

**PDC2019
Washington, DC, USA**

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The Digest2 – NEO classification code

Peter Vereš⁽¹⁾, Matthew J. Payne⁽¹⁾, Matthew J. Holman⁽¹⁾ and Sonia Keys⁽¹⁾

⁽¹⁾ *Harvard-Smithsonian Center for Astrophysics, Minor Planet Center. 60 Garden Street, Cambridge, MA 02478, USA. pveres@cfa.harvard.edu, mpayne@cfa.harvard.edu, mholman@cfa.harvard.edu*

Keywords: *Minor Planet Center, NEO identification, NEO discovery*

ABSTRACT

Digest2 is a program for a short-arc orbit classification that has been serving the NEO community for more than 12 years. Its algorithm is similar to the statistical ranging technique and provides a pseudo-probability of a tested short-arc tracklet belonging to a given Solar System orbit type. Digest2 is mostly used for classification of newly discovered NEO candidates in a need of rapid follow-up and its threshold dictates whether the object will get the opportunity to be visible to the follow-up community. We tested the performance of Digest2 on tracklets selected from real observations of NEOs and non-NEOs, simulated tracklets based on real and synthetic orbits [1] and tracklets generated in theoretical all-sky survey with current detection capabilities as well as the future LSST cadence [2]. Motivation for simulated survey and model population was to avoid the observational biases [3]. We focused on metrics such as accuracy, precision, false positive and false negative rates and effects of randomness, astrometric uncertainties and identification of very near Earth fly-bies. We demonstrated that NEO Digest2 varies as a function of time, rate of motion, magnitude and sky-plane location. We found out that NEOs tend to have on average lower Digest2 score at low Solar elongations, near the ecliptic. 94% of of NEOs simulated in all-sky survey achieved the maximum Digest2 score at least once and 99.6% of NEOs achieved the current Near-Earth Object Confirmation Page (NEOCP) Digest2 threshold. Because the program has been in continuous development, we will present planned improvements and future directions for the project.

References

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