International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 12 Issue: 12 | Dec 2025 www.irjet.net p-ISSN: 2395-0072

FLAWNT-COLOR ANALYSIS MAKEUP APPLICATION

Tejaswini B J[1], Rakshitha R[2], Shruthi K S[3] ,Shreya Bedsur[4]

[1]*Student, Dept. of Information Science Engineering, AMC Engineering College, Karnataka, India*
[2]*Student, Dept. of Information Science Engineering, AMC Engineering College, Karnataka, India*
[3]*Student, Dept. of Information Science Engineering, AMC Engineering College, Karnataka, India*
[4]*Student, Dept. of Information Science Engineering, AMC Engineering College, Karnataka, India*

Abstract – *Flawnt is an AI-powered skin tone and makeup shade analysis platform designed to help users find the most accurate cosmetic matches for their unique complexion. The application captures a selfie using the device camera and processes the image through a series of computer-vision techniques. It extracts facial pixel values, segments the skin regions, and applies clustering algorithms along with LAB colour-space transformations to determine the user's exact undertone—whether warm, cool, or neutral—with significantly improved precision compared to basic RGB analysis.*

Once the undertone is identified, Flawnt intelligently maps the results to a curated cosmetics database specifically tailored to reflect the wide diversity of Indian skin tones. The system then generates personalized recommendations for foundation, lipstick, and blush shades that align with the user's complexion, undertone, and colour intensity. This ensures that users receive product suggestions that are both scientifically accurate and aesthetically flattering.

Technically, Flawnt is built using React, TypeScript, and HTML Canvas APIs, enabling fast in-browser image processing without the need for backend computation. Local Storage support allows the app to maintain user preferences, analysis history, and product matches, creating a smooth and continuous user experience. The design emphasizes real-time feedback, intuitive controls, and a clean, interactive interface. Overall, Flawnt showcases the powerful integration of computer vision, colour science, and beauty technology, offering users greater confidence in choosing the right cosmetic products while demonstrating how AI can meaningfully enhance everyday decision-making in the beauty domain.

Key Words: **AI skin tone analysis, undertone detection, LAB color space, computer vision, cosmetic shade matching, personalized recommendations, React & TypeScript.**

1. INTRODUCTION

In today's fashion and beauty industry, understanding which colours best complement an individual's natural features can be a game-changer. Colour analysis considers a person's skin tone, hair colour, and eye colour to determine seasonality and tonality, ensuring each person finds shades that truly enhance their appearance. Colour analysis is crucial in the cosmetics industry as it helps brands create products that complement diverse skin tones. It enhances customer satisfaction, reduces product returns, and boosts confidence by providing shades that harmonize with individual undertones.

By analysing photographs of a user's face under natural lighting conditions, the app accurately detects skin undertones and recommends suitable foundation, lipstick, blush, and eyeshadow shades. Unlike traditional trial-and-error methods or in-store consultations, this technology minimizes human error, saves time and money, and ensures a personalized beauty experience.

Additionally, the system leverages advanced colour-science techniques to achieve more precise results, even across varying skin textures and lighting environments. It provides a consistent and objective analysis that is difficult to replicate manually. The integration of AI also allows the platform to continuously improve through user feedback and data refinement. Overall, it empowers users to make informed beauty choices with confidence and convenience.

2. PROBLEM STATEMENT

Scale of the Problem: 30% of users buy the wrong shade, leading to wasted products and money, with women spending up to $300,000 on beauty products in a lifetime, while many brands still lack diverse shade ranges.

Real-Life Consequences: Wrong makeup purchases lead to financial waste, self-confidence issues, and a time-consuming trial-and-error process.

Why Existing Solutions Are Failing: Existing solutions fail due to unreliable in-store lighting, sales biases, online shopping risks, and confusing color analysis guides.

Consequences of Wrong Makeup Choices: wrong makeup choice lead to unnatural foundation, clashing lipstick, unflattering blush and increased product waste.

3. EXISTING METHOD

There are several traditional and modern approaches to personal color analysis in makeup. However, many of them

have limitations that make the process difficult or inaccurate for consumers.

Self-Assessment Methods: Consumers try to determine their undertones (cool, warm, or neutral) by examining their veins, jewelry preference, or how their skin reacts to sunlight.

Drawbacks: Many people don't understand undertones or fall in between categories.

In-Store Shade Matching: Consumers visit a cosmetic store and test different foundation shades on their skin. Beauty advisors may help match a shade based on experience or by using swatches on the hand, wrist, or jawline.

Drawbacks: Store lighting is often artificial and does not reflect how the makeup will look in natural light. Swathing on the hand or wrist does not always match face skin tone.

