

Automated software for CCD-image processing and detection of small Solar System bodies

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Efficiency is a crucial factor in the discovery of near-Earth asteroids (NEA) and potentially-hazardous asteroids. Current asteroid surveys yield many images per night. It is no longer possible for the observer to quickly view these images in the the blinking mode. This cause a serious difficulty for large-aperture wide-field telescopes, capturing up to several tens of asteroids in one image. To achieve better asteroid-survey efficiency it is necessary to design and develop automated software for the frame processing. Currently the CoLiTec software solves the problem of the frame processing for asteroid surveys in the real mode. The automatically detected asteroids are subject to follow-up visual confirmation. The CoLiTec software is in use for the automated detection of asteroids in Andrushivka Astronomical Observatory, in the Russian remote observatory ISON-NM (Mayhill, New Mexico, USA), as well as in the observatory ISON-Kislovodsk and in ISON-Ussuriysk starting from the fall 2013. The CoLiTec led to the first automated asteroid and comet discoveries in the CIS (Commonwealth of Independent States) and Baltic countries. In 2012 (2011) 80 (86) % of observations and 74 (75) % of discoveries of asteroids in these countries were made using the CoLiTec. The comet C/2010 X1 (Elenin), discovered using the CoLiTec on December 10, 2010, was the first comet discovered by a CIS astronomer over the past 20 years. In total, out of 7 recently discovered in the CIS and Baltic countries comets 4 comets were discovered due to the CoLiTec, namely C/2010 X1 (Elenin), P/2011 NO1 (Elenin), C/2012 S1 (ISON), and P/2013 V3 (Nevski). About 500,000 CoLiTec-used measurements were reported to MPC, including over 1,500 preliminary discovered objects. These objects include 21 Jupiter Trojan asteroids, 4 NEAs and 1 Centaur. Three other discovered asteroids were reported via dedicated electronic MPC circulars. In 2012 the CoLiTec users were ranked as No. 10, 13, and 22 in the list of the most productive observatories in the world by the number of conducted observations of small Solar System bodies. The observatory ISON-NM took 7th place in the world based on both the number of conducted observations and the number of preliminary discoveries made in 2011–2012.