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AR Make-up Filter for Social Media using the HSV Color Extraction

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ABSTRACT

Choosing the appropriate cosmetics is an arduous task. Because cosmetics are tested directly on the skin to ensure each person's preferences are met. The consumer repeatedly tries a sample and then discards it until he discovers one that meets his tastes. The cosmetics business and consumers are affected by this move. Companies can utilize Augmented Reality (AR) technology as an alternative to mass-producing cosmetic samples. The difficulty of deploying augmented reality is the difficulty of putting cosmetics into camera video streams. Each individual bears the burden of skin color and its effect on light. HSV Color Extraction was the method employed for this study. The application of augmented reality intends to enable consumers to test cosmetics with their chosen color and assist businesses in competing in the industry by promoting items and engaging customers. This work makes it easier to choose cosmetics using augmented reality and social media. AR simulates the usage of the desired color cosmetics, whereas social media allows users to obtain feedback on their color preferences. The outcomes of this study indicate that augmented reality (AR) apps can display filters in bright, dim, and even wholly dark lighting conditions. This research contributes originality that cosmetic firms can utilize to market their products on social media.

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1. INTRODUCTION

It is no longer uncommon for humans to wear makeup. Men and women, along with children and adults, began using cosmetics. In addition to helping, one's face appear younger throughout daily activities, the application of cosmetics can increase one's sense of self-confidence. Ancient Egyptians' use of kohl around the eyes is proof that cosmetics has existed for a very long time. In addition, information technology occasionally aids in its advancement. Coupled with the globalization era, this has resulted in makeup becoming a fad that can be applied by both men and women [1].

With the advancement of technology, trends in cosmetics are growing. The phrases bold makeup, Korean makeup, and face painting are popular nowadays. Moreover, this trend is enlivened by beauty vloggers and influencers on social media. This phenomenon encourages people to apply makeup because cosmetics is readily available [2]–[9]. The website makes it simple to purchase domestic and international products. Obviously, this creates both positive and bad potential. People's increased expressiveness and inventiveness had an excellent effect. However, it cannot be denied that this leads to a consumerist lifestyle. People typically spend between IDR 50K to IDR 500K on cosmetics, especially if a lack of knowledge about skin color hues forces them to spend multiple times choosing a shade that complements their face. Customers can save on

cosmetic buying costs when they find the right product. With the rapid development of technology, this problem can be solved, for example, by implementing Augmented Reality and virtual reality [10]–[22].

In previous studies, Jang et al. [23] described a method that uses a virtual reality environment to simulate the application of makeup on displayed avatars. To do this, the color of the virtual cosmetics was designed to appear more natural in comparison to a skin tone. The technology captured images using a 3D scanner. The LEDs attached to each of the three cameras that comprise the scanner are initially utilized to calibrate the system's color. After applying various cosmetics, the next stage is to produce an approximation of the avatar's skin colors using data from both the skin and cosmetic spectrums. Jang et al. [23] have developed techniques for producing virtual makeup that offers fascinating effects. However, because they require specific equipment to scan the skin and beauty ingredients to collect the optical properties, it is not feasible to employ them in a real-time interactive makeup application system.

Aline and Carlos [24] have successfully presented an augmented reality system that allows the user to apply virtual cosmetics directly to his or her face using one finger or a comparable device. Using a personal computer equipped with an Intel RealSense RGBD camera to capture color and depth images to create a real-time virtual cosmetics application. The only thing that can limit the potential of augmented reality is its applications. It is not possible to appear attractive on social media using the virtual makeup application method described in this study. The use of Augmented Reality (AR) on mobile devices eliminates the need for resources such as personal computers. The Instagram Application Programming Interface does not permit the processing of substantial quantities of data [25].

This work aims to develop an augmented reality (AR) virtual make-up simulation utilizing Instagram filters (may be applied to Story, reel, or live) individuals of all ages can use that. By using HSV Color Extraction, a hue, Saturation, and value-based color selection method. HSV has been used in several previous studies with various purposes, for example, finger detection [26], fruit ripeness [27], coffee disease [28], skin disease [29], land fire detection [30], Irish detection [31], parking detection [32], et cetera. In this research, the application includes foundation and lipstick colors. Customers need to modify the color of the foundation to match their skin tone, and the lipstick color should be adjusted to match their skin color. In the future, this application can be used as part of promotions by cosmetic companies around the world.

