



**HAL**  
open science

## Continuous tracking of structures from an image sequence

Yann Lepoittevin, Isabelle Herlin, Dominique Béréziat

► **To cite this version:**

Yann Lepoittevin, Isabelle Herlin, Dominique Béréziat. Continuous tracking of structures from an image sequence. GDRE ConEDP Meeting 2013 - Modeling and control of systems: applications to nano-sciences, environment and energy, Apr 2013, Grenoble, France. hal-00873748

**HAL Id: hal-00873748**

**<https://inria.hal.science/hal-00873748v1>**

Submitted on 21 Oct 2013

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# CONTINUOUS TRACKING OF STRUCTURES FROM AN IMAGE SEQUENCE

– talk –

YANN LEPOITTEVIN, ISABELLE HERLIN, DOMINIQUE BÉRÉZIAT

The talk describes an innovative method to simultaneously estimate motion and track a structure on an image sequence. To process noisy images, assumptions on dynamics should be involved. Consequently, the method relies on the dynamics equations of the studied physical system.

The issue of tracking a structure has been largely studied in the image processing literature, see Yilmaz et al. [1]. In Papadakis et al. [2], a method that computes motion field and tracks a structure, based on an incremental 4D-Var approach, is described. But it requires an accurate segmentation of the structure on the whole image sequence. On the other hand, our method only necessitates an approximate segmentation of the object on the first image. To our knowledge, no paper describes such a method that, only based on image data and a rough segmentation, simultaneously estimates motion and segments/tracks a structure.

A strong 4D-Var algorithm, such as described by Le Dimet et al. [3], is used to solve the evolution equation of image brightness, those of motion's dynamics and those of the distance map modelling the tracked structure. The observation data used by the assimilation process are the satellite images and their gradient values. The solution is obtained by minimization of a cost function using the L-BFGS algorithm, described by Zhu et al. in [4].

Promising results have been obtained on twin experiments in order to quantify the accuracy of the method. The approach has also been tested on satellite acquisitions in order to track clouds an meteorological satellite acquisitions. Further research will concern the conception of a multi-object tracking method.

## REFERENCES

- [1] Yilmaz, A. and Javed, O. and Shah, M. : *Object tracking: A survey, ACM Computing Surveys, 2006*
- [2] Papadakis, N. and Mémin, E. : *A variational technique for time consistent tracking of curves and motion, J. Math. Imaging Vis., 2008*
- [3] Le Dimet, F.-X. and Talagrand, O. : *Variational algorithms for analysis and assimilation of meteorological observations: theoretical aspects, Tellus, 1986*
- [4] Zhu, C. and Byrd, R.H. and Lu, P. and Nocedal, J. : *L-BFGS-B: Algorithm 778: L-BFGS-B, FORTRAN routines for large scale bound constrained optimization*

INRIA, CERIA, JOINT LABORATORY ENPC - EDF R&D, UNIVERSITÉ PARIS-EST. B.P. 105, 78153 LE CHESNAY, FRANCE

*E-mail address:* Yann.Lepoittevin@inria.fr