

SUBSECTION “ASTROINFORMATICS”

ON THE COMMUNICATION OF PHOTOMETRIC SYSTEMS FOR REDUCTION OF STAR MEASUREMENTS WITH PHOTOGRAPHIC PLATES

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For the purpose of photometric calibration of astronegatives, work has been done that made it possible to establish a relationship between the photovoltaic magnitudes of the BVR Johnson system and the magnitudes BV Tycho2 and bgr GAIA DR2. For a sample of more than 11 thousand common stars, the rms errors of the reduction of the solar indices of the B-V Tycho2 and b-r catalog of the GAIA DR2 catalog to the Johnson BVR system do not exceed 0.1 magnitude.

RE-REDUCTION OF THE OLD PHOTOGRAPHIC OBSERVATIONS OF INTERAMNIA (704) BASED ON GAIA DR2 REFERENCE CATALOG

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A new astrometric reduction of old photographic plates, benefiting from modern technologies such as high precision digitizing machines associated with a reduction using high precision Gaia DR2 catalog could be useful to study the orbital motion of Solar system minor bodies. Based on the newly released Gaia DR2 star catalog, the scans of the photographic plates containing images of Interamnia (704) taken by the Zonal Astrograph of Mykolaiv Astronomical Observatory (MAO) in 1974-1985 were re-reduced. For our investigation we used 29 plates from UkrVO archive digitized by commercial EPSON scanner with 1600 dpi resolutions. Besides for 2 of them were digitized by high precision digitizing machine of Shanghai Astronomical Observatory (ShAO, PRC) with 2540 dpi resolution. Almost all plates have 3 exposures with small shift. Each of 29 plates was scanned 6 times by EPSON scanner in 0° direction. Digitizing machine scanned 2 plates also 6 times but 3 times in 0° direction and 3 times in 90° direction. A total of 85 asteroid positions taken from 29 plates were derived using various reduction options. Only 5 asteroid positions were calculated from ShAO scans. The full identification was conducted and coordinates of all objects were obtained with usage of different options of astrometric reductions. The mean inner accuracy of obtained asteroid positions is 0.03" in RA and 0.14" in DEC for EPSON scanner and 0.014" in RA and 0.013" in DEC for digitizing machine in 0° direction and 0.010" in RA and 0.011" in DEC in 90° direction. The comparison of the new topocentric asteroid positions with Horizons ephemeris was made for calculation (O-C)

residuals and their RMS. The mean residual differences between the scan obtained positions and JPL calculated positions were $(0.09 \pm 0.16)''$ in RA and $(-0.09 \pm 0.25)''$ in DEC for MAO digitized plates, for ShAO scans the calculated differences are close to zero. Comparison of the results obtained with previous reductions of these observations with Tycho2 and UCAC4 reference catalogs showed that the use of the Gaia DR2 reference catalog does not lead to a significant improvement in the random and systematic component of the residual differences (O-C) for scans with EPSON scanner from the UkrVO archive. The results, obtained by processing images from ShAO digitizing machine, suggest that in this case, Re-reduction of the all photographic observations based on Gaia DR2 could improve the accuracy of old photographic observations to the level of modern ground-based CCD observations.

SOFTWARE FOR SEARCH AND MEASURING OF WDS CATALOG DOUBLE AND MULTIPLE STARS FROM DATABASE OF RESULTS OF CCD OBSERVATION

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Double and multiple star systems are source of unique information for determining the parameters of star formation models and for testing stellar models evolution. Therefore observations and measuring of their mutual configuration parameters is still important. Observations of double and multiple star systems at the RI MAO were performed using different telescopes since 2013. In addition, we also have an observational database and proceeding results of the fields in open clusters vicinity, which were performed using the KT-50 telescope (D=500mm, F=3000mm) in 2011- 2020. All astrometric processing was carried out by the Astrometrica software using UCAC4 or GAIA DR2 as reference catalogs. The catalogs of stars positions in the vicinity of open clusters were created as results of these observations.. There are a lot of double and multiple stars in the fields with open clusters. Software for search and measuring of mutual configuration parameters of the double and multiple stars from Washington Double Star Catalog (WDS) are presented. Observational array over 71 nights of 2019 were checked. 9679 CCD images were reduced and in 7170 of them 27157 WDS pairs were found. Total numbers of unique pairs are 1475 in 1088 systems with average number of pair observations near 18. The standard errors of measurements were 0.15" for separations and 0.5° for position angles. The epoch difference between our observations and the last observation in the database is in the range from 2 to 28 years. The comparison with WDS data was shown that residual differences and their standard errors were $(-0.03 \pm 0.24)''$ in separations and (-