



Progress Report Submission for C. J. Taylor

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The technical side of progress reports becomes reminiscent of a change log, yet it is vital for full realisation of the work put in. A simpler indicator of progress may be experiments and their results, possibly along with occasional inspections of the application's state.

Agreed Upon

Organisational

- Write down 6 or 7 ideas that the presentation must get across. Try to organise them in a suitable order.
- Future presentations will adhere to \LaTeX , but PowerPoint will be considered too.

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

- My presence at the Plenary IRC meeting in Manchester is encouraged and confirmation of attendance has been sent to Jennet.
- Christine will find out about my source of funding so that a reply can be sent to Surrey where the EPSRC summer school takes place.

Technical

- Scale the height of bumps appropriately to ensure default MATLAB scale does not dominate.
- Add control files capabilities for intuitive experiment reproduction. Log options can also be added to complement the former.
- Optimisation process needs tweaking. It is imperative that we try to find better ways of finding solutions which replace purely random placement and abstain from any extent of data-bias.

Agreed Upon on Friday February 5th

The following had not been completed before the February 8th meeting took place. They are therefore relevant to this report as much as they were to the previous.

Organisational

- Look for automatic MATLAB documentation in the Division (if existent).
- Get included in the internal MATLAB mailing list.

Technical

- Implement visualisation of perfect¹warps to assess objective functions more properly.
- Perturb the perfect warps, e.g. using CPS warps or Gaussian distribution of offsets, for analysis of different objective functions near convergence.

¹In practice these will be nearly perfect.

- In the model-based case, use one data instance as a reference to prevent the optimisation from drifting away to bad solutions. This reference could possibly be the mean of the data.
- Make use of error bars in various plots.

P rogress Made

Before Saturday, March 13th

Organisational

- HTML reports are all available under:
<http://www2.cs.man.ac.uk/~schestr0/Experiments>
 where they will be sorted by dates. See below for elaboration on the technical side.
- Figures will still be located at:
<http://www.danielsorogon.com/Webmaster/Research/Figures>
 The aforementioned automatic process will make the Figures page obsolete. It autonomously does all that has been done thus far (and beyond it).
- *schestowitz.com* will soon be the new location of my research workspace and documents.
- Addition to the 2 existing MATLAB mailing lists in ISBE.
- **Key ideas for the presentation: (draft)**
 1. Automatic model construction has been proven feasible
 - (a) MDL can describe model complexity
 - (b) Solved problem for shape models
 2. Quality of appearance models cannot yet be optimised automatically
 3. Appearance models require dense correspondence for automatic construction
 4. Registration typically depends on choice of reference
 5. Registration aids establishing correspondence
 6. Correspondence for appearance model construction is aided by registration principles

