

The Geometry of Style

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Introduction

It's well known that to get your most suited hairstyle or pair of glasses, you should have a basic understanding of face shape geometry, which is something deeply mathematical. So **what's face shape geometry?**

It's the classification of the human face into different geometric shapes according to the ratios between its parts, with the oval shape considered the "perfect" one in cosmetology, with a ratio of length: width equal to 1.618 (golden ratio).

Many stylists work on the principle that ideal beauty is achieved by compensating for what's "missed" or adjusting what's perceived as imbalanced, always aiming for that golden ratio (oval shape) through illusion. Hairstyles and glasses for sharp, angular faces are always round and soft to dismiss the face's sharpness, while those for round faces are angular and sharp to dismiss the face's roundness.

Beauty has always worked through compensation, but why not through the preservation of a face's features?

Both can be aesthetic, harmony, and compensation.

Compensation

Accessories can deceive the eye through altering face ratios. Although no actual ratios change, it all happens in your brain, which may look more like a neuroscience thing, which is totally right, but illusion requires math, too. Just like perspective art.

Delboeuf Illusion is a mathematical phenomenon working based on shifting your brain focus. A round face is almost a 360-degree curve, and wearing rectangular glasses sort of divides the face into four 90-degree segments. This forces the brain to stop following the circular curve and shift its focus towards the sharp lines of the rectangle, making the ratio look more like 1.5. This could only work because the brain is highly sensitive to vertical and horizontal straight lines (Linear Dominance). Although Joseph Delboeuf was a pioneer in Psychophysics -establishing science to prove that the human mind isn't a perfect camera-, his theory is an old one, a foundation for modern theories, like **Geometric Contrast**. It includes the **Gestalt Principle** that explains how the brain perceives shapes in comparison to neighboring elements, not in isolation. Being the application used today by stylists and fashion experts, it'll be our reference. We've mentioned that the oval shape is the goal.

Since $R(actual)$ (Round Face Actual Ratio) = $L/W \approx 1:1$

Then, the goal is to alter the ratio by elongating length and fixing width, and as just mentioned, the brain perceives a face shape in comparison to accessories worn. So

$W(perceived) = W(glasses)$, $L(perceived) = L(face) - L(glasses)$ creating what's called the **Perceived Ratio** -the brain's real-time calculation of the ratio affected by external additions and accessories.

$$R(perceived) = (L(face) - L(glasses)) / (W(glasses))$$

This way, the ratio is manipulated to make the face look oval, through the brain comparing its new perceived length to a stable, shorter width of the glasses. And by increasing $L(glasses)$, $L(perceived)$ decreases, resulting in a perceived ratio closer to 1:1 or even smaller. Which is why it's often advised for round-faced people to wear rectangular-thin glasses rather than square-thick ones.

You can notice how you perceive the L/W ratios of both opposite faces of different glasses' frames, though both are rectangular.



Harmony

We have just understood how the compensation strategy relies solely on ideal beauty, totally ignoring one's own features. And I see it's very unfortunate that it's the widely accredited strategy when you can heighten your unique features through harmony and similarity.

I remember when I got my current pair of glasses as a rounded-face person, I only picked the sharp, angular pairs to try out at first, as I was advised, but in the end, I picked a round pair.

They did fit, featuring my face's roundness -that's when

I reconsidered every fashion and style advice I've ever received. Both rectangular and round frames went well; it mainly depends on which you favour.

Compensation worked through distributing proportions aiming for an ideal shape, while harmony aims for pattern reinforcement. Every shape in the world has a specific curvature(k), and wearing accessories that have similar k to your face achieves harmony, fractal-similarity, concentricity for round shapes, and parallelism for sharp angular shapes.

**Note: $k = 1/r$ (r is the radius of the circle), it defines a shape type and slope*

Harmony stabilizes the ratio; no contrast is involved, which is easy and relaxing for the brain to process. You may check yourself the following image, where rectangular glasses fit a sharp face perfectly well.



Hijab

What we just discussed can be applied similarly to any type of accessory, with different tweaks, of course. However, I thought the hijab would be the most worth mentioning briefly. Most accessories define just a specific part of the face or body, resulting in minimal alteration of proportions, while the hijab is a cloth that defines the whole face. It's a dynamic geometric frame that can minimize width and/or reinforce curvature.

Most hijab styles result in contrast; the fabric covers hair, ears, and the lateral parts of the head, reducing $W(perceived)$ significantly. It's hard for a round face to be perceived as round in a hijab, unless you wear a tight style that keeps the face shape as it is.

And perhaps that's why a loose style is the most common nowadays, it goes with the face's curves instead of defining it, which can be comfortable for some, including myself.

Why do some styles fail?

You may be confused if you shopped for glasses before, which is most probable, as some glasses styles don't really fit, so how does it work when I just proved that both harmony and contrast could fit? In fact, it relates to how well you execute the geometric approach rather than what approach you pick. It works the same as a domain for an equation; if you choose a value outside the domain, the equation has no S . S in R . Similarly, if you use contrast too excessively, it results in confliction not correction.

This can be a flexible thing; not every style should be perfectly contrasting or harmonizing, as in the context of styles and fashion, the human eye can calculate proportions way better than any calculator.

Conclusion

It can be funny the way I inserted Mathematics in a field of an artistic, non-technical crowd. So this may lead us to believe that we all love math in different ways! A good sense of fashion and beauty is often perceived as intuitive talent, while it includes some kind of unconscious geometric calculations.

I do hope you enjoyed it. This topic isn't that math-heavy. All I thought of while researching was something fun to write about, and I found this topic relatable and fun in the experiment. It's very interesting to learn that your daily habit of choosing accessories has math.

