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AN INTEGRATIVE APPROACH TO EYEBROW SKETCHING: GEOMETRIC ANALYSIS AND LIGHT-AND-SHADOW MODELING IN THE PROFESSIONAL SKETCH TECHNIQUE

Summary. *This article presents an integrative approach that combines geometric analysis with light-and-shadow modeling in the process of eyebrow sketching, referred to as the "Professional Sketch" technique. The study is based on a review of existing research and publicly available data. It introduces a five-point reference system that ensures precision and symmetry in sketch construction, along with a gradient shading technique that leverages light-and-shadow modeling to create natural volume and depth. The method's individualization, achieved by accounting for a client's unique facial anatomy, allows the universal model to be adapted to various eye placements and nose shapes. The practical implementation of the Professional Sketch technique is supported by photographic documentation and digital measurements, demonstrating the effectiveness of the integrative approach in improving both the technical quality of the practitioner's work and the aesthetic perception of the final result. The findings presented will be of interest to professionals in aesthetic correction and design, including makeup artists, brow designers, and researchers exploring the application of mathematical and physical methods to shape analysis. The integrative framework uniting geometric analysis and light-shadow modeling in the Professional Sketch technique offers new opportunities for*

greater precision and personalization in sketch design – relevant to both applied science and industry practices within the beauty sector.

Key words: *eyebrow sketching, geometric analysis, light-and-shadow modeling, professional sketch, individual adaptation, permanent makeup, eyebrow shaping, integrative approach.*

Introduction. Eyebrow sketching, as a preliminary stage in professional correction, serves not only as a preparatory step for permanent makeup or tinting but also as a crucial element in shaping a client's harmonious appearance. In this context, the integration of classical geometric principles with modern light-and-shadow modeling techniques becomes particularly important, enabling practitioners to meet new standards of precision and aesthetics.

A review of literature on integrative approaches to eyebrow sketching reveals two primary research directions. The first focuses on objective analysis of facial geometric parameters and their relation to idealized brow proportions. This is exemplified by the educational guide "Eyebrow Anatomy for PMU Artists: What's Important to Know" [1], published on pmuhub, which emphasizes the importance of symmetry, proportionality, and balanced ratios as a foundation for further modeling tailored to the client's anatomy. Closely related to the practical application of sketching methods are online resources such as "Best How To Draw Natural Eyebrows On Sketch with Realistic" [4] from sketchpict and "Eyebrow Sketch" [5] from paintingvalley, which offer step-by-step guides for constructing lines and shapes.

The second line of inquiry centers on the artistic interpretation of volume and relief through light-and-shadow effects. For instance, the article "Relief Modelling Using the Chiaroscuro Technique: A Project Work Among Student-Sculptors" [2] illustrates the use of chiaroscuro to enhance expressive depth and form, treating light and shadow as sculptural tools. Similarly, Dr. Kamau's study "Stylistic Approaches in Portraiture Painting: Analysis of Selected Portraiture by

Contemporary Kenyan Artists" [3] explores stylistic elements in portraiture, expanding the concept of light modeling and offering methods that synthesize traditional techniques with contemporary artistic visions.

It is also worth highlighting several studies [6–8]. Kim Y. J., in "Awareness of the Hair Stroke Technique among Eyebrow Semi-Permanent Makeup Techniques" [6], analyzed the characteristics of the hair-stroke method in semi-permanent eyebrow makeup to determine the level of theoretical knowledge and practical skill required of beauty-industry specialists. Ounachad K., Oualla M., and Sadiq A., in "Face Sketch Recognition: Gender Classification Using Eyebrow Features and Bayes Classifier" [7], examined the potential for classifying gender based on eyebrow traits within facial sketch recognition. Khudayberdievich B. A., in "The Role of Physiognomics in Teaching Students to Draw Portraits" [8], proposed applying physiognomic principles by emphasizing the link between distinctive facial features and eyebrow characteristics.

These two directions reveal a tension between analytically driven and more interpretative artistic approaches. On one hand, works grounded in geometric analysis offer methodologically rigorous solutions for defining the ideal eyebrow shape. On the other hand, research on light-based modeling emphasizes the aesthetic and subjective nature of artistic expression – creating methodological challenges for developing universal standards in eyebrow sketching.

The aim of this study is to explore the potential of an integrative approach in eyebrow sketching by examining how geometric analysis and light-shadow modeling can be combined in the Professional Sketch technique.

The novelty of this work lies in its creation of a methodology based on the calculation of five key anchor points, enabling both accurate anatomical representation of the client's facial features and the enhancement of natural volume and gradient shading through light effects. This approach may serve as a foundation for advancing practical methods in the beauty industry.

