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CoLiTec-multifunction software for the CCD image processing

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ABSTRACT

Software for automated frames processing of asteroid surveys given as series of frames is necessary for the most effective astronomical observations.

This possibility is provided by the CoLiTec software that allows not only to detect asteroids, but also to perform astrometric measurements in real time, http://www.neoastrosoft.com/.

100% reliability of the detection of moving objects is retained up to the lower limit of SNR equal to 3 in case of a minimum series consisting of four frames, with no stars covering of asteroid, and decreases to 50% for SNR equal to 2 at the same conditions.

CoLiTec has abilities for detecting very slow and very fast objects. Range of visible velocities of detected asteroids is 0.7-40.0 pix./frame. For example, the fasters NEO is K12C29D asteroid (40.0 pix./frame) or the slowest object is ISON C/2012 S1 comet (0.8 pix./frame).

CoLiTec software performs frames processing of asteroid surveys during observations by using multiprocessor mode.

Visual control with user-friendly interface is used to increase the reliability of the discovered asteroids identification.

CoLiTec supports telescopes with very wide field of view (up to 10 degrees²).

CoLiTec has assisted in making over 1.500 preliminary discoveries of asteroids, including 4 NEO, 21 Trojan asteroids of Jupiter and 1 Centaur. It has been used in roughly 600 000 observations, during which four comets (C/2010 X1 (Elenin), P/2011 NO1 (Elenin), C/2012 S1 (ISON), P/2013 V3 (Nevski)) were discovered.

By the overall results of 2011 and 2012, observatory ISON-NM, equipped with a 45-cm telescope and CoLiTec software, ranked 7th worldwide in both amount of asteroids observations and the amount of their preliminary discoveries.

The communication describes astrometric reduction of the frame based on UCAC4 catalog and provides an analysis of its results. The comparative analysis of the accuracy was performed between the CoLiTec and Astrometrica software. The analysis showed the benefits of the CoLiTec software using with astrometry of asteroids in relation with Astrometrica using, especially when using wide field and low quality frames.

Frame storage and publication software is a perspective of CoLiTec developers. This software allows maintaining a frame archive and searching for frames by specified parameters (coordinates). External access to the archive is provided via the own web interface and the Aladin software. It allows receiving additional frames from such external resources as SDSS and 2MASS. The software has been implemented with the use of VO technologies, including the SIAP (Smart Image Access Protocol).

Considerable attention will be soon given to the possibility of individual binding astrometric reduction to telescopes and increasing observations accuracy.

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