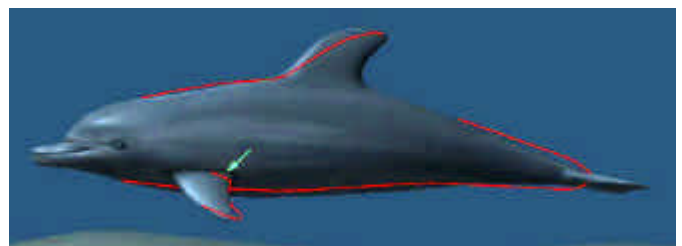
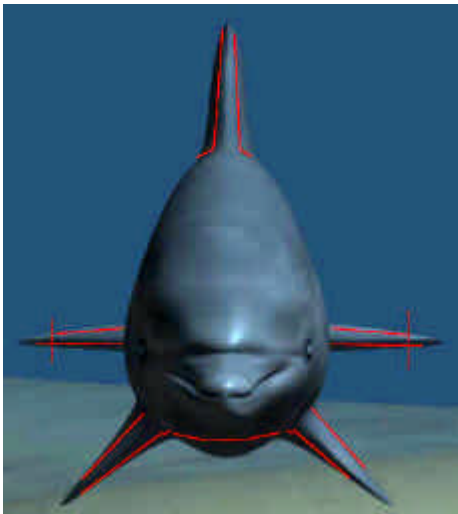


References

ALWAYS USE THE BEST REFERENCE YOU CAN FIND!

This should be your golden rule when you model, shade and animate - you must follow it faithfully, this is very important. Concentrate, relax, flick your eyes back and forth between the reference and model, forget what you think you know, measure relationships in the image ("that part is about twice as wide as that one, and two widths from that edge..."), get the right side of your brain working... one trick to help that along is to turn the reference image upside down, and the model as well. This helps to silence the left side of the brain (the logical time-keeping language side), who thinks it knows what something looks like without having to check it, but in reality it doesn't. You always have to check, and recheck. For example, someone might model a wineglass with a too-thin stem, too-thin walls and wrong proportions on the bowl and the foot, and give the glass-shader a milky plastic look, even with reference. Even such a relatively simple object needs careful observation and test rendering, perhaps even going so far as to measure with calipers.

Look at the first two images below - the left one shows a dolphin modelled in Softimage® by an expert, Mr. Saw Kok Hong, a talented Malaysian cg artist, but **WITHOUT REFERENCE**. The red lines indicate the changes made after looking at some reference images - the fins were all too thick and the wrong shape, the tail fin was too big, the eye too light, etc. (Though it's likely your mistakes would have been different ones).





The above screenshot shows the final result.

Photorealistic modelling must always be an iterative process, where you go back and forth many times from your model to the reference, comparing, comparing. (See the photo-matching method I outline further down.) That's why it's so slow. That's also why you should try and get some art training, even if it's just a weekly figure drawing class (figure drawing is recommended for any artist, no matter how proficient).

Advice on human references

If you have access to a suitable human model then use a camera with black and white makeup to put a grid on his/her face, shooting it from all conceivable angles with a zoom-lens (to flatten the perspective). Also the lighting should be very diffuse and even. High and low shots will also help enormously. I would also shoot some 45 degree angles with a normal lens and no make-up and different lighting setups, for my photo-matching technique (see below). Then select one side, front and below/top view and scan them, then fiddle the contrast and brightness in a paint program until its all clearly visible black lines on white or almost white. If you can do this, I definitely recommend it. If you don't have access to a suitable real life reference, use other people's photographs, like the one's in magazines etc. As long as you don't manage to make any single reference recognizable in your final model (don't even try, just mix and match), and as long as you don't render an image that looks too close to any single reference image, you shouldn't have any legal problems with the copyright owners but if in doubt take legal advice.

Proportion tips...

The Hip-to-Waist ratio should be about 0.7 to 0.6, if you're trying to model an attractive woman, or 0.9 to 0.8 for an attractive man - this has been found in studies to be the ratio preferred by most people (even an isolated tribe in eastern Ecuador).

The average eyeball is 24 mm in diameter, with very small individual variations. The average female skull is 21.6 cm high, 19 cm deep and 15.2 cm wide, with a horizontal cross-section across the forehead that is egg shaped (narrower end forward, slightly squared off).