The study hypothesizes that applying an integrative framework – merging precise geometric analysis with detailed light-and-shadow modeling – leads to eyebrow sketches with improved symmetry, visual appeal, and technical accuracy, thereby enhancing overall client satisfaction with the final result.

The methodology is based on the analysis of prior research and publicly available sources in the field.

1. Geometric Analysis in Eyebrow Shape Construction

Designing an ideal eyebrow shape begins with a thorough understanding of its anatomical structure. The eyebrow can be conventionally divided into three main components:

- Head (start) – the initial point of the structure, determining where the brow begins;
- Body – the longest and most dominant section, defining the overall character of the brow. A classic proportion suggests a 2:1 ratio between the body and the tail, meaning the body should represent approximately two-thirds of the total length, and the tail one-third [1];
- Tail (end) – the final part, typically triangular in form, providing a defined graphic accent (see Fig. 1).

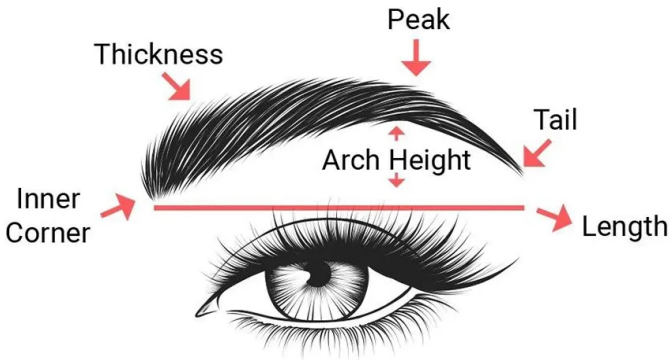

Fig. 1. Eyebrow elements [1]

Another critical element is the apex, the highest point of the arch, which determines the line's dynamic and directly influences facial perception. In this context, the sketching methodology draws inspiration from classical portrait

techniques, where each element is precisely proportioned to create a balanced and harmonious composition [3; 7].

Contemporary eyebrow sketching techniques rely heavily on strict geometric principles. Central to this approach is the identification of five reference points that ensure symmetry and proportionality in the design (see Fig. 2).

Fig. 2. Diagram with marked five reference points for sketching eyebrows

Source: compiled by the author

- Point 1 (start) – Located by drawing a vertical line from the outer edge of the nose through the inner corner of the eye and dividing it into three equal parts. The uppermost intersection determines the brow's starting point.
- Point 2 (width) – Positioned approximately halfway to two-thirds across the iris from Point 1 to the right. This defines the body's width.
- Point 3 (apex) – The highest point of the brow arch, placed so that the distance between Point 3 and Point 4 equals the distance from Point 1 to Point 2.

- Point 4 (arch height) – Located by taking half the horizontal distance between Point 1 and Point 2, then projecting downward to the brow's lower edge. This determines the vertical dimension of the arch.
- Point 5 (end) – Found at the intersection of a horizontal line drawn from Point 1 with a diagonal line extending from the outer edge of the nose through the outer corner of the eye. This marks the brow's natural end without visual drooping [1; 6].

Figure 3 below shows the result of using the Professional Sketch technique.

Fig.3. The finished result of using the Professional Sketch technique

The use of comprehensive geometric analysis based on these five core reference points enables artists to incorporate each client's unique facial structure while achieving a high level of symmetry and proportion in their sketches.

2. Light-and-Shadow Modeling in the Professional Sketch Technique

Within the framework of the Professional Sketch technique for eyebrow design, the principles of light and shadow are applied through deliberate differentiation of brightness and saturation across various brow zones. Typically, the lower edge of the brow is drawn with greater definition, which visually "lifts" the entire structure and adds a sense of character to the shape [1; 3]. In contrast,

the upper boundary is rendered more softly to reflect the natural fall of light from top to bottom, creating a smooth transition between tonal zones. This approach allows artists not only to enhance the client's unique facial features but also to achieve a sense of volume with minimal invasiveness during the marking process.

The use of light-and-shadow principles in the Professional Sketch technique is built upon a gradual transition from lighter to darker tones along the length of the brow, resulting in a cohesive and natural-looking finish.

In practice, implementing light-shadow modeling requires the use of specialized tools that ensure precise application of gradient effects. These instruments help maintain consistency, control, and finesse – essential elements for creating visually balanced and realistic brow designs.

3. Integrating Client-Specific Features: Practical Implementation of the Professional Sketch Technique

The effectiveness of the Professional Sketch method is largely defined by its flexibility in adapting to the individual features of each client's face. Creating a well-balanced eyebrow sketch requires consideration not only of general proportional principles found in classical guidelines but also of interindividual variations, such as eye placement, nose shape, and overall facial symmetry.

Once the five key reference points are established, the sketch is constructed step-by-step, with each component fixed as illustrated in Figure 4.

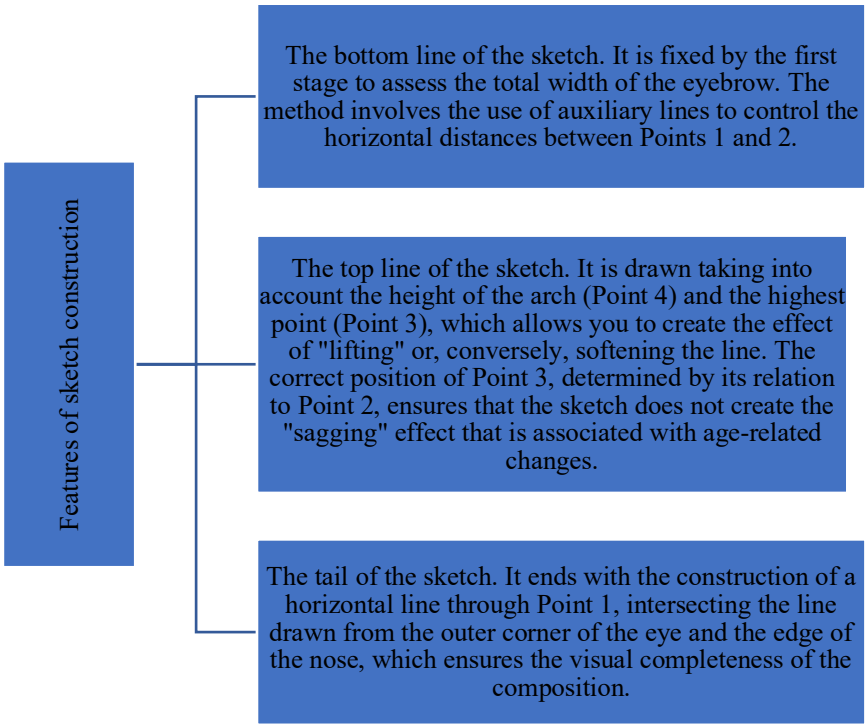

Fig. 4. Features of the sketch construction [1; 2]

Each phase of the process is documented through photographs and intermediate measurements, allowing the practitioner to continuously verify the alignment of the sketch with the intended proportions. Corrections are made using precision tools – such as fine pencils, markers, and paste – to ensure the highest level of accuracy [4; 8].

Incorporating client-specific anatomical characteristics into the Professional Sketch technique ensures a high degree of adaptability to various facial structures, enabling maximum symmetry and aesthetic harmony in the final result.

Conclusion. The Professional Sketch technique offers an effective integrative approach to eyebrow sketching, successfully combining the precision of geometric construction with the artistry of light-and-shadow modeling.

Geometric analysis provides the structural foundation for the brow, aligning with facial landmarks, angular inclinations, and the spatial relationships between the key points: the arch, the beginning, and the tail. Simultaneously, tonal shading and directional lighting modeling enhance the brow's dimensionality, creating an illusion of depth and natural definition.

For the practitioner, Professional Sketch reduces the risk of drafting errors through a clear, step-by-step algorithm. Its versatility lies in its adaptability to both manual and machine-assisted brow styling techniques. The ability to vary stroke intensity and model volume offers a creative foundation for producing exclusive designs, making it a powerful asset for content creation in social media and reinforcing the artist's image as an innovative and technically skilled professional.

For the client, this method ensures predictability in the final result. The sketching phase offers a visual preview of brow shape and thickness in relation to the face's features. Light-and-shadow modeling allows for a realistic representation of volume and pigment density, fostering client confidence in the design. This contributes to trust in the practitioner and psychological comfort, as the client has a clear understanding of the end result before the procedure begins.

From a marketing perspective, the Professional Sketch technique signals trend awareness and educational value. For professionals focused on commercial brow styling with an emphasis on symmetry and aesthetics, it becomes a tool for elevating the visual impact of their work and strengthening professional credibility. Moreover, it serves as a foundational module in training programs: for emerging artists, mastering sketch construction lays the groundwork for achieving flawless results and developing a distinctive artistic style – an essential advantage in today's competitive beauty industry.

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