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FluidImage, a libre framework for scientific treatments of large sets of images: A software for the fluid dynamic community, by the fluid dynamic community.

In:

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Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-198677
A libre framework for scientific treatments of large sets of images

FluidImage

A software for the fluid dynamic community, by the fluid dynamic community

A solution

Easy, safe and efficient for all users, nice for the developers

New methods of open-source software
- scientific Python environment (=>multi-platform)
- unit tests (stable, less bugs)
- automatic web documentation
- modular, object oriented
- collaborative environment (Mercurial/Bitbucket)

Efficient and multi-architecture (from desktop computer to cluster)
- asynchronous, distributed and parallel computing
- hybrid computation (CPU/GPU)
- unified API for the different schedulers (OAR, Slurm, ...)
- optimized algorithms
- Python/Numpy compiler Pythran (functions as fast as C++ or Fortran)

FluidImage


Preprocessing

- Functions of scipy.ndimage, scikit-image and OpenCV
- tools implemented out of the box:
  - spatial and spatio-temporal filters (median, minima, percentile)
  - brightness and contrast tools (global threshold, rescale intensity, histogram equalization)
  - miscellaneous operations (gamma correction, sharpen)
- easy to add user-defined functions operating on a single image

Particle Image Velocimetry - PIV

- Based on 2D correlation
- multiple pass with grid refinement

Comparison with PIVlab (Matlab)

Several methods (using CPU and/or GPU) for
- correlation computation
- interpolation
- sub-pixel peak detection
- detection of wrong vectors

Speed-up

Benchmark done on one node on a cluster at LEGI for a computation of 100 velocity fields. The deviation from the linear curve is to be due to IO limitations (NFS).