感性を用いた色彩表現

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1 Introduction

Colors determine the way we perceive the world around us. Color coordination utilizes the balancing and harmonization of different colors with various characteristics. Coordinating colors has been a topic of discussion among artists and scientists for many years [7, 2, 4, 8]. It has especially been studied in terms of creating harmony among colors in the field of computer graphics and visions. Cohen et al [1] proposed an application that automatically changes the colors of an arbitrarily chosen image to enhance the harmony of colors. Their work is based on the harmonic templates on hue wheels developed by Matsuda [6], which in turn are derived from various color theories and experimental studies.

However, the effects of color coordination are determined not only by hues but also by other elements such as saturation, lightness, dimensions, and contrast. Among these elements, saturation and lightness, which together is called *tone* also play an important role in the effects on human perception. Good coordination of color follows certain rules of how hues and tones are composed. For instance, when the differences in hue values of colors are small, it leas to a wide variety of tones, and vice versa. Although there are no conclusive studies that give us finite rules for color coordination, there are some forms and schemes that describe the ways in which artists and designers arrive at good color coordination [5]. One example of this is the above-mentioned hue harmonic templates.

Color coordination also aims to convey the concept and/or mood and feel that designers and artists (i.e. colorists) have in mind. Colorists rely on the various theories and their experience to select a set of colors that create an intended concept. Once the set of colors is defined, the colorists need to color or recolor his product with this set. This task can be repetitive and laborious before obtaining the set of colors with the intended outcome.

In this paper, we introduce a new method that allows users to automatically change the colors of a given image in accordance with a predefined look or mood based on hue and tone. Using our method, one can easily change the colors of an arbitrarily chosen image to various coordinated sets of colors by selecting hue and tone sets. Our technique is especially useful in situations where a user has an intended feel and mood he/she wants to convey in the image or when two images are to be merged into one. Our method allows the user to analyze the mood and feel associated with the image and to adapt the hues and tones of the images to meet the desired mood and feel.
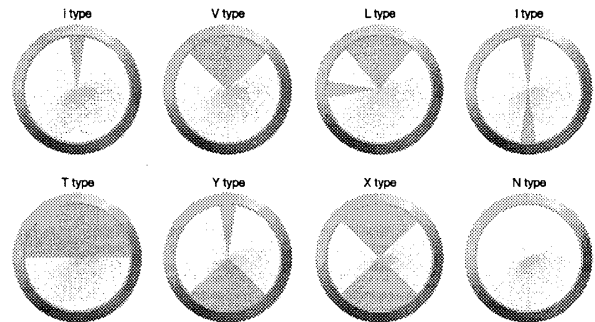
Figure 1: Harmonic templates on the hue wheel. A collection of colors that fall into the gray areas is considered to be harmonic. The templates may be rotated at an arbitrary angle.
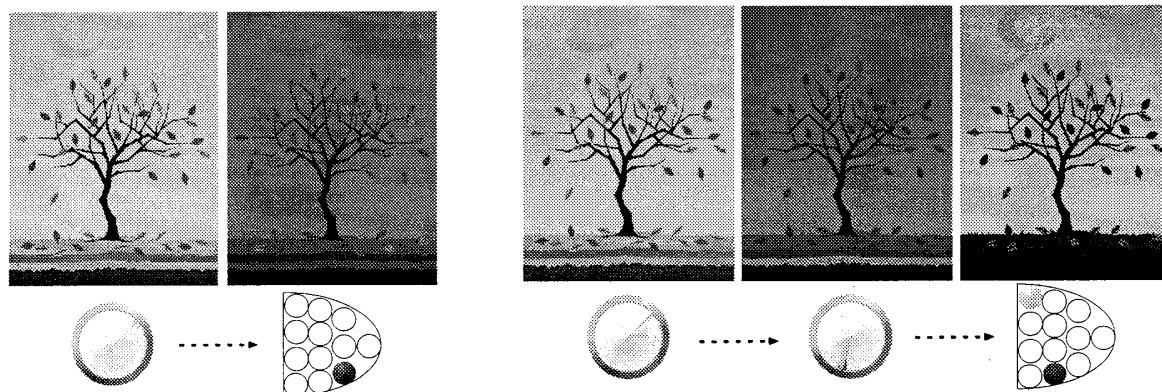
2 Color Coordination

