

ISSI International Team on
3D RECONSTRUCTION METHODS FOR THE STEREO MISSION
(ISSI, 26-28 October 2005, 2nd meeting)

Minutes of meeting

Participants : Frédéric Auchère (1 day), Thierry Dudok de Wit, Jean-François Hochedez, Bernd Inhester, Antoine Llebaria, Angelos Vourlidas.

Absent : Jean-Pierre Wuelser.

1 Programme

Review of current developments

(1 1/2 day)

- A. Vourlidas : reconstruction efforts at NRL, including forward fitting of CMEs and pixon tomography.
- A. Llebaria : reconstruction of polar plumes and automatic detection of CME's from synoptic maps.
- J.-F. Hochedez : 3D reconstruction efforts at ROB, including optical flow techniques, feature extraction and segmentation.
- T. Dudok de Wit : contrast enhancement by independent component analysis.
- B. Inhester : how to exploit the topology of the magnetic field to constrain the reconstruction.
- F. Auchère : forward modelling and tomography of plumes and quiet corona.

2 Outputs

We need to find domains (niches) in which we can contribute to the STEREO community within a short time. There are two of them:

- provide a WiKi database with a commented list of references (articles, books, documents, images, movies or presentations) that deal with 3D reconstructions. It will contain documents relevant to Stereo, but also documents on image processing, etc.
- provide web-based documents that present various 3D reconstruction methods in user-oriented perspective, using physical phenomena as test cases. These documents will also be hosted by ISSI.

2.1 WiKi database

This database should collect all documents that are relevant to the 3D reconstruction of data from Stereo, possibly using other satellites (SoHO, ...) as other viewpoints. As it is based on a WiKi interface, everyone can contribute to it. Our team members will act as moderators to decide whether to accept a submission or not.

2.1.1 Contents

The data base will contain articles (with full texte in pdf when available), preprints (with full text in pdf), books, presentations (in pdf only), movies, images, data sets (to be decided later). For each submitted document, several fields will have to be filled in, see below. Everyone from the community can then comment on the documents. These comments will appear together with the other fields.

We expect this database to contain between 200 and 500 documents, requiring 1 to 2 GB of space.

2.1.2 Access

The database will be password restricted, to avoid copyright problems. Access will be given to all the members of the Secchi 3D reconstruction team, and to those asking for it. Every user will have the right to read and search the database, download documents, post comments and upload documents (once accepted by the moderators). The moderators in addition will have the right to delete documents and to accept/reject submissions.

There will be one username & password for all Secchi team members and one administrator username & password for the moderators.

2.1.3 Moderators

All present team members will be moderators of this database. Their task is to decide whether or not a submitted document can be uploaded as such. We expect some documents to be rejected at first because fields are insufficiently or incorrectly filled in. All moderators will receive an alert every time someone submits a document. Thierry DdW will be the moderator in fine.

2.1.4 Calendar

A first version of this database will have to be ready before the next team meeting, so that the team members can already add some documents to it and test it. Depending on the number of corrections to be made, this database will then be made accessible to the community by mid 2006. It will be hosted by ISSI and updated by the team members until this team ends. A decision will then have to be taken about a possible transfer to a different host.

2.1.5 Interface

The WiKi interface will contain the following (see <http://eui.oma.be> for an example):

- main access page asking for username and password
- main menu with access to : submission form, database search
- same menu, but with delete option (for login by moderators only)

The main interface will contain the following fields :

- Author of document
- Title of documents
- Type of document. To be selected from pull-down menu with : article, book, report, preprint, presentation, commented image, movie, web site. More than one is possible.

- Link to source : link to EADS database for article, link to website or other.
- Name of submitter
- Date of submission : added automatically
- Comments. This field is compulsory for the one who submits the article. It will be mentioned on the interface that the submitter should briefly explain why this document is useful, what it applies to, what its potential flaws are. This is not an evaluation of the quality of the document, but of its relevance to 3D reconstruction. More comments may be added later by other people.
- Keywords. To be selected from a pull-down menu. More than one is possible. See below for list.
- Button to upload document. This will then automatically issue an email to the moderators.