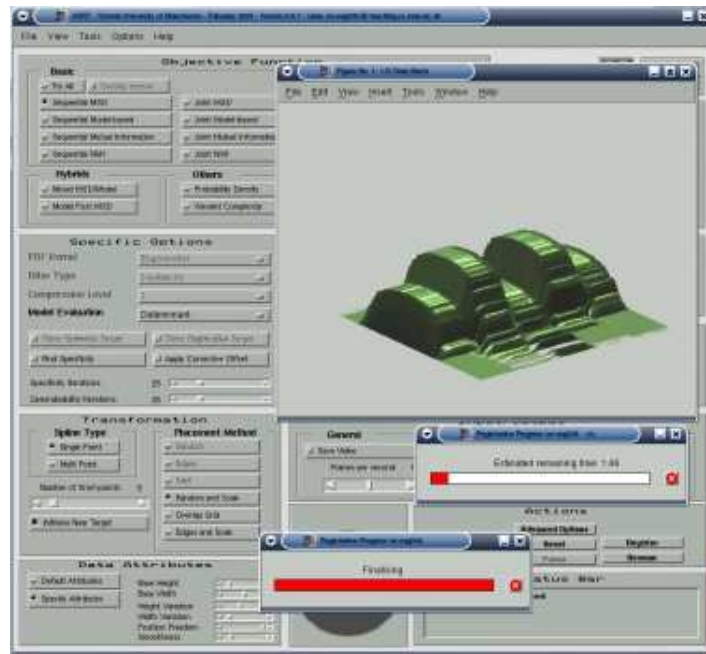
Technical

- Internal ISBE pages have been updated slightly, but mainly cosmetic changes were involved in this change.
- Desired piece-wise linear warp is successfully returned along with its corresponding warped images.
- The target of optimisation can now be shown.
- AART interface includes the notion of initialisation near target and desired warps.
- Two perturbation methods with chosen magnitudes can be applied to target warp. Behaviour of optimisations at the registration target and near it are investigated and shown at:

<http://www.danielsorogon.com/Webmaster/Research/Figures>

- Various bugs have been fixed. Amongst such bugs: window size for smoothing, as well as resolution limitations for the target warp function
- Logs and output methods have been implemented to record experiments (see E-mail from Wednesday, March 10th). Examples of ASCII outputs have been included in the E-mail message.
- Height scale has been fixed so that images subjected to correct transformation are displayed properly. Some issues of correctness are yet to be looked at in depth.
- Invariant single reference is now an optional feature. Reference can be forced from the UI and presently, first image is set to be reference, although in the future mean of images can become a valid alternative.
- New menu for perturbation allows for random noise and CPS warp perturbation.
- A bug with the **<overlapping warps>** option has been fixed and **<warp maps>** can now show overlaid target warps.
- Colours of plots have been changed to gray shades instead of RGB to fit the colour schemes slightly better.
- HTML experiments documentation is a new exciting option that is fully automatic. It retains all options that are necessary to reproduce an experiment along with its unique generated data and output images and videos.
- Error bars added to specificity and generalisability plots.

- 1-10000 was set to be the new iterations range for specificity and generalisability computation.
- Work on varying cycles, e.g. compute specificity or mean MSD every n iterations, has begun; it is still in progress.
- Perturbed initialisation near convergence seems to be buggy due to non-continuity (see below).



Bumps with random noise applied in AART.

Before Saturday, March 20th

Organisational

- A progress meeting took place on Friday, March 19th.
- A Division access times issue has been resolved.
- ISBE Internal Web pages have been modified. Most changes are to do with general layout and orientation.

Technical

- Specificity and generalisability can be computed every n iterations to save computational power.

- Elaborate extensions to automatic documentation which allows the user to keep organised and increase productivity (see the next subsection).
 - Detailed statistics are produced, saved and linked as required.
 - HTML headers are built automatically and not manually as was the case previously.
 - Loading of identical data for comparative experiments becomes trivial.
 - Title and index are added to all HTML documentation elements to improve structure and navigation capabilities.
 - Figures are automatically labelled and saved – a very powerful feature.
- Common choices for experiment parameters have been incorporated as an options which speed up repetitive settings. Likewise, bump properties have been extended to cater for commonly used schemes, e.g. low variation and fixed height.
- The number of modes and standard deviations to be displayed can be controlled from the advanced options menu. The appearance model can be viewed every iteration or once at the very end.
- The general optimiser can be easily set to be verbose for debugging purposes. Attempts to improve optimisation have been unsuccessful so far.

Experiments

The aforementioned link allows access to a very large number of experiments. The more interesting ones will be browsed and analysed throughout the next meeting. The handle names of the important experiments can be listed in a report such as this, though it is not obvious whether it will serve any purpose. This question is worth a brief discussion.

Next Stage

- Reading of Mathematical Methods course material will need to occupy a large proportion of time at some stage before May or June.

- An E-mail needs to be sent to Surrey to hopefully confirm EP-SRC status and a reply from Christine Cummings still ought to be received.
- Optimisation needs manual intervention. This will be dealt with later, possibly the weekend.
- Discussion of results and ways to proceed depending on the developments made throughout the weekend and on Monday.