

International Conference

**Digital Preservation and Presentation
of Cultural and Scientific Heritage**

11-14 September, 2011, Veliko Tarnovo, Bulgaria



Workshop Astroinformatics

ABSTRACTS

Veliko Tarnovo, 13.09.2011

SYNOPSIS

The main problems addressed by the newly born area of Astroinformatics may be summarized as follows:

- Improvement and development of existing algorithms for search in astronomical data bases, as well as in the WFPDB (wfpdb.org);
- Set up of data base giving interactivity and interoperability in making search with Web based procedures and keywords;
- Improvement and development of new methods for compression, representation and visualization of the images extracted from the photographic plates; these methods are problem-orientated to the theory and practice of Astronomy in the frames of the project;
- Set up of Web access to the digitized original log-books, containing original data of the observers with applying a technology for objects localization in scanned binary images;
- Improvement of the access to the modern astrometric catalogues created and upgraded during the last decades on the base of the Earth observations and from the Hipparchos and Tycho catalogues.

The workshop on Astroinformatics is partially supported by the Bulgarian National Science Fund grants DO-02-275 “Astroinformatics: signal processing and analysis of digitized astronomical data and Web based implementation” and DO-02-273 “Wide-field Plate Database: Development and Internet access”.

PROGRAMME

13.08.2011, Tuesday

9:00 Opening

9:10 Applications of Wavelet Compression to Digital Astronomical Images, Ognyan Kounchev and Damyan Kalagarsky

9:30 Wide-Field Plate Database: Development and Access via Internet, Milcho Tsvetkov

9:50 Article Disassembly – New Ways to Handle Information in Publications, Andràs Holl

10:10 Digital Preservation and Web Access to Konkoly Observatory Schmidt Telescope Plate Archive, Katya Tsvetkova, Milcho Tsvetkov and Andràs Holl

10:30 Laboratory for Digitization, Storage and Access of the Astronomical Photographic Plates in the Institute of Astronomy and National Astronomical Observatory, Momchil Dechev and Milcho Tsvetkov

10:50 Software Tools for Digitization of Astronomical Photographic Plates, Nikolay Kirov, Katya Tsvetkova and Milcho Tsvetkov

11:10 Coffee break

11:30 Technology for Scanning and Preprocessing of Astronomical Photographic Plates, Milcho Tsvetkov, Katya Tsvetkova and Nikolay Kirov

11:50 Potsdam Astronomical Photographic Plate Library Katya Tsvetkova, Milcho Tsvetkov, Nikolay Kirov, Petra Boehm, Matthias Steinmetz, Rainer Arlt, Harry Enke and Regina von Berlepsch

12:10 ASTROWEB – Graphical Representation of Astronomical Wide-Field Plate Database Using WEB Based Open Source Geographical Information System Aleksander Kolev, Milcho Tsvetkov, Dimo Dimov and Damyan Kalagarsky

12:30 Closing the Workshop on Astroinformatics

NB. During the DIPP2011 conference an exhibition on the topics of Astroinformatics will be presented. Samples from original astronomical plates, scans and photos of the digitization technique will be exhibited. During an representative poster session the results of processing of different plate archives in Europe presented in the WIDE-FIELD PLATE DATABASE (wfpdb.org) will be discussed.

Applications of Wavelet Compression to Digital Astronomical Images

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Abstract

During the last two decades new methods alternative to the classical Fourier Analysis have been developed for the analysis and compression of images, in particular Wavelet Analysis. However a really big success wavelets have achieved mainly in the one-dimensional Signal Analysis where they outperform the classical Fourier method in a very large class of one-dimensional signals, namely those “images” which are piece-wise smooth.

It has been a longstanding problem to develop multidimensional wavelets which outperform Fourier method even in the simplest two-dimensional case. A dozen of approaches exist, as curvelets (Donoho-Candes, 1999), bandlets (Mallat, 2002), brushlets (Coifman, 1997), contourlets (Vetterli), shearlets (Labate, Kutyniok, 2003), directionlets (Velisavljevic, 2006), platelets (Willett and Nowak 2003), grouplets (Mallat, 2009), dual-tree complex wavelet transforms (Kingsbury 1998; Selesnick et al. 2005), etc. The main point is to find a basic function (wavelet-like function) with elongated support and the above approaches stick to this concept. However none of them produces an orthonormal family which has the nice algebraic properties of the famous one-dimensional wavelets of Daubechies, Chui, etc.

We present a new family of multidimensional orthonormal wavelets, called polyharmonic subdivision wavelets, developed recently in a joint research with Nira Dyn, David Levin, and Hermann Render. On a large set of astronomical images we test the polyharmonic subdivision wavelets. The experiments show that these wavelets successfully capture the features of astronomical images, by providing an efficient analysis and compression.

References

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Wide-Field Plate Database: Development and Access via Internet

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Abstract

Here we describe the motivations and results from the first time period of the project Wide-Field Plate Database: Development and Access via Internet (DO-02-273/18.12.2008) designated for funding on the basis of competition by the Bulgarian National Science Fund in the field of Promotion of research in priority areas. The main direction of the development of the project is especially dedicated on the digitization and preservation, as well as on the web access of the astronomical plate archive of the 2-m RCC and the 50/70 cm Schmidt telescopes of the National Astronomical Observatory Rozhen done in the period 1979-1998. The basis of the work is given in the following two publications motivated the project over the past 10 years, (Tsvetkov, 2006; Tsvetkova, Tsvetkov, 2006).