Search window : the database must be searchable by keyword, author, title, etc. Details will be decided according to the type of Wiki interface.

Search display window : once one of several documents have been selected, they should appear in a list, with author name, title, type of document and keyword. Clicking on one document will then open another window.

Detail display window : window for showing all the fields of one particular document. A field at the bottom allows the user to add a comment if he wishes. This will ask for his comment and for his name. A date of the comment will automatically be appended.

2.1.6 Keywords

The following keywords will appear in the pull-down menu. There are three domains. More than one keyword can be selected.

Type of instrument

- EUV imaging
- coronagraphy
- radio waves
- in-situ measurements

Type of method

- Stereoscopic methods
- Tomographic methods
- Motion tracking (optical flow, sinograms, ...)
- Forward Model(ing)
- MHD models
- Magnetic field extrapolations
- Image transforms (synoptic maps, coordinate transforms, ...)
- Multiscale analysis (wavelet analysis, Fourier analysis, ...)
- Image enhancement (contrast enhancement, edge detection, ...)

- Denoising
- Calibration (instrument response, geometry, vignetting, mapping, ...)

Type of physical process

- Loops & active regions
- Streamers & current sheet
- Quiescent Sun (e.g. filaments, spicules, chromospheric network)
- Eruptions
- Radio bursts
- CMEs & magnetic clouds
- Coronal holes & plumes
- Accelerated particles (SEPs)

2.1.7 Other points

Cross-referencing between different documents is useful. Implementation will depend on the type of Wiki interface. Moderators will probably have to do this manually.

2.2 Survey articles

Web-based documents are ideal for rapidly disseminating information. We shall provide survey articles covering various aspects of 3D reconstruction we're competent in (not seeking completeness).

Objective : user-oriented survey similar to Numerical Recipes, with key concepts but no code. Refer as much as possible to existing material in order to avoid redundancy.

When : must be available by end 2006 (last team meeting). Contents to be discussed during next team meeting (March 2006).

There are 3 topics :

- 1. 3D reconstruction of loops** using synthetic data (Frédéric & Jean-Pierre), magnetic field data (Bernd) and high cadence EIT data (Jean-François).

Objective : extract loop geometry, disentangle loops, work on loop brightening.

Methods : magnetic constraints (Bernd), feature extraction (Jean-François), tie-point (?)

Who : Bernd (lead), Frédéric, Angelos, Jean-Pierre, Jean-François.

- 2. Plumes** using synthetic data from fractal model (Antoine) and from ray-tracing (Frédéric).

Objective : characterise plumes and use this as a test case for various approaches.

Methods : sinograms, tomography (back-projection + others ?), forward modelling, contrast enhancement.

Who : Antoine (lead), Frédéric, Jean-François, Thierry

- 3. Preprocessing** of EUVI and COR data

Objective : address various issues such as noise statistics, calibration differences in band-passes, feature enhancement, denoising, cosmic ray hits (?). Refer as much as possible to existing material.

Who : Jean-François, Frédéric, Angelos, Thierry.

3 Actions

all : collect relevant articles/texts for the Wiki database.

all : select data sets for surveys (see Section 2.2).

Jean-François : prepare data set (synthetic Sun in EUV)

Jean-Pierre : prepare data set (loops)

Thierry : setup Wiki interface

4 Next meetings

Third meeting : Wednesday morning March 15 - Friday afternoon March 17. Participants : team members + Frédéric Auchère (IAS).

Fourth and last meeting : end 2006.

5 Website

Our website is at : <http://www.issi.unibe.ch/teams/Stereo/>

(s)ftp access : <ftp://Stereo@ftp.issi.unibe.ch/>