USAGE OF PLATE SCANNING DEVICE FOR DETERMINATION OF COORDINATES AND MAGNITUDES OF CELESTIAL BODIES

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The Research Institute “Mykolayiv Astronomical Observatory” has a great experience in photographic observations. The glass library contains more than 8600 plates, obtained during the period of time since 1961 to 2000 with the Zonal Astrograph.

The Stellar Plates:

1. A zone near the celestial pole with declination between +70o and +90o was photographed twice. The first set contains about 200 plates at a mean epoch of 1929. It was specially made to compile the AGK2 catalogue. On the base of their processing, S. N. Belyavsky compiled a catalogue of 11322 stars. The second set contains 250 plates at a mean epoch of 1973. It was photographed in Mykolayiv to determine the proper motions of stars.

2. A zodiacal zone, lying between +10o and -10o from the ecliptic, was photographed with the aim to get the catalogue of 180 000 stars up to 12 magnitude at a mean epoch of 1979. 1196 plates with double overlapping of the zodiacal zone were obtained.

3. An equatorial zone with declination between +4o and -4o was photographed at a mean epoch of 1992. It was supposed to photograph this zone with fourfold overlapping but the observations were completed only up to 87% due to lack of the plates.

4. 104 plates were obtained during observations of Mihailov's list of stars at a mean epoch of 1978.

5. 217 plates were obtained during observations of 131 fields around radio sources for ROAS programme at a mean epoch of 1980.

The Planet's Plates:

1. About 2500 plates, containing images of all major planets (except Mercury and Pluto), were obtained.

2. About 1000 plates, containing images of Jupiter's satellites (I, II, III, IV) and Saturn's satellites (III, IV, V, VI, VIII), were obtained.

3. About 2500 plates, containing images of the selected minor planets, were obtained.

4. More than 200 plates, containing images of the bright comets, were obtained.

The plate scanning device and special software were developed for measurements and data processing to determine equatorial coordinates of the celestial bodies.

Software features:

- standard reduction;
- filtration;
- determination of rectangular coordinates;
- identification;
- determination of equatorial coordinates.

Reference catalogues:

- USNO – A2;
- USNO – B1;
- UCAC.

R&D results:

- Plates of (210 x 210) mm in size were scanned. Image size is (7000 x 7000) pixels. Output file features are the following: 40 Mb in size, 8 bit, bmp.
- Scanner accuracy is ±0".06 in direction of CCD row and ±0".15 in direction of scanning. Angular scale of measured plates is 120 "/mm.
- Software for identification of stars was developed. Original method of visualization was

used to control the result of identification or to provide a possibility for manual identification.

• Software for reduction of rectangular coordinates to equatorial coordinates was developed. B-splines with the coefficients given by Schonberg's variation were used to take account of systematic errors during the reduction of measurements.

The results of research and development have shown the expediency of scanner usage for determination of stellar positions. The positional accuracy of ±0".1 for stars of 8 to 13 mag was obtained by using four positions of plate relatively to the scanner.