

Towards Production Level Cardiac Image Analysis with Grids

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Motivation and Objectives

- Lack of sophisticated IT infrastructure and automation in Health Institutions: “Healthgrid Workflows”
- Large Number of patient datasets in clinical trials: Automation using techniques like parameter sweeps
- Fine tune parameters in order to adapt to images variability
- Studying practical grid performance and its suitability

Overview of Current Work

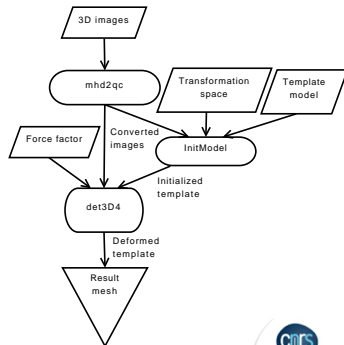
- This work details our data-intensive Cardiac Image Processing Experiments. We use the EGEE Grid Computing Infrastructure and show qualitative and quantitative results using *MOTEUR* and *Taverna2* enactments of our experiment workflows.
- Two experiments for *Myocardial Segmentation* and one for *Cardiac Motion Estimation* were carried out.

Workflow Managers: MOTEUR and Taverna

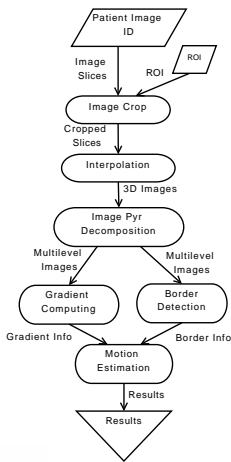
- Taverna and MOTEUR (with VBrowser integration) provides complimentary features necessary for our experiments.
- MOTEUR: A Parallel, Grid-enabled Enactment, working within the VBrowser¹ environment, offers advanced Data browsing capabilities.
- Taverna²: Rich-client User Interface, extended with gLite plugin interfacing EGEE (to be published in cbms09), Mixed Local-Grid execution modes.

Myocardial Segmentation: Analysis of Heart Shape

- MOTEUR enactment
- *mhd2qc*: 3D image conversion step
- *InitModel*: Initialization using an *a priori* heart model
- *det3D4*: Segmentation step that deforms the model to fit myocardial borders
- *Force factor*: A threshold influencing the deformation process



Myocardial Motion Estimation: Analysis of Heart Beat



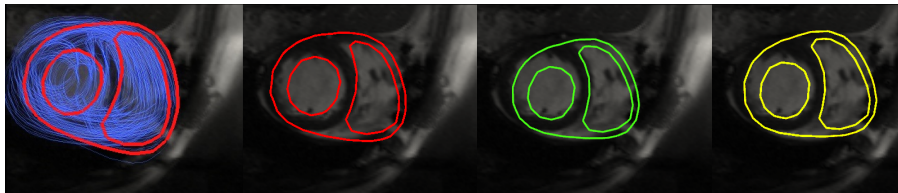
- Taverna Enactment
- Quantitative motion estimation of heart beat
- Image Processing Filters
- Compute Intensive and Parallelism

Segmentation Automation Infrastructure

- MOTEUR enactment in the VBrowser³ environment.
- EGEE File Catalogue and single Storage Element for Grid Data Management.
- Local Simulation on intel xeon 5410, 2.33 GHz quad-core (3 dedicated and 1 server hosting core)
- 10 MRI examination sets scanned using a Seimens MR scanner.
- Production at the cardiology hospital, Lyon, France.

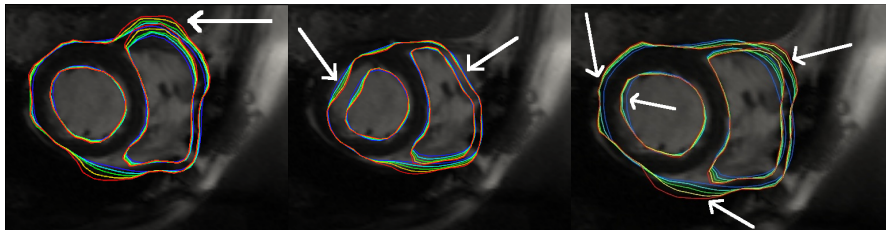
Segmentation Experiment #1

- Obtained results for different values of Rotational and Transformational parameters.
- A sweep on 75 different parameter combinations was done.



Segmentation Experiment #2

- Results for different values of *Force Factor* Parameters
- Force factor: 0.1=blue 0.2=cyan, 0.3=green 0.4=yellow 0.5=red

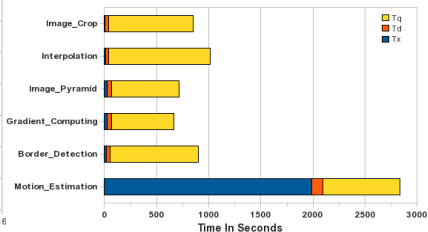
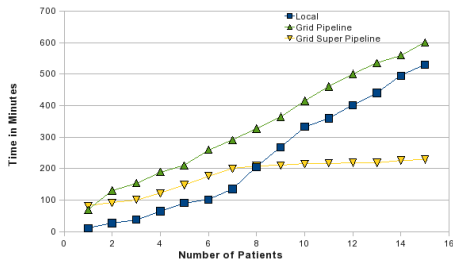


Motion Estimation Infrastructure

- Enactment using Taverna gLite plugin
- Job resubmission policy
- Round Robin Workload manager selection policy
- Data transfer request resubmission in case of failures
- Different enactment modes: local, pure grid, mixed-mode

Results

- T_q =Queuing Overhead
- T_x =Execution time
- T_d =Data Transfer times



Screenshot: MOTEUR and Vbrowser

VBrowser[0]:https://ws1.grid.sara.nl/~glatard/workflow/workflow-PTiv75/workflow-PTiv75.html

Location Edit View Tools Windows Help

Location: https://ws1.grid.sara.nl/~glatard/workflow/workflow-PTiv75/workflow-PTiv75.html

Resource

My View

- /home/glatard
- biomedLFC
- SRB@sara
- viz-login
- gwendia_cardiac
- vlemed LFC
- alex
- amc
- amc-ng
- amc-ng-enc
- back-ups
- demo-VLMR
- fokke
- generated
- glatard
- jalkemade
- jereone
- kiboulebar
- martin
- matthan
- mdm
- piter1.de.boer
- remi
- data_storage
- db
- joblogs
- masks
- output
- output-may-2008
- output_26-08
- scripts
- workflows
- group
- individual
- iaps
- nback
- roi
- groupAnalyses
- individualAnalyses
- inputs
- flirt_and_roi_indiv.s
- http
- results
- siMa
- testVSLFC
- testVSLFC2
- tristan
- wibisano
- garbage.sh
- hello-1228916611960604456
- ccli
- Desktop
- applisCreatis

CobraViewer

Status Services Input Results Info

Workflow monitoring

Grid files browsing

indivAnalysis

roi

flirtIndiv
done:2
running:0
failed:0

roiIndiv
done:0
running:10
failed:0

zstat2standard

JOB STATUS:workflow-PTiv75

Configuration JobStatus

Update Periodic Refresh(minute): 1

Job Actions

Retrieve Output Cancel Jobs Select/Unselect

N°	JobID	JobStatus	Link Out	St
1	https://rb.grid.sara.nl-9000...	DONE SUCCESS	Not yet...	
2	https://rb.grid.sara.nl-9000...	DONE SUCCESS	Not yet...	
3	https://rb.grid.sara.nl-9000...	READY	Not yet...	
4	https://rb.grid.sara.nl-9000...	READY	Not yet...	
5	https://rb.grid.sara.nl-9000...	READY	Not yet...	
6	https://rb.grid.sara.nl-9000...	READY	Not yet...	
7	https://rb.grid.sara.nl-9000...	WAITING	Not yet...	

Job monitoring

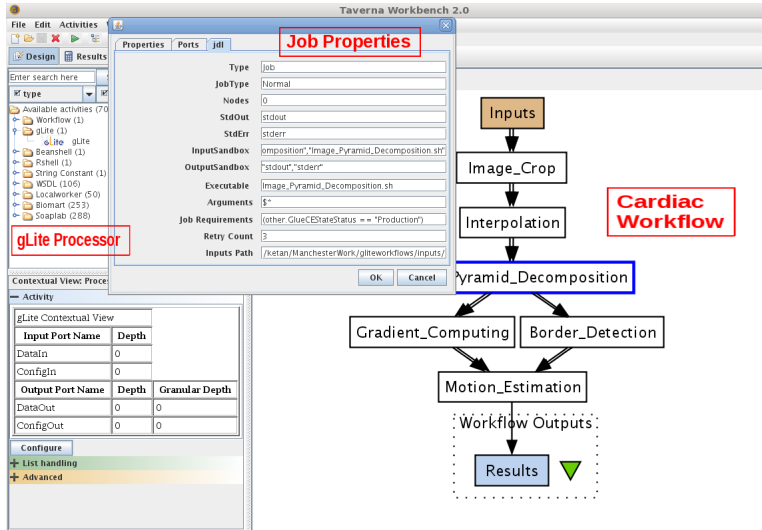
Workflow inputs

Load from file Save to file Add Parameter List Add Parameter Range Add Parameter Tag Path Delete

Name	Group	Value
indivAnalysis		https://ws1.grid.sara.nl/~glatard/workflow/workflow-PTiv75/workflow-PTiv75.html
roi		https://ws1.grid.sara.nl/~glatard/workflow/workflow-PTiv75/workflow-PTiv75.html

Run Workflow Web service URL: https://ws1.grid.sara.nl/~glatard/workflow/workflow-PTiv75/workflow-PTiv75.html

Screenshot: Taverna and gLite Plugin



Thanks!! Questions??

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