

## **6. Results and Discussion**

Having created the morphing tool we now discuss the main findings of this project and consider what directions future work may take.

### **6.1. The Tool in Context**

We have created a tool that morphs between faces and with which the Client is largely satisfied. The tool meets all the mandatory requirements and has now been used in the research project for which it was intended, leading to some meaningful results. (Some of the Client's work can be seen in Appendix E). While we have examined some efforts towards automation, the tool has not advanced far into that field. Going by the criteria laid down in Chapter 3 we have met three of the four criteria for success.

The tool was intended to be a simple but effective morphing tool optimised for the domain of faces from both the human world and animal kingdom. While the software was reasonably straight forward (as much as a morphing program can be), rendering times were excessive and some images couldn't be exorcised of their ghosts. The software used by the client was little more than a basic morphing program (though the quality wasn't far short of some of the software reviewed in Chapter 2), and had no special facility for dealing with faces over any other type of morph.

One problem with this project was the significance of the user interface. Writing a morphing program is a challenge in interface design, and even though early versions were 'rough and ready' it can be argued that the development of a suitable interface featured too prominently in this project, despite "interface issues involving ease of specifying the morph" featuring in the original project description.

Interface matters potentially detracted from the more methodical issues of developing and automating a morph. In particular, the construction of a multiple document interface significantly hindered work on project fundamentals. While it was always intended that the interface would take such a form, and we maintain that it would pay dividends with future developmental flexibility, we accept that the choice to overhaul the interface may have been of significant detriment to the project. At the stage in the project at which it was decided to work on the multiple document interface the choice was one of developing within a restrictive environment or improving the environment allowing more scope for project enhancement at the cost of time spent on pivotal parts of the project. Much of the work proposed in Chapter 4 would have been unnecessarily difficult without an improved interface.

While we mentioned both user-level features and templates, little attempt was made to implement user-level primitives. This could have been a good compromise between lines and templates, especially where fairly regular shapes such as the eyes can be found.

Many of the issues mentioned here could have been addressed if they were developed at the start of the project, though since the Client required a working tool half way through the project it was necessary to take some shortcuts. Planning thoroughly and implementing a full-scale framework would have made the Client's deadline unmanageable, even though an initial investment can speed things up in the long-term. For a one-year project such factors need to be balanced.

## **6.2. Directions for Future Work**

This project has considered a number of possible enhancements to standard image morphing techniques and given no thought whatsoever to at least that many again. Morphing is a huge field, and rather than being done and dusted it is now stretching out in imaginative and creative ways. We have considered some of these and proposed others, but we have barely implemented them to their full potential. There is definite scope to further investigate much of the material presented in this report, especially with respect to automation, one of the largest areas of current morphing research.

While morphing can be seen as a texture-transforming operation, the image being operated on often has a texture of its own. One thing that has been apparent whilst running test morphs is that while it may be possible to correspond features such as eyes and noses, this doesn't allow you to turn fur into feathers any better than a standard cross-fade does. When this is used in scientific investigations such as how attractive a given face is [BRAU01] we are inclined to wonder whether the perceived smoothness of the skin could prejudice the results. In order to generate more realistic morphs it may be necessary to morph this texture separately and map it back during the image morphs as some sort of 'delta map' over a smooth textureless image.

As warping techniques change focus from what is being morphed to what it represents, maybe one day we will be able to feed in two animal images with corresponding genetic information and generate a true synthetic hybrid, though CAD schematic and architectural morphing will probably precede this.