanese satellite, Suzuka, was detected. With the first two validation observations of DeDUST now turning out to be of defunct satellites, the Debris Detection capability of arcsec star trackers has officially been demonstrated for the first time.

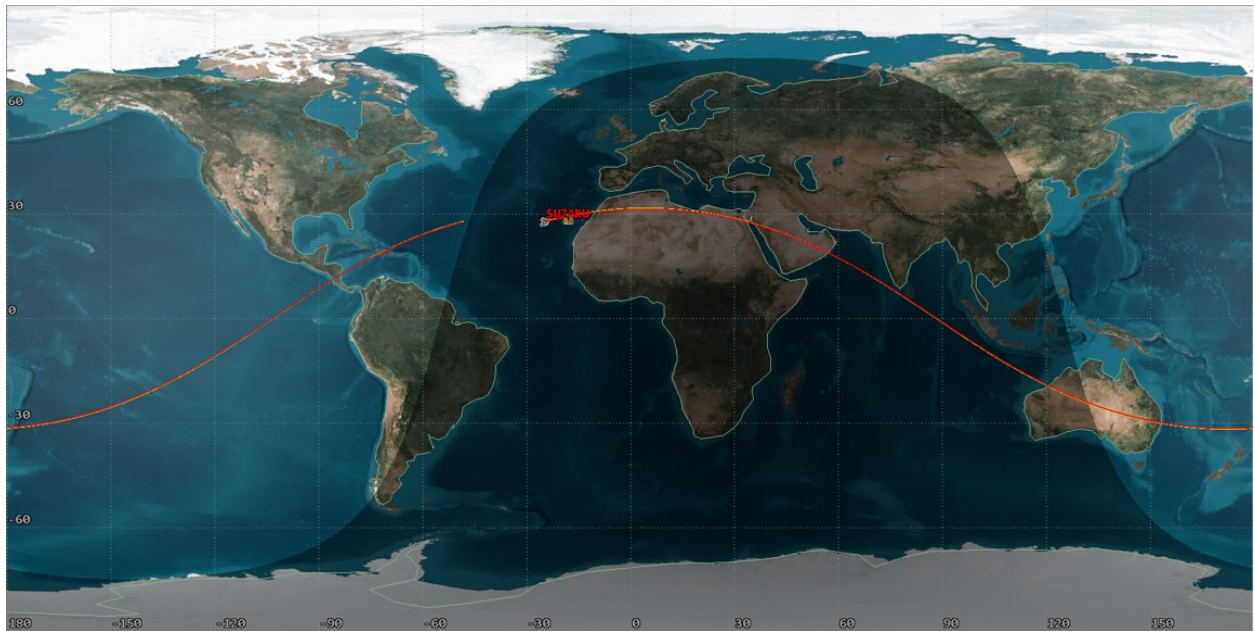


Figure 3: Matched satellite ground track with NORAD TLE.