Topics

Measurement of "Color Discrimination Ellipse" for Object's Surface with Texture

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1. Introduction

Colors of automotive parts are designed and the color difference tolerance for quality control is determined as a result of experimental observation using colored prototypes of actual parts. To realize the observation without trial manufacture, a new method of generating the color appearance of automotive parts by optical transmission has been proposed in which the virtual color can be seen with the surface texture retained. This method was applied to the quality control of the color difference, and its applicability has been confirmed.

2. Transmission coloring method

Fig. 1 shows the method of coloring actual parts virtually by optical transmission. An actual car part, a CRT display to show the colors and a half mirror to split the incident lights into reflected light and transmitted light are placed as shown in the figure. The color shown by the CRT display is superimposed on the color of the actual parts by the half mirror, and an observer can see virtually new color. In this method, the color of the parts can be changed freely with the surface texture (pattern, gross and shade) retained. The strength of the coloring can be controlled by the reflectance/ transmittance of the half mirror.

3. Application to color quality control

Using the parts colors generated by this method as experimental stimuli, the human eyes' color difference tolerance (color discrimination ellipse) used for quality control was measured. In Fig. 2, a group of the parts colors generated as experimental stimuli are expressed by the colorimetric value. The direction and strength of the color differences were controlled more precisely and at lower cost than the colored prototypes of actual parts. Fig. 3 shows the example of the color discrimination ellipse measured by the experiment using this method. The result was obtained without producing prototypes at considerable cost.

4. Summary

A method of virtually coloring automotive parts by optical transmission with the surface texture of the parts retained has been proposed. This method was applied to the measurement of the color discrimination ellipse for the parts. The virtual color generated by this method has higher accuracy, and the measurement was carried out at lower cost than the conventional experiments using colored prototypes.

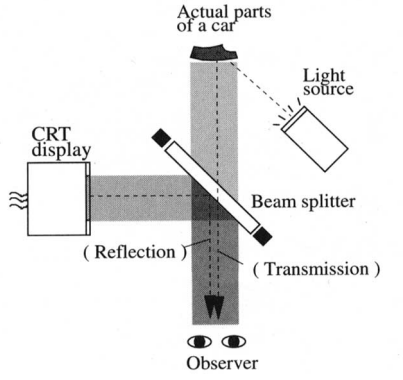
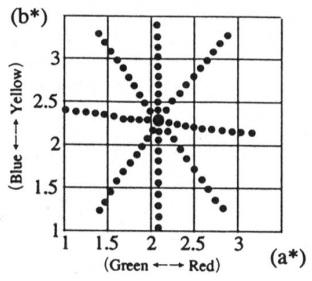


Fig. 1 Method of coloring actual parts virtually by using reflection from CRT display.



[a*, b* : Parameters of CIE LAB color system]

Fig. 2 Examples of generated colorappearance.

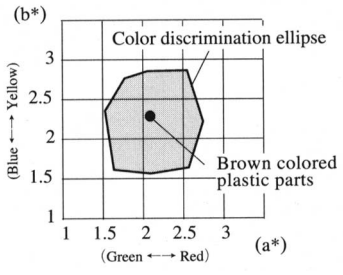


Fig. 3 Example of color discrimination ellipse.

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