Mobile Beauty Apps With Basic Filters: Some existing beauty apps provide simple filters or AR features that allow users to "try on" makeup shades digitally. These rely on preset overlays rather than analysing actual skin tones.
Drawbacks: These filters are mostly cosmetic and do not use scientific colour analysis. They often distort real skin colour, leading to inaccurate shade recommendations and inconsistent results across devices.

4. METHODOLOGY

Methodology Steps:

1. Image Input (User Uploads Face Photo)

The process begins when the user uploads a clear photo of their face. The system guides the user to take the picture under natural or neutral lighting to avoid colour distortions. This image serves as the primary source for pixel-level colour extraction and analysis.

2. Image Preprocessing (Lighting Adjustment & Face Detection)

To ensure accurate results, the uploaded image undergoes preprocessing. Lighting normalization techniques are applied to reduce shadows, brightness variations, and environmental colour influence. A face detection algorithm identifies key facial regions—such as cheeks and forehead—which are more reliable for skin analysis. This step filters out areas like hair, clothing, or background to avoid interference.

3. Skin Tone & Undertone Extraction Using Colour Space Conversion (RGB → LAB)

Next, the system converts the image from the RGB colour space to the LAB colour space. LAB is used because it closely resembles how the human eye perceives colour differences. Pixel values are extracted from selected facial regions, and clustering algorithms (e.g., K-means) group similar pixels. This helps determine the dominant skin tone and analyse undertone characteristics based on the A and B channels in LAB space.

4. Classification Using Trained Model or Logic Mapping

Once colour values are extracted, the system classifies the undertone as warm, cool, or neutral. This is achieved through either:

- A trained machine learning model, or
- Rule-based logic derived from LAB thresholds.

The classification ensures consistent results across various lighting conditions and diverse skin tones.

5. Recommendation Generation (Matching Makeup Shades)

After identifying the user's skin tone and undertone, the system maps the results to a curated cosmetics database. Each product entry includes tone and undertone tags, allowing the system to match foundation, blush, lipstick, and eyeshadow shades that best complement the user's complexion. The matching algorithm prioritizes accuracy and diversity across Indian skin tones.

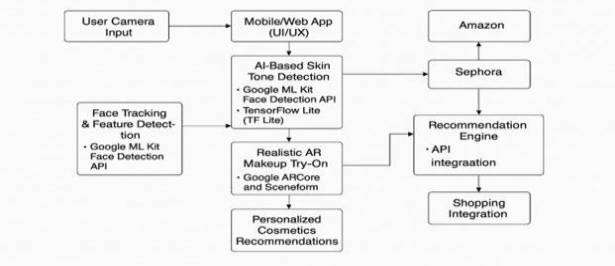
6. Display Personalized Suggestions

Finally, the application displays a set of personalized beauty recommendations. Users receive a clear list of suitable foundation shades, colour palettes, and product suggestions tailored specifically to their undertone. The interface is designed to be simple and interactive, giving users an easy way to explore their recommended shades.

5. DESIGN FLOW

Design Flow Step:
1. Start
2. User registration/login
3. Upload face image
4. Image processed to extract skin features
5. Undertone detection algorithm runs
6. Database lookup for suitable product shades
7. Display personalized results
8. User can save or compare shades
9. End

6. ARCHITECTURE DESIGN



System Design for AI-Based Makeup Shade Recommender

7. CONCLUSION

The Flawnt app successfully identifies user undertones with high accuracy and delivers personalized beauty recommendations tailored to individual skin profiles. By combining advanced image processing techniques with precise colour-science analysis, the system ensures reliable undertone detection and enhances the overall quality of cosmetic shade matching. This technology not only improves customer satisfaction but also contributes to a more sustainable and inclusive beauty ecosystem by reducing product mismatch and minimizing unnecessary purchases. In addition, Flawnt elevates the user experience through its seamless interface, real-time processing, and ability to address the diverse spectrum of Indian skin tones. The platform demonstrates how AI-driven tools can transform traditional beauty routines into data-informed, confidence-boosting experiences.

Looking ahead, future enhancements may include the integration of augmented reality (AR) for virtual try-on, enabling users to preview makeup shades instantly and interactively. Additional features such as expanded product databases, improved lighting correction algorithms, and deeper personalization models can further refine the accuracy and usability of the system.

8. REFERENCES

[1] Hye Rim Hong & Young In Kim - A mobile application for personal color analysis |2019|Cogent Business and Management.

[2] Jisoo Park, Hyungjoon Kim, Seonmi Ji & Eenjun Hwang - An Automatic Virtual Makeup Scheme Based on Personal Color Analysis | January 2018|ResearchGate .

[3] X. Li, R. Han, N. Ning, X. Zhang and X. Jin. Efcient - Facial Makeup Transfer Combining Illumination Transfer | 2019 | IEEEACCESS.