

Research on human vision using psychophysical methods H. Shinoda, Dept. of Human & Computer Intelligence, Ritsumeikan Univ.

Color Science

- color management system
- scale for space brightness
- new lighting design and method
- color vision deficiency
- elderly color vision
- LED application

- Color Vision Deficiency**
Color vision simulator of color deficient
UDcolor View® & UDcolor Manager® - KISTEM Co. Ltd.
- Elderly Color Vision**
Lighting system enhancing elderly color vision
Color Recovery System, CRS® - Yoshichu Mannequin Co. Ltd. & Kuroi Electric Co. Ltd.

Vision Science

- visual acuity & size perception
- brain activity measurement using NIRS
- gaze tracking for human interface
- size perception on 2D image
- slit vision

What is "UDcolor" ?

Normal Color Vision

- Original

- Modified

Dichromat (P, D) Vision

- Original

Logo "UD" is invisible

- Modified

The software detects confusing colors and changes them

Now, the logo "UD" is visible

What is color deficiency ? How's color perceived by color deficient ?

- Trