



Progress Report Submission for C. J. Taylor

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Agreed Upon

- Consider rewriting the main points that a project presentation must get across.
- Update the target conferences page in the internal Web site.
- Investigate existing optimisation issues.
- Perform bigger overnight tests to analyse the larger-scale behaviour of the objective functions.
- Continue testing the algorithms near convergence.

Note: Several more omitted as they were not explicitly requested.

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Electronic version: <http://www.danielsorogon.com/Webmaster/Research/Progress>

Progress Made

Sub-categories will now become a standard. They cater for the natural distinction between: 1) organisational issues, either managerial, secretarial or personal; 2) experiments; 3) technical issues that will resemble a change log of the application.

There is a dependency between the experiments and the technical tool that is used to generate them. Inevitably, some bullet-points will default to be put under somewhat irrelevant sub-headings.

Organisational

- ISBE Internal Web site has been further updated, the target conferences page included.
- As part of code maintenance and organisation, many comments have been added to the code as well as necessary documentation.
- Additional on-line resources¹ for AART have been added as part of the plan to keep progress well-documented and information appropriately indexed and in tidy order.
- Rough talk in \LaTeX has been put together.

http://www.danielsorogon.com/Webmaster/Research/March_2004

- MIAS IRC Meeting took place in the end of March, but there is nothing particularly important for me to report.

Experiments

All experiments are presentable as HTML files.

<http://www2.cs.man.ac.uk/~schestr0/Experiments>

- Automation abilities have been extended.
- The hypertext structure and linkage were improved.
- Amongst the more contributory experiments:
 - Shape weight experiments have been performed.

¹None of this information is public. Access is permitted only to people involved.

- Very large experiments were run to produce useful figures and statistics.
- The model-based objective function was run very close to convergence or at convergence.

Technical

- Animation of appearance models² made possible as well as capture of the sequence to produce an AVI file.
- Optimisation verbosity modes have been added to assist debugging.
- A large number of additional schemes/options have been added to the menu for quicker experiments customisation.
- Continued automation of experimentation: one variable registration parameter can be specified to run several different experiments autonomously. There are 4-5 different customisable parameters with user-defined numerical ranges to be explored³.
- A bug with the opening of default data was resolved. It is crucial for the running of experiments whose results are data-independent.
- Dynamic warp option has been added. The search performed by the optimiser can now be visualised.
- Optimisation investigation continued. At first it was assumed that the volume in space which is being explored results in negligible changes to the state of the optimiser. Later it became clearer that W_s was the source of most difficulties.
- The main menu layout has been thoroughly extended.
- A new application component allows verbal descriptions to be assigned to experiments and extend the handle which is a primary key. This description promotes simpler experiments discovery and organisation.

Observations

- The sequential optimisation version of multi-point warps does not exist. The code does not support such algorithms although past experiments provided results and figures for them.

²Given the number of modes and standard deviation to be presented – this is by all means flexible.

³Clearly, a feature as such is much better demonstrated than explained succinctly in words. However, for completeness this change log-like listing will persist.

- Diffeomorphism seems to be broken sometimes in the multi-point warp case. The new visual debugging option makes this apparent.
- Optimisation can lead to values which are below the estimated registration target, as defined by the piece-wise linear warps. This is due to height which can be resolved by sharp bends of the warp.

Next Stage

- Reading of Mathematical Methods course material will need to occupy a large proportion of time at some stage before May or June.
- Discussion of results and ways to proceed depending on the developments made throughout the weekend and on Monday.
- Discuss the way in which experiments should be recorded and referenced. It is possible to refer to handles from this report, but it is not clear how effective this would be.
- **Ideas to be discussed or yet to be investigated:**
 - altered objective functions relying on appearance models, e.g. pair-wise model-based scheme or pyramid of hierarchical small groups.
 - Use a mean reference instead of one fixed data instance. Make use of this reference in the model-based objective function.
 - Discuss multi-modality registration potential which relies on PCA.