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# MOSAICING LARGE IMAGES FOR THE VIRTUAL OBSERVATORY

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**Abstract.** We present the current status and future developments of a data base complying with the Virtual Observatory SIA (*Simple Image Access*) protocol, and providing access to ESO, SRC and POSS Schmidt surveys digitized by the MAMA micro-densitometer at Observatoire de Paris. Image examination and retrieval is already allowed by the prototype through VO clients such as the CDS Aladin facility. Mosaicing (part or all of) several contiguous Schmidt fields will allow access to very large images at resolution as good as the 0.6 arc-sec MAMA pixel (*http://www.cai-mama.obspm.fr*).

## 1 Introduction

At the present time, most services providing access to wide field surveys offer only images which are of limited size and generally bordered by the plate edge even when the "Region Of Interest" (ROI) covers several adjacents fields which shoud require mosaicing to meet the user's request. We are developing a data base which, thanks to appropriate reprojection of the fields to be mosaiced, will offer high resolution images from ESO, SERC and PALOMAR atlases with dimensions only limited by client software and network bandpass constraints, and compliant with the V.O. standards.

## 2 Image reprojection

We use the SWARP software (*E. Bertin, http://terapix.iap.fr/softs/swarp*) developed by the TERAPIX team at Institut d'Astrophysique de Paris (IAP). SWARP is first feeded with a file containing the "PV" parameters (see Greisen & Calabretta 2002) allowing accurate determination of the gnomonic coordinates (see e.g. Kovalevsky & Seidelman 2004) as a function of pixel coordinates. To coadd or mosaic the images of interest, SWARP resamples and eventually reprojects them on a common plane tangent to the celestial sphere where the gnomonic coordinates $\xi$ and $\eta$ can be expressed in the following way:

$\xi = +\,\mathrm{cd}\,(\mathrm{xpix} - \mathrm{xpix0})$; $\quad \eta = -\,\mathrm{cd}\,(\mathrm{ypix} - \mathrm{ypix0})$,

where xpix0 and ypix0 are, in the reprojected image, the pixel coordinates of the adopted centre, and cd is the common scale of both axes.

## 3 The data base

The heart of the S.I.A. server (*http://www.ivoa.net/Documents/WD/SIA/sia-20040524.html*) is a relational data base implemented under PostgreSQL. Informations of various types are recorded in the tables of this base: astrometry of each of the atlas fields digitized by the MAMA microdensitometer with a pixel size of 10 microns (0.6 arcsec); access to the corresponding images; photographic atlas; observation and scanning conditions; catalog of the detected objects with their astrometry and photometry. We use the Geographic Information System (GIS) ( *http://www.opengeospatial.org*) under PostgreSQL to allow high level queries.

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## 4 Implementation of the SIA

The recommendations of the SIA 1.0 are well suited to large field images. Access to the relevant information is performed in two steps. The service first sends the list of the available relevant images accompanied by metadata in the form of a VOTABLE, before giving access to the images themselves on the basis of the URL selected by the user. The available SIA services are "Image Cutout Service" and "Image Mosaicing Service".

## 5 Currect status of the project

A first version of the base has been installed on the site of the V.O. Paris Data Centre. It makes use of software developed by CAI or by the TERAPIX project team whose part of the pipeline has been installed by J.C. Malapert for image resampling and reprojection. A prototype of SIAP (Simple Image Access Protocol) service is being finalized in collaboration with the Paris V.O. Data Centre (P. Le Sidaner) and the Aladin team at CDS (F. Bonnarel). The V.O. layer allows generalization of remote queries. The SIAP service prototype is:
**http://voplus.obspm.fr/cgi-bin/SIA.pl?** .

A query compliant with the SIAP protocol such as :

**http://voplus.obspm.fr/cgi-bin/SIA.pl?POS=100.0,-79.0&SIZE=0.1,0.1**

can already be sent from Aladin ( *http://aladin.u-strasbg.fr/aladin.gml*), and a prototype of mosaicing service has been developed . The leftmost part of Fig. 1 displays the access, through Aladin Multiview, to the overlaps of the Region Of Interest with the two candidate fields, namely ESOR 16 and 17. The following subimages show the different steps leading to the mosaic. Elimination of plates borders and calibration steps in the final image is obtained by using convenient weight maps.

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Left: access, through Aladin Multiview, to the overlaps of the Region Of Interest with the two candidate plates ESOR-016 and ESOR-017. Right: the different steps leading to a mosaic free of plate borders and calibration steps

**Fig. 1.** Mosaicing of two adjacent ESO-R Schmidt fields

## References

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