A New Approach in Determining Lateral Facial Attractiveness

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1. Abstract

Introduction: The current literature on facial attractiveness focuses on anterior-posterior facial portraits, with lateral facial analysis limited to comparing facial attractiveness scores with various facial measurements. Here we use a novel approach to more rigorously study lateral facial attractiveness by combining morphing software and a genetic algorithm with web-based facial attractiveness scoring to evolve attractive lateral facial images.

Objectives: The objectives of this study were to: 1) identify the key lateral facial landmarks that produce realistic lateral facial images; and 2) determine if a genetic algorithm combined with morphing software can progressively evolve lateral facial attractiveness.

Methods: A cohort of lateral facial portraits were selectively paired by a genetic algorithm biased towards more attractive faces, and “breed” with morphing software to create a cohort of faces more attractive than the original. By repeating this process facial attractiveness was “evolved” through several cohorts.

Results: Key facial landmarks are: trichion to glabella, nasion to tip of nose, subnasale to labrale inferius, and pogonion to menton. Facial attractiveness scores increased in each successive cohort.

Conclusion: Using these landmarks and methodologies, realistic lateral facial portraits were created and progressively increased in facial attractiveness. This technique is a robust alternative to traditional approaches in the analysis of lateral facial attractiveness.

2. Background

Beauty is an elusive quality to measure, and attempts at quantifying it have in general failed due to the intrinsic subjective nature of this quality. During the Renaissance, da Vinci and Durer analyzed the frontal view of the face and developed the Classical Cannons which have permeated art, science, and medicine for the past five centuries. Modern approaches to study facial beauty have used focus group evaluations to rate the attractiveness of facial photographs and then correlate these attractiveness scores with various linear or angular measurements of the face. Focus groups have included trained experts and lay groups of evaluators that score faces based on a numerical scale. These studies are not only labor and time intensive, but also limit the size of subject pool and evaluators as they must be performed by 1) using focus groups to rate and evaluate photographs and 2) obtaining study participants willing to allow their facial features to be meticulously measured and then scrutinized.

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

3. Mechanical Design

Genetic Breeding Algorithm

There are different approaches to create synthetic lateral images. Using a genetic breeding algorithm (see above) biased towards more attractive facial beauty scores, can selectively allow for cohort faces to be more attractive. Likewise, a selective breeding algorithm can randomly pair attractive and unattractive faces together to “breed” a cohort of images that are more attractive. (see below)

62 synthetic lateral images were created from digital photographs of volunteers by morphing software.

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 “attractive” offspring. These images were later subjected to a similar process to produce the F2 generation of 8 “attractive” offspring.

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

6. Results

Aim 1:
Critical registry points were successfully defined to create a synthetic lateral image. (Figure 5)

Aim 2:
Synthetic images created in all generations of either attractive or unattractive categories maintained clear defined contours of all facial features. (Figure 7)

8. 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 identified crucial distinct facial features required to create a realistic synthetic image in each generation.

9. 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.