

**PDC2017
Tokyo, Japan**

IAA-PDC-17-02-02

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Linking the Isolated Tracklet Astrometry

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Keywords: *astrometry, linking, orbits, computing*

ABSTRACT

Finding new Near Earth Objects (NEOs) is important in understanding the impact hazard they pose to the Earth. In order for an NEO to receive an official designation and be considered a real object, it must be first observed, then sufficiently followed-up by additional telescopes so its initial orbits is accurate enough to allow finding it again at a later date. Non-NEOs are also important to find as they allow fewer candidates to be posted to the NEO Confirmation Page (NEOCP), which in turn saves valuable follow-up time. However, not all objects are immediately re-observed, due to a variety of reasons. The astrometry for these orphan tracklets is relegated to the Minor Planet Center's (MPC) Isolated Tracklet File (ITF), which contains over 12 million detections of 3.5 million objects, the majority of which are from the Catalina Sky Survey (sites G96, 703, I52), Pan-STARRS (site F51), and the Spacewatch Project (site 691).

We have previously shown (DPS 2016) that some objects on the NEOCP had been previously observed prior to being posted, but their astrometry was not linked when first observed, mainly due to the larger time separation between observations. We have developed a method to mine this rich ITF data source to find previously

unknown NEOs, main-belt asteroids, and those in between, which have already been observed sufficiently but whose detections have not yet been linked together. Our algorithm employs a distributed brute force approach which tests tracklets whose relative motion suggests they may be the same object. Suspected linkages are then used to search for additional tracklets to confirm that the linkage is correct.