The Wide-Field Plate Database WFPDB (wfpdb.org) represents an unique virtual instrument in astronomical research, which allows to obtain information on existing astronomical observations of celestial objects over the past 130 years with the professional astronomical telescopes at observatories around the world. Briefly this is an unique virtual telescope working as a “Time Machine” when obtaining information on historical observations of minor planets, comets, stars and galaxies is needed. The project goals also aim to continue and expand the successful work initiated during the past 15 years by extending the provision of technical work on the base and improve and extend the internal LAN (www.skyarchive.org) and ensure as rapid on-line access to data based on international standards of the International Virtual Observatory Alliance (IVOA) and the European Virtual Observatory (EURO-VO). The main results of this work are described in details in the annual report project July 15, 2010:

http://trillian.magrathea.bg:8181/DATABASE_FNI_273_2010July/

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Article Disassembly – New Ways to Handle Information in Publications

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Abstract

Articles and books – the basic publication units – could be disassembled to semantic building blocks. For scientific journal articles, such blocks include figures and tables, among others. Providing meta-data for figures and tables, and making them accessible per se opens up new ways of presenting and using scientific information – like producing an image-database on certain subjects, based on figures published in different journals. These meta-data should be supplied by the publishers, who in turn might require authors to provide this information. Some examples are shown from a small astronomy journal, the *Information Bulletin on Variable Stars*.

Digital Preservation and Web Access to Konkoly Observatory Schmidt Telescope Plate Archive

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Abstract

The digital preservation of the Konkoly Observatory Schmidt telescope, as well as the web access to the plate previews, aim the preservation of this scientific heritage and the re-usage of the astronomical photographic plates in time domain astronomy. The photographic plates used as detectors and storage information at the astronomical observations with the Konkoly Schmidt telescope had been obtained in the period 1962–1996. The work on the digital plate preservation and web access started in 2003 with procreation of electronic plate catalogue and digitization of selected representative plates as well as with interlinking the publishing in Konkoly Observatory Information Bulletin on Variable Stars (IBVS) with the developing in Sofia Wide-Field Plate Database (WFPDB). The process of the digitization of the Konkoly Schmidt telescope plates is described.

Laboratory for Digitalization, Storage and Access of the Astronomical Photographic Plates in the Institute of Astronomy and National Astronomical Observatory

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Abstract

In this work we describe the activities of the Laboratory for digitalization, storage and access of the astronomical photographic plates in the Institute of Astronomy with National Astronomical Observatory (IA NAO). A brief description of the photographic plates, methods of digitalization and necessary tools for scanning and storage is done. We discuss also future plans for access our plate database and integration with virtual observatory.

Software Tools for Digitization of Astronomical Photographic Plates

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Abstract

In this paper we present tools for helping the process of digitization of astronomical photographic plates. The requirements of Virtual Observatory presume that any FITS file, which contains digital image, has to be equipped with a complete header. Wide-Field Plate Database (WFPDB) offers the most of the meta-data needed for the creation of FITS header. The **FITS header** software gives the user an appropriate tool for connecting WFPDB catalogs and digitized plate image. Using the modern scanners sometimes impose to convert files from the inner format of the scanner (or driver) into FITS format. The **tif2fits** software converts VueScan row-tif format to FITS and also divides plate image and wedge image in case of scanning with gray-scale wedge.

Technology for Scanning and Preprocessing of Astronomical Photographic Plates

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Abstract

Here we describe the meteorology and the experience during astronomical plate digitization using the flatbed EPSON scanners. Last decade with such scanners more than 250 000 plates in different observatories in Europe were digitized.

Potsdam Astronomical Photographic Plate Library

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Abstract

The Potsdam photographic plate library at the Leibniz Institute for Astrophysics Potsdam (Germany) is presented. Its contents includes plate archives, data from the plate index catalogues and extracts from the respective logbooks, as well as digitized plate images and interfaces to access all the available information. The plate index catalogues and the digitized images of the Potsdam astronomical photographic plates are prepared according to the standards of the Wide-Field Plate Database (WFPDB, <http://www.skyarchive.org>) and German Astrophysical Virtual Observatory (GAVO, http://vo.aip.de/plates/pot-cdc_description.html). The high-resolution digitization of the plates (in standardized FITS file format), the low resolution plate previews (in TIFF and JPEG file format), as well as suitable digitization of the catalogues, logbooks, and relevant scientific research papers (in JPEG and TIFF) are done by commercial high-quality flatbed scanners.

ASTROWEB – Graphical Representation of Astronomical Wide-Field Plate Database Using WEB Based Open Source Geographical Information System

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Abstract

In this work we present an open-source MapServer intended to be used as an WEB-based geographic information system. We analyzed a MapServer object model and algorithms proposed for dynamic presentation of geo-referenced spatial data. The results from the usage of the proposed algorithms in application and development of the AstroWeb, which graphically present the existing data of the applications of the Catalogue of the Wide-Field Plate Archives (CWFP v. 2011) and web access, are present.