Primary Marker + **Secondary Marker** ▶ **Universal HueCode**

Hue specific superposition marker

Multiple markers superimposed on a single sheet.
Recognizable under a variety of lighting conditions,
no learning required, general-purpose code.

Overview

2D codes are used in various situations such as information transmission, tickets such as airline tickets, product management in stores, and robot control. However, only one information is usually obtained from 2D codes. Therefore, composite markers are developed by superimposing multiple markers.

In the conventional hue specific superimposed marker "HueCode " devised by the inventors, different markers are superimposed on the area of one marker, and two pieces of information can be acquired simultaneously. However, HueCode can only read markers with a reader that implements a special algorithm. In order to read markers under various lighting conditions, prior learning is required, and HueCode may not be recognized in unknown environments.

The present invention is a **"Universal HueCode"** that solves the above problem by superimposing two or more markers and adopting a color scheme that appears to be the first marker when converted to greyscale, even though the distance between the colors of each marker = RGB u-grid distance is maximally separated. By replacing commonly used QR codes and AR markers with Universal HueCode, it is possible to embed additional information into the marker while continuing to use it for its current purpose. Furthermore, by improving the recognition algorithm, recognition under various lighting conditions is possible without prior learning.
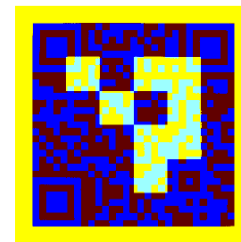
Product Application

☐ Next generation 2D code

IP Data

Effect

1. 100% marker readability under various lighting conditions without learning required

Method	Primary	Secondary				
	15 cond. (N=900)	15 cond. (N=900)	5 cond. (N=300)	Outside of 5 cond. (N=600)	1 cond. (N=60)	Outside of 1 cond. (N=840)
Proposed (k-means)	100 %	100 %	100 %	100 %	100 %	100 %
Baseline (SVM, 15 cond.)	100 %	96.7 %	100 %	95.0 %	100 %	96.4 %
Baseline (SVM, 5 cond.)	100 %	90.9 %	100 %	86.3 %	100 %	90.2 %
Baseline (SVM, 1 cond.)	100 %	86.7 %	100 %	80.0 %	100 %	85.7 %

2. Successfully recognized transparent glass window by mobile robot

(a) Recognition of windows using the primary marker   (b) Distance measurement using the secondary marker

Contact

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