2. METHOD

2.1. Face Recognition and Tracking

Face recognition is a special kind of visual pattern recognition. People constantly see patterns, and these patterns provide us with knowledge [33], [34]. The brain recognizes this information as a meaningful concept. An image or video is a matrix of numerous pixels for a computer. The engine is intended to determine what concept a specific piece of data represents in the data. Using the visual recognition technique, this is an approximate classification issue. For facial recognition, it is crucial to know whom a face belongs to in that portion of the data for all computers that recognize a face. This is a subsection of the issue. In the broadest sense, facial recognition encompasses the technologies needed to construct facial recognition systems. This comprises face detection, face positioning, identity recognition, and image preprocessing, among other things. The objective of the face identification technique is to identify the coordinate system for each face inside an image. This is the process of examining the entire image to determine whether the applicant has a face. Face coordinate system outputs may be square, rectangular, etc. Face position is a facial feature's coordinate position in the face detection system. Deep learning consists primarily of utilizing some of today's superior positioning technologies. The facial positioning algorithm executes significantly faster than face detection.

Face tracking is a computer vision algorithm designed to aid in the creation of a perceptually efficient user interface. They must be able to monitor in real time without requiring disproportionate computational resources. Face detection and tracking are becoming increasingly important in a variety of contemporary circumstances. It is present in each and every aspect of the business [34]. Others continue to rely on the outmoded approaches, even though some persons have discovered how to use it in a successful and effective manner. Figure 1 illustrates the block diagram of the employed approach.

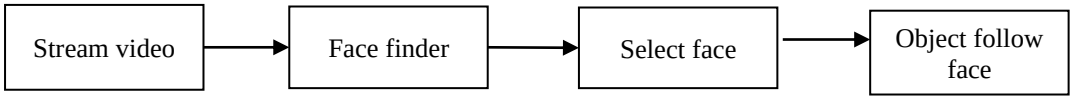

Figure 1. Block diagram method for filtering Instagram

2.2. Markerless AR

There are two forms of augmented reality, marker-based augmented reality and markerless augmented reality, based on the technique of showing virtual objects utilizing augmented reality. Markerless augmented reality is an AR technique that does not use frame markers to detect things. Markerless augmented reality eliminates the need for registered markers (markers) as tracking objects, as the application may automatically recognize items (e.g., faces) without the need to register them beforehand. The marker-less augmented reality approach is a way for detecting markers that will be utilized in apps, as the application does not need to be "taught" or "introduced" in advance to recognize the faces of application users.

2.3. HSV Color Modelling

HSV color modeling specifies color in terms of Hue, Saturation, and Value. Hue reveals the object's true colors, such as red, violet, and yellow. Hue is utilized to distinguish colors and identify hues such as redness, greenness, and others. Saturation states the level of purity of a color or the power of the color. Value is the luminosity of a color. The value ranges from 0-100%. Whenever the value is 0, the color is black. The bigger the value, the more vibrant and new color variations develop [35]. The HSV color model is the most popular model for RGB colors and is usually used by desktop visualization applications (Figure 2).

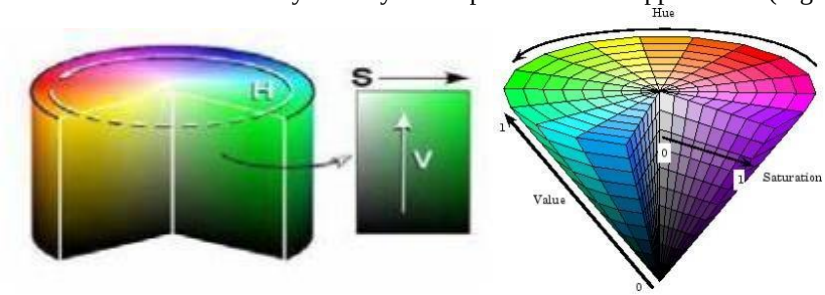

Figure 2. HSV Color Model[36], [37]

Since the HSV (Hue Saturation Value) color model is derived from the RGB (Red, Green, Blue) color model, we must convert RGB color to HSV in order to produce this HSV (Hue Saturation Value) color. Using the HSV model, some colors are comparable to those the human senses perceive. While other models, such as RGB, produce colors by combining primary colors. In order to more closely resemble the original hue.

