What is Facial Beauty?

For centuries, pioneers such as Durer and Da Vinci endeavored to quantify facial beauty. Modern facial beauty quantifications have lead to many similar facial features that Durer and Da Vinci claimed to quantify centuries ago. Symmetrical harmony, clarity of skin, and vivid color of face, are some dominating factors that encompass a beautiful face.

Morphing Overview

Morphing allows for a controlled transformation of one facial photograph with another in order to create a composite synthetic face. Each synthetic image is a composite (50/50) of two images. We can use morphing technology to create synthetic images in order to investigate facial beauty standards. Our research has used MorphMan 2000 (Stoik Software) to create successive generations of synthetic lateral images.

Objectives

Aim 1
Evaluate and identify the critical facial landmarks that must be used as registry points to produce natural and realistic synthetic lateral facial images.

Aim 2
Develop a methodology to verify whether we can create successive generations of lateral morphs using a genetic breeding algorithm biased toward producing more attractive faces.

Significance of Study

By utilizing morphing technology to create lateral facial photographs with web-based large scale population facial scoring techniques, our study can provide a more rigorous quantitative and qualitative method to define facial beauty.

Mechanical Design

32 synthetic lateral images were created from digital photographs of volunteers by morphing software. (MorphMan 2000).

The 16 highest scoring images (the “most attractive” top 50th percentile) of the parent generation were randomly morphed together in order to produce the F1 generation of 8 more “attractive” offspring lateral synthetic images.

Images in the bottom 50th percentile were also morphed to produce the F1 generation of 8 “unattractive” offspring lateral synthetic images. This process was repeated for 3 more generations in order to compile each synthetic image in an attractive or unattractive category.

Beauty Score Calculation

Each image was posted on an internet-based rating website (Hotornot.com) until each face was rated 200-300 times. The website provides scores for each image between 1 and 10.

Scores of the lateral images were used to categorize the synthetic images in their “attractive” or “unattractive” categories.

Lateral Morph Analysis

An example of synthetic F3 morph created from two synthetic F2 morphed images.

User Defined Registry Points

Morphing software uses interpolation algorithms to allow the mapping of user-defined registry points. These registry points create a synthetic image by integrating the registry points of two images into one composite image as seen above (synthetic image).

Assignment of registry points to distinct facial features

Key features of registry points to distinct facial features

1- outline of eyebrow
2- outline of eyelashes
3- lateral palpebral commissure
4- upper eyelid outline
5- lower eyelid outline
6- pupil outline
7- lateral sclera

Reference points used to create a realistic synthetic lateral image

1- trichion to glabella
2- nasion to subnasale
3- subnasale to vermilion border
4- alar groove to menton
5- pogonion to the menton
6- outline of lip
7- exterior ear boundary

Results

Aim 1:
Critical registry points were successfully defined to create a synthetic lateral image.

Aim 2:
Synthetic images created in all generations of either attractive or unattractive categories maintained clear defined contours of all facial features.

Conclusion

The methodology to identify the critical registry points required to create a synthetic image was successful in all generations of either attractive or unattractive categories. This process has also retained every distinct facial feature required to create a realistic synthetic image in each generation.

Future Work

Is it possible to create an automatic morphing technology?
Expand pilot study to quantify distinct lateral facial features.
Expand on different ethnic-orientated lateral images.
Analyze male and female distinctions of lateral facial features.
Expand research on male lateral imaging.