The average distance between the pupils is 65 mm for women. These skull measurements of course have fairly large individual variations, except for the eyeball diameter, which is surprisingly constant.

The total height of the "idealised" average female body is roughly 7 1/2 heads, the realistic average is more like 6 - 7 heads.

The upper teeth are lower in front, and getting slightly higher and smaller towards the back. The lower teeth are set back behind the upper, the lower front teeth much smaller (almost half as wide) than the upper frontals - the result is that the lower side teeth are offset half a tooth's width vis-a-vis the uppers, like two adjacent rows of bricks.

Where can I find good reference images?

Use drawings, artist anatomy books, illustrator's reference books like "Fairburn Heads" etc, underwear and swimwear catalogs, fashion magazines, health magazines, men's magazines, websites about models or movie stars, even your friends. Keep looking for straight poses, shot horizontally from the front and the side, or as close to it as possible, these are the best to work from. Select expressionless poses in the beginning, until it becomes time for you to start animating the smile and other expressions.

The photo matching technique

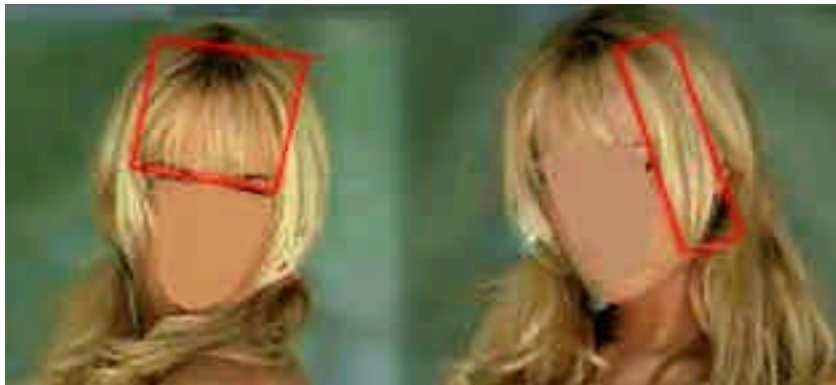
When your model starts to look finished, use the technique I call photo matching (can be used for any modelling project) - select a photo, and then match it in terms of focal length, distance and angle to subject, light sources strength and angle, cropping, shading of objects etc. Then start test rendering, scrutinizing and editing the model until the test render starts to look like the photo - it's up to you of course how close you want to try and get. This is a very time-consuming process, since you are constantly discovering new "discrepancies", especially after any sort of break or pause. When you're done with one photo, select another photo from a different angle and with different lighting, and do the same thing again. Again, how far you take this is up to you, but the results are certainly worth the additional effort.

In the final stages it helps to apply blur and grain and similar background - the whole point of this technique is to make it easier for your eyes to spot the difference in the actual model from the original, by isolating it. A very good help is if some of the photos have any highlights and shadows - trying to match them is often more accurate than following plan-drawings (IF you can get your lights in roughly the same position as the ones in the photo, which usually is possible). A great book for photomatching: "Making Faces" by makeup artist genius Kevyn Aucoin (highly recommended).

Things to look out for

Among the hardest things to model on the body are the shoulders, (animation-tip: the pivot points of the shoulder joint shifts suddenly inward a few inches and down a bit as the arms rise higher than horizontal (same thing in reverse on the way down), for more check out this link) the bending elbows, the bending knees (again, the knee does not simply rotate but also translates a bit down, since the joint isn't round but oval) and the ankle/foot connection.

Hardest in the face is the proper "roundness" (when seen from above or below) of the lips, teeth, forehead, cheekbones/cheeks. Bite into a soft piece of cheese or something (or even better, have your model do it) to see how the teeth curve around. The jaw's rotational pivot point should be behind the neck, since the real jaw both rotates AND slides down a bit as it opens. Asymmetry is important in the face (not too much though, just an almost subliminal amount will do, otherwise the face becomes less attractive to most people), tweak the features at the end like raising one eye, skewing the nose a bit etc. Hair can be most realistically done using complex realistic textures and transparency maps on very simple geometry. To get those maps, you can use others photos, like I did here (I cropped out the areas marked in red, and retouched them).



Alternatively, you can photograph people, or put a wig in a scanner. I don't recommend using only particles for realistic hair, because the software isn't quite developed enough -- not yet anyway!

Notes

(This section has been left intentionally blank.)