2.1 Coordination Schemes of Hues

The color coordination schemes of hues we use in this paper are harmonic templates proposed by Matsuda [6]. The schemes are illustrated in Figure 1. The templates are defined over the hue channel of the HSV color channel on a hue wheel. Each hue wheel template has a set of sectors which are defined by gray areas. Colors with hues that fall in the gray sectors of the template are defined as harmonic according to this template. The templates are composed of eight different template types, namely i, l, L, T, V, X, Y, and N. The templates may be rotated by an arbitrary angle. Each h on the hue wheel is then associated with one of these sectors. The type-N template corresponds to gray-scale images and thus is not dealt with in this work. Given a template with a specific angle $T_m(\alpha)$, the task is to associate and shift each hue of pixel p so that they reside inside the sectors of the template.

2.2 Coordination Schemes of Tones

The coordination schemes of tones used in this work are based on tone templates developed by Japan Color Research Institute [3] called PCCS. PCCS is a hue and tone color system created from extensive psychophysical studies on how people perceive colors and is widely accepted and used by designers and artists (i.e. colorists). The tone is composed by saturation and lightness channels (Figure 2). It consists of seventeen types, five of which correspond to gray-scale colors and thus are not dealt with in this work. Each of the remaining twelve types is associated with saturation and lightness values for each hue range of thirty degrees. The entire hue wheel is divided into twelve ranges making each of which thirty

(a) Changing tone of the image to type deep

(b) Changing hue to purple and tone to types dark and pale

Figure 3: Color coordination on hue and tone in action. The tone of the original image is changed to tone type deep (a). The hue of the original image is changed to purple using the harmonic template type i and the tones are changed to types dark and pale, respectively (b).
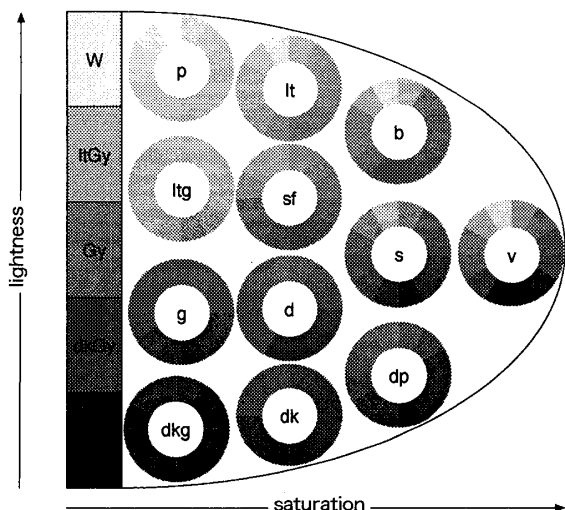

Figure 2: PCCS tone template. A collection of tones of colors on each ring represents a tone type. Each ring is associated with moods and feels by adjectives.

degrees. Each tone template is also associated with a representative adjective that expresses the mood and feel of the tone [3]. Similar to hue templates described in the previous section, we associate the saturation S and lightness L of each pixel in the image with one of the tone templates $Tone_n$ ($n \in p, ltg, g, dkg, lt, sf, d, dk, b, s, dp, v$) for each hue range HR_t ($t \in 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12$).

3 Conclusion

We have presented color coordination methods for hues and tones that can be used for changing the colors of images with certain moods or a specific feel in accordance with the wishes of a user. Our technique adjusts the hue of each object in the image, without causing the color to

split within this object. It also aspires to preserve the original relationships of tone within the image. Our technique is especially useful in situations where a user has an intended feel and mood he/she wants to convey in the image or when two images are to be merged into one. Our method allows the user to analyze the mood and feel associated with the image and to adapt the hues and tones of images to meet the desired mood and feel.

References

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