3. RESULTS AND DISCUSSION

3.1. System Design

In selecting the shade foundation color, the researchers took references from six types of human skin tones, namely Light Pale, Pale, Tanned, Brown, Dark Brown, and Black. Of the six types of skin tones, we try to match the appropriate color to be used as a shade foundation. Overall, nine colors cover the six types of skin tones as follows (Figure 3).

1. Two shades are taken from the Light Pale skin tone type,
2. Two shades taken from Pale skin types,
3. Two shades are taken from the Tanned skin type,
4. One shade taken from the skin type Brown,
5. One shade taken from the skin type Dark Brown,
6. One shade takes from the Black skin type.

Figure 3. Color Shade Foundation Skin Tone Human Skin [38]

In selecting lipstick colors, we took reference from a brand called EVER with the EVER-Liquid Lipstick series (Figure 4). We took this brand as a reference because it has a complete color range, as many as 69 colors in the form of numbers which are categorized as follows (Figure 5-Figure 9).

Figure 4. EVER brand lipstick color variant

1. The Nude shade consists of numbers 94, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 201, 202, and 96 (Figure 5).

Figure 5. The color of the lipstick shade Nude

2. The color shade red consists of numbers 95, 26, 27, 32, 33, 34, 36, 37, 40, 41, 44, 46, and 97 (Figure 6).

Figure 6. The color of the lipstick shade Red

3. The Classic color shade consists of numbers 20, 21, 22, 23, 24, 25, 28, 29, 30, 31, 35, 38, 43, and 45 (Figure 7).

Figure 7. The color of the lipstick shade Classic

4. The Metal shade consists of numbers 60, 61, 62, 63, 64, 65, 66, and 67 (Figure 8).

Figure 8. The color of the lipstick shade Metal

5. The Rebel shade consists of numbers 39, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, and 92 (Figure 9).

Figure 9. The color of the lipstick shade Rebel

3.2 System Testing

The first test scenario is to test whether the system can function adequately in 2 different light conditions: dim and dark. The test was carried out to determine the foundation filter's performance first, then the lipstick color selection filter. Figure 10 shows a screenshot of the application with two different environmental brightness conditions.


Figure 10. Foundation filter testing in dim and dark lighting

The test results show that the color filter can perfectly display the foundation color even in dim light conditions. The second scenario is to test the lipstick selection filter in 2 different light conditions, dim and dark, with the results shown in Figure 11.


Figure 11. Lipstick filter testing in dim and dark lighting

Based on the HSV (Hue Saturation Value) method, this dramatically affects make-up filters, including Hue here to differentiate colors in choosing a shade foundation that is suitable for the user's skin tone and the color in choosing a lipstick color according to the user's wishes. In Saturation here, usually, in choosing a shade foundation, the user will choose a natural one, and for choosing a lipstick, the user will also choose a color that matches the color of the lips or a color that is not too bright so that it looks fresher. The last one is the Value here. The brightness that is obtained when the user uses this filter is very influential. If the user gets very high brightness, especially when choosing the foundation shade, it will not match the original, or this filter may not work correctly. On the other hand, if the user gets very low brightness, choose a shade foundation that matches a dark shade result.

Apart from light testing, we also conducted a survey of 20 women aged 19-38 regarding the use of this filter on social media. Based on the survey results, it is known that 50% of people like to wear makeup, 70% of people like to use filters, and 70% of people say that filters work well. Once accumulated, we got an 83% vote saying this filter is liked and works well.

4. CONCLUSION

Using HSV color extraction, an augmented reality application for makeup filters on social media has been developed. It has been demonstrated that HSV color coding can aid in identifying faces based on skin tone and cosmetic coloring. Adopting this social media filter allows users to test foundation and lipstick hues based on skin tone. This social media filter uses nine skin tones as foundation benchmarks and allows users to experiment with 97 lipstick color options. Hue and Saturation play a role in distinguishing colors in shade foundations, whereas lighting significantly impacts value. After testing, the filter can function effectively in bright and dim lighting but not in dark lighting.

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