

MAISON: A Web Service of Creating Composite Images On-the-fly for Pointing and Survey Observational Images

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Abstract. MAISON³ (*Multi-wavelength Astronomical Image Service On-line*) is a Web broker service which allows users to retrieve different images of the same field-of-view (FOV) from separate image servers. Through MAISON, users can readily preview a composite image created on-the-fly from these multiple images. Given a successful development and release of the seminal version, we are currently developing a new version of the MAISON system which will be equipped with several new features.

1. Overview of the MAISON

A flow chart of a single MAISON session is illustrated in Figure 1. The session consists of two systematic queries from a client to remote image servers via the MAISON server.

1.1. The First Query: Getting an Image List

At the first query which is launched at the top page, users are requested to specify the celestial area and remote image servers from which the images are

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³<http://maison.isas.ac.jp>

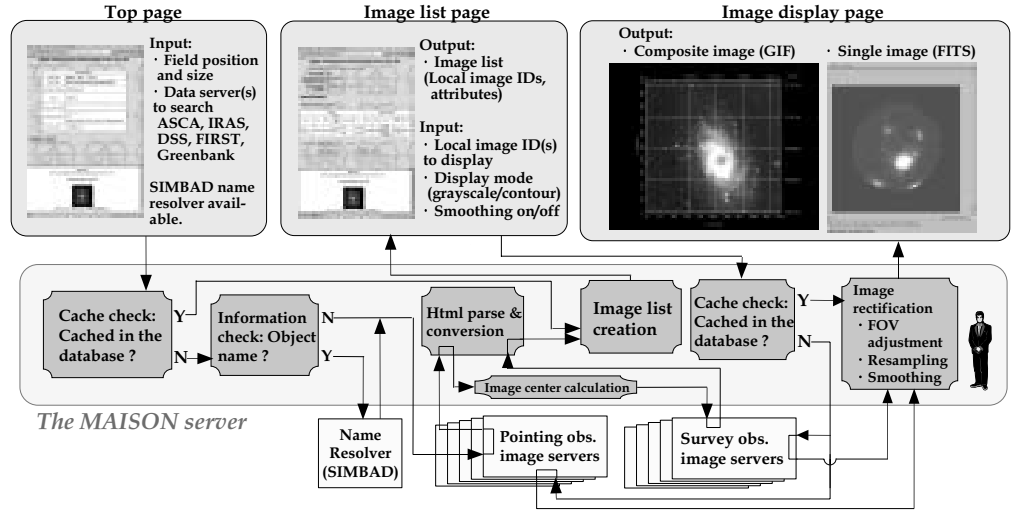


Figure 1. A flow chart of a MAISON session. Three top layer panels represent client browser windows, while a middle layer panel underneath them shows operations of the MAISON server. The MAISON server accesses remote servers which are illustrated underneath the MAISON server layer.

to be retrieved. What is returned in this query is a list of images (not the images themselves) which meet the user's input request and are available at the specified remote servers.

The MAISON system affiliates the remote servers unilaterally, i.e., a remote server is affiliated *as is* with the MAISON system. Because of this unilaterality a condition is imposed on the remote server that it should be a TCP/IP-based server dealing with FITS images that hold popular WCS records. The condition, however, is a quite ordinary one for a standard astronomical image server and therefore it does not actually limit the remote servers available to the MAISON system. Similar to most of other astronomical image servers, the MAISON server accepts either an object name or celestial coordinates in order to specify a celestial area. The object name is resolved into coordinates using a SIMBAD name resolver client routine (Wenger et al. 2000) provided by CDS. The user's initial input parameters are converted into a CGI variable 'QUERY_STRING' that is suitable to the remote servers' specific CGI-form. This conversion is conducted in reference to a conversion table created and maintained off-line manually. The MAISON server then submits the QUERY_STRING to the specified remote servers. Pointing observation images are searched for within a finite area on the sky centered at the users' specified location, thus generally have different FOVs. Because of this we need to know the real center of the individual pointing observation images prior to obtaining the survey images comparable with the pointing images. Accordingly, the submission to the pointing observation image servers always needs to precede that to the survey observation image servers. The HTML information returned is parsed in a manner prescribed specifically in

the conversion table. The parsed information is composed into a single HTML list file of the available images and then displayed on the client's browser.

