

Control of color and brightness using polarization color

Kitami Institute of Technology

Yutaro Shibata, Sho Sakurai, Motoki Mori and Kenji Harada

E-mail: m1852400134@std.kitami-it.ac.jp

Introduction

Retarder films exhibit polarization color using polarizer. With conventional polarization color control, only color can be controlled. In this presentation, we talk about a control of color and also brightness using polarization color.

Experimental methods

Figure 1 shows the optical layout using simulation. As the birefringent material, a retarder film having a retardation of 565 nm (λ retarder) and 140 nm ($\lambda/4$ retarder) was used. A white light (D65) was used as a light source. The polarizer arrangement is crossed Nicol. Polarization colors when four retarder films (λ retarder, λ retarder, $\lambda/4$ retarder, λ retarder) were rotated by 3° in the range of angle 0° to 180° were simulated using MATLAB. Figure 2 shows points plotted on the xy chromaticity diagram in the above conditions. In the case of this simulation condition, it is possible to display the color in the black range in Fig. 2. As a method of brightness control, a specific color is selected, all colors are extracted from a specific range, and brightness control is performed. Figure 3 shows the results of arranging the colors of these points in descending order of the brightness. The numbers at the bottom of figure 3 are the brightness (L^*) of the extraction points in the Lab color system.

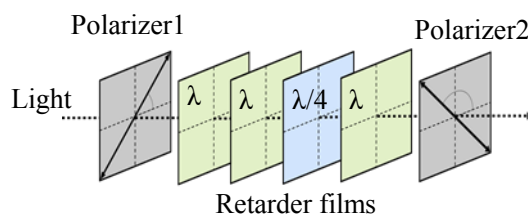


Fig. 1 Optical setup for polarization color

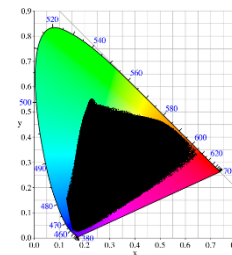


Fig. 2 Displayable color range

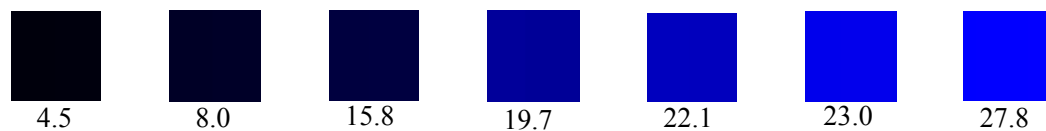


Fig. 3 Intensity distribution of extracted polarized color (blue)

Conclusions

We have produced a control of color and also brightness using polarization color. This technique is simple and can be applied for security, entertainment, and educational use.