Subsection Virtual observatories are practice of application

FLATBED SCANNERS IN GOLOSIIV PLATE ARCHIVE DIGITIZATION

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ABSTRACT. The problems associated with the application of budget flatbed scanners to digitize astronegatives are discussed.

Key words: digital archive, scanner, image processing

The key moment of Ukrainian Virtual Observatory project currently running in Ukraine is the digitizing of glass photographic archives with a total number of plates above 300 thousand. Vast collections of stored astronomical images require the development of tools for their fast, robust calibration, vetting, search and retrieval. Recent years many observatories in the world have used flatbed scanners as the digitizers for their glass collections. But until this moment, the quality of digitizing with commercial scanners causes many questions. Nevertheless, flatbed scanners remain the most available appliances for relatively rapid archive digitizing and application of the proper scan procedure and proper algorithms of a digitized image processing provide the best accuracy, which could be achieved for given appliance and given observational material (Pakuliak et al., 2012; Vavilova et al., 2012a, 2012b,. 2011, 2010).

Since 2008, the process of MAO NASU archive plates digitizing and inclusion of plate preview images into GPA database has been under way, using two models of flatbed scanners. It started with Microtek ScanMaker 9800XL TMA and now has been continued with Epson Expression 10000XL. Digitizing is carried out in two modes: a) with high resolution of 1200 dpi, dynamic range of 16 bits and two scans for every plate for current cataloging and b) with lower resolution or lower dynamic range and only one scan with the aim of fast online visualization.

The database with metadata of plates is allocated on the computational resources of MAO. The results of digitizing are immediately registered into the database with plate metadata and after the uploading to its server storage place become available for search and browsing on the pages of DBGPA (http://gua.db.ukr-vo.org). To date we digitized a set of about 1 thousand plates with Microtek ScanMaker and more than 5 thousand plates with Epson Expression (of GPA 26 thousands plates in total). The result of their comparison shows a somewhat better accuracy for Epson Expression 10000XL vs Microtek ScanMaker 9800XL TMA (Table 1).

R.m.s. errors before the correction for scanner instrumental errors are ±0.173″ and ±0.303″ for RA, ±1.141″ and ±1.941″ for DEC for Epson and Microtek correspondingly. The ultimate accuracy is of ±0.106″ and ±0.156″ for RA, of ±0.110″ and ±0.153″ for DEC (Epson and Microtek correspondingly). It follows that internal instrumental errors for Epson Expression 10000XL can be excluded from pixel coordinates more accurately than those of Microtek without application of any specific appliances but using only the digital data of the plate itself. So this model of a flatbed scanner is used for both types of images as it allows accounting the systematic errors more accurately, and Microtek SkanMaker 9800XL is used for the preview images only.

Table 1. Comparison of accuracies, achieved for two models of scanners, used for digitizing of astronegatives

Resolution	900 dpi	1200 dpi	1600dpi
Epson Expression 10000XL			
N of stars	6056	8235	6134
$\sigma_{RA,arcsec}$	±0.62	±0.49	±0.41
$\sigma_{DE,arcsec}$	±0.63	±0.54	±0.46
$\sigma_{m,mag}$	±0.24	±0.22	±0.22
Microtek ScanMaker 9800 TMA			
N of stars	10421	9717	6473
$\sigma_{RA,arcsec}$	±0.90	±0.78	±0.63
$\sigma_{DE,arcsec}$	±1.18	±1.07	±0.98
$\sigma_{m,\ mag}$	±0.40	±0.35	±0.36

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