1.2. The Second Query: Getting a Composite Image

At the second query, the users are requested to select from the image list a pair of images to put together into a composite image. These images are then retrieved from their respective hosting remote servers, rectified, composed, and finally displayed on the client browser in GIF format. A single image may be displayed as well using a FITS image viewer provided as a Java applet.

Given the users' input parameters for the second query, the MAISON server converts them into a QUERY_STRING in the same manner as does in the first query. MAISON has a local cache database for recent queries and images. Accordingly, if the QUERY_STRING is found in the database, the locally stored images are used in this session. Otherwise the query is submitted to the specified remote servers. The pair images are then retrieved from their respective hosting remote servers and stored on the MAISON server's working disk space. The images are rectified in reference to their WCS information so as to have exactly the same FOV. The rectification is performed using the WCSTOOLS library (Mink 1999).

The rectified images are then put together into a single GIF image using the PGPLOT⁴ library, with one image illustrated in a gray-scale and the other superposed on it as a contour map. A grid and labels for equatorial coordinates are also drawn in the GIF image. The GIF image is finally displayed on the client browser using an 'image' tag of the HTML. In the FITS image viewer invoked for displaying a single image, users may change a color map by mouse-dragging and a magnification of the image by a menu selection in this applet window.

2. Development of the New MAISON

The currently released version of MAISON has several issues of improvement and reinforcement to get a better performance, thus leading us to plan a whole reconstruction of the MAISON. To this end we have already started a development of the new MAISON system. Substantial aspects of the reinforcement has been enlightened by the excellent Aladin system (Bonnarel et al. 2000). Main issues of the improvement and reinforcement include:

- *The image viewer*
All the images are to be treated in the FITS format and will be displayed in a single image viewer (Figure 2). The image viewer will be coded as a Java applet to allow users to do a prompt interactive operation on the images. More than two images may be selected for the composite image display.
- *Catalog data*
A catalog data server VizieR (Ochsenbein et al. 2000) has been mirrored at NAOJ/ADAC and will be affiliated with the new MAISON system. The catalogued objects will be superposed on the image viewer.

⁴<http://astro.caltech.edu/~tjp/pgplot/>

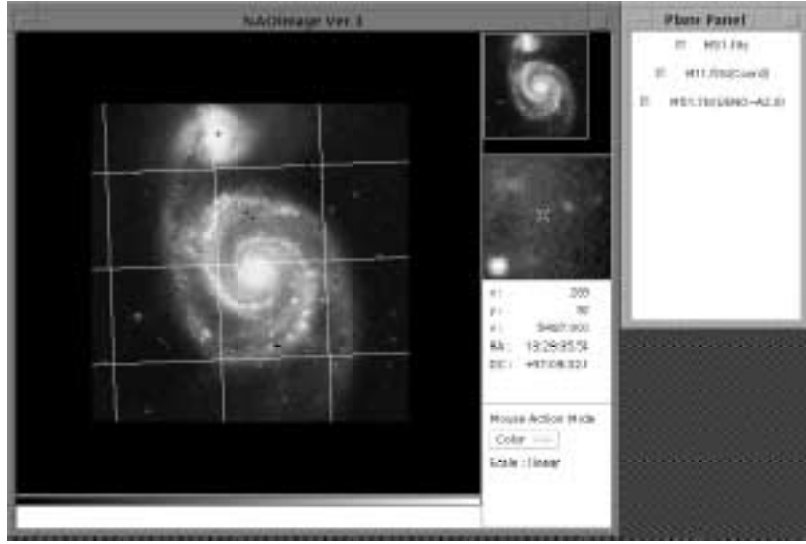


Figure 2. The image viewer for the new MAISON system (under development). The viewer uses FITS files as an input images. The viewer is equipped with subpanels similar to those of SAO image, and any numbers of gray-scale images and contour map images may be selected and overlaid as if they are drawn on ‘transparent sheets’. The sheet may be a chart of the catalogued objects in the sky area.

- *DSS wide-field server*

A DSS image server maintained at NAOJ/ADAC has been featuring a locally modified getimage which is capable of generating an image up to 6°-square FOV (Taga et al. 2001). The output pixel scale can be set accordingly larger and therefore helps to transfer DSS data significantly faster than the original DSS image. The DSS wide-field server will be affiliated with the new MAISON server.

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