

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
RESEARCH INSTITUTE “NIKOLAEV ASTRONOMICAL OBSERVATORY”

**METHODS AND INSTRUMENTS
IN ASTRONOMY: FROM GALILEO
TELESCOPES TO SPACE PROJECTS**

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ABSTRACT BOOK

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more. Each wavelength can provide different information about a celestial event or object, but also requires a special expertise to interpret. In a virtual observatory environment, all of this data is integrated so that it can be synthesized and used in a given study.

The International Virtual Observatory project was launched about ten years ago, and major IVO achievements in science and technology in recent years are discussed in this presentation. Standards for accessing large astronomical data sets were developed. Such data sets can accommodate the full range of wavelengths and observational techniques for all types of astronomical data: catalogues, images, spectra and time series. The described standards include standards for metadata, data formats, query language, etc. Services for the federation of massive, distributed data sets, regardless of the wavelength, resolution and type of data were developed. Effective mechanisms for publishing huge data sets and data products, as well as data analysis toolkits and services are provided. The services include source extraction, parameter measurements and classification from data bases, data mining from image, spectra and catalogue domains, multivariate statistical tools and multidimensional visualization techniques. Development of prototype VO services and capabilities implemented within the existing data centers, surveys and observatories are also discussed.

We show that the VO has evolved beyond the demonstration level to become a real research tool. Scientific results based on end-to-end use of VO tools are discussed in the presentation.

FIRST RESULTS OF DATA REDUCTION OF NIKOLAEV PHOTOPLATE ARCHIVE

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The results of plate scanning and image processing are presented. An archive of RI NAO consists of more than 8000 plates obtained with the Zonal Astrograph (D=160 mm, F=2.04 m, FOV= 5° x 5°). The plates with the image of the star cluster Pleiades obtained in 1962 and images of the Zodiac stars obtained in 1975 were scanned in series of 10 scans with three household scanners: Epson Perfection 3200 Photo and two models of Epson Perfection V200 Photo with a resolution power of

1200 DPI. Raw data processing, including image filtration and recovery of bright stars were made using MIDAS software package. Further reduction and results analysis were carried out using our own software and the Tycho-2 reference catalogue.

All three scanners have shown low stability of moving cartridge. It has linear biases up to 20 pixels per 10000 pixels of motion and a periodic counterpart from 2 to 5 pixels. After taking into account the features of scanners and data reduction, the following results were obtained: the standard deviations of stellar positions are from $\pm 0.04''$ to $\pm 0.12''$ in right ascension and from $\pm 0.06''$ to $\pm 0.13''$ in declination, depending on the image quality and stellar magnitude. The error came from repeating measurements (RE) is from $\pm 0.02''$ to $\pm 0.07''$ for both coordinates. The standard deviation of stellar magnitude is from $\pm 0.2^m$ to $\pm 0.5^m$ for stars of $9^m - 13^m$. RE is from $\pm 0.03^m$ to $\pm 0.05^m$ for stars of $10^m - 13^m$.

Using the results of a preliminary research, we have scanned 50 plates in series of 5 scans with Epson Perfection V200 Photo with the same parameters. We have made data reduction and compiled a catalogue of positions and proper motions for 17350 stars in ecliptic zone. The catalogue contains stars in the ICRS system from 7 to 14 magnitude, the majority them have 11^m to 13^m , on the mean epoch of observation 1977.4. Mean standard error of one position measurement is about $0.062''$ in RA and $0.067''$ in DEC, RMS of (O-C) is about $0.084''$ for coordinates and $0.005''/\text{year}$ for proper motions.

Further work in this direction is being successfully continuing.

ASTRONOMICAL DATABASES AND VO-TOOLS OF NIKOLAEV ASTRONOMICAL OBSERVATORY AS A BASIS FOR DEVELOPMENT OF UKRAINIAN VIRTUAL OBSERVATORY

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Results of work in 2006-2009 on creation of astronomical databases aiming at development of Nikolaev Virtual Observatory (NVO) are presented in this abstract. Results of observations and their