

IRODORI - A Color-rich Palette Based on Natural Vision Technology-

Junko Kishimoto *
National Institute of Information
and Communication Technology

Masahiro Yamaguchi **
Tokyo Institute of
Technology

Hideaki Haneishi +
Chiba University

Nagaaki Ohyama ++
Tokyo Institute of
Technology

1 Introduction

"Natural Vision" is a novel color imaging technology developed through research into high-fidelity image reproduction for TV systems, i.e., high fidelity in terms of color, glosses and textures. The technology has been studied since 1999 in a research project directly controlled by the Telecommunications Advancement Organization of Japan (The present National Institute of Information and Communication Technology).

One of the features of Natural Vision is that the use of a multispectral camera and a multiprimary display allows natural color reproduction which is far beyond the capacity of the conventional RGB (red-green-blue) system. Most existing display devices utilize three primary colors: red, green, and blue (RGB). In contrast, Natural Vision dramatically increases the color range that can be displayed by using a multiprimary display with four or more primary colors.

As an important extension of this project, we are conducting research and development into applying this ability to display an increased number of colors to computer graphics. We have developed a user interface for mixing multi-primary colors, and demonstrated the psychological effects of viewing an extended range of colors, particularly those with high chroma. As a result of this study, we have built IRODORI system, a color palette which allows people to experience a wider range of colors that are not accessible through conventional RGB display devices.

2 Exposition

The core technology for IRODORI is the interactive CG rendering system using six-primary-color display. A six-primary-color projection display system is composed of two modified LCD projectors into which additional interference filters were inserted. Different sets of filters are employed in the two projectors. Images projected from the two projectors are overlaid on the screen. A new hardware enables correction of geometrical distortion caused by the slightly different positioning of the two projectors. The six-primary-color projector can reproduce a color gamut 1.6 times larger than conventional RGB projection systems[Figure 1]. In addition to an LCD projector system, we have also developed several types of multiprimary display systems, such as a 6-primary-color DLP™ projector system and a 4-primary-color flat panel LC display.

The IRODORI system consists of a six-primary-color projection display, CG software installed in a conventional PC, and a 3to6 signal converter, which has 3-channel input and 6-channel interface. The newly developed multiprimary color conversion method, which is essential for generating multiprimary color signal from colorimetric image data, is implemented.

What are the characteristics of the increased colors? They are colors which are seldom encountered, such as stimulating high chroma colors, luminescent and fluorescent colors, and very deep, dark colors. In addition, the palette can render colors of memorable scenes, such as bright blue skies, a marine blue-

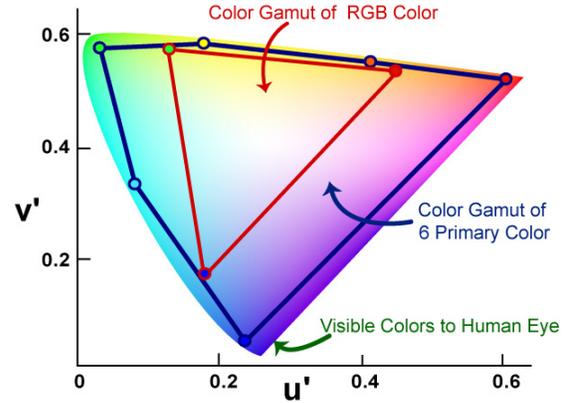


Figure 1: CIE u'-v' chromaticity diagram

colored sea, dappled sunlight through fresh green leaves, and a blazing sunset.

Although we may not be aware of it, we actually need more colors to physically reproduce the images we see in our mind's eye. This fact is confirmed by an experiment, in which we asked subjects with no prior knowledge of IRODORI to paint red autumn leaves (vivid red, typically seen in Japan). Some 30% of the colors used by the subjects were those that cannot be reproduced on conventional displays.

It is possible to design computer graphics using previously unavailable colors by using IRODORI. In addition, we demonstrate various items of content produced using IRODORI, such as a therapeutic movie which reproduces images of real trees against a natural background (woods and water) using a large number of somber colors; a motivational movie which uses many stimulating, high-chromatic colors; and a short animated feature.

3 Conclusion

As a sub-project in Natural Vision, the goal of the IRODORI system is to show ways of applying the ability of a multiprimary display to produce many colors to the field of CG expression, and to realize a system that can contribute to the enhancement of digital expression.

The ability to render a greater range of colors than has previously been possible will broaden the expression of digital images produced by CG. The initial applications will be in media and digital art, as IRODORI provides new tools for creators. Fields of application will gradually expand, from theaters and projection of video games which call for stimulating and high-chroma expression to TV and personal computer terminals.

* e-mail : kishimoto@akasaka.nict.go.jp

** e-mail : guchi@isl.titech.ac.jp

+ e-mail : haneishi@faculty.chiba-u.jp

++ e-mail : yama@isl.titech.ac.jp