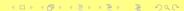# Astroinformatics and digitization of astronomical heritage

Nikolay Kirov

Computer Science Department
New Bulgarian University

Institute of Mathematics and Informatics
Bulgarian Academy of Sciences

The fifth SEEDI International Conference Digitization of cultural and scientific heritage, May 19-20, 2010, Sarajevo, BiH

Abstract

The new interdisciplinary area of Astroinformatics combines scientific knowledge from astronomy and Information and Communication Technologies (ICT), based on Internet developments.

Recently, four institutes of the Bulgarian Academy of Sciences launched a joint project called "Astroinformatics" and aimed at the development of the necessary methods and techniques.

The project is funded by the National Science Fund, Bulgarian Ministry of Education and Science.

Abstract

Astroinformatics has arisen from the need of ICT methods for preservation and exploitation of the scientific, cultural and historic heritage of astronomical observations. Two data sources are main objects of the ICT developments:

- Metadata for photographic plates
  The Wide-Field Plate Data Base (WFPDB) is an ICT project, which has been launched in 1991, by the working group "Wide-Field Sky Surveys" of the International Astronomic Union and is unique by its nature at international level (M. Tsvetkov – IA, BAS).

- Digitization of photographic plates
  So far 150 000 photographic plates have been digitized through several European research programs.

Abstract

Advanced technologies for digitization plates and also astronomical logbooks, as well as WFPDB improvements and additions are now under development in the frame of the current project.

Keywords: Astroinformatics, Information and Communication Technologies, Photographic Plates, Astronomical Logbooks, Digitization

Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation
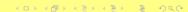
Partner institutions

- Institute of Mathematics and Informatics, BAS
- Institute of Astronomy, BAS
- Institute of Information Technologies, BAS
- Central Laboratory for Geodesy, BAS

Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation

The team includes members of

- National Institute of Meteorology and Hydrology, BAS
- Sofia University "St. Kliment Ochridsky"
- New Bulgarian University
- Rakovski Defense and Staff College

International participation

- Astronomical Institute and University Observatory, Jena, Germany
- Astronomical Institute of the Czech Academy of Sciences, Prague, Czech Republic

Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation

The main project objective is the usage of ICT methods and instruments for processing, representation and storage of astro-images in specialized database for efficient data retrieval. The planned tasks are:

- ▶ Preservation, compression and access to wide-field astronomical observations
- ▶ Virtual Observatory ICT standards compatibility, specially for platform independent operability
- ▶ WEB-based search tools for stars in digitized observations
- ▶ Adaptation of methods for image analysis, compression, web-access and data-mining
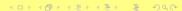- ▶ Dissemination among the ICT and astronomical community of the team experience

Wide-Field Plate Data Base

http://www.skyarchive.org/

The wide-field photographic observations are some of the main information sources in astronomy, especially for events dating back in time. There are about 2 million plates stored in the astronomical archives worldwide, as an outcome of the work of more than 400 professional wide-field telescopes for more than a century.

Now WFPDB contains metadata for over 500,000 astronomical photographic observations.

Now the digitized photographic plates are irreplaceable sources for

- ▶ studies of the stellar long term brightness changes;
- ▶ studies of the long term variability of active galaxies;
- ▶ search and identification of potentially hazardous asteroids which might cause catastrophic events by their collision with Earth.

Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation

WP3: Data storage & preservation

- ▶ Astronomical plate metadata preservation (WFPDB)
- ▶ Image data storage
- ▶ Image database organization
- ▶ Original logbooks data preservation
  The logbooks contain metadata for astronomical photographic plates, written by the observers at the time of observations.

Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation
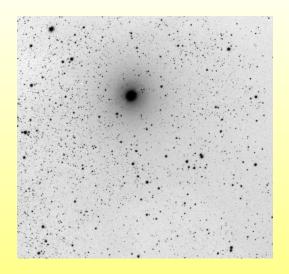
WP4: Virtual Observatory standards compatibility

- Implementation of presentation and access protocols according to the accepted International Virtual Observatory Access standards.
- Metadata standardization based on FITS header formalism.
- Applied software for standard FITS header extraction using existed catalogue and image information.

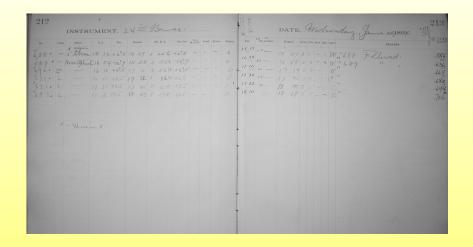# Astroinformatics: signal processing and analysis of digitized astronomical data and web-based implementation

WP5: Web-based access

- Web-based access and catalogue visualization to the low-resolution images (jpg, color)
- Web-based access and catalogue visualization to the high-resolution images (fits, grayscale)
- Web-based access to the original telescopes logbooks (jpg).

Photographic plate

Thank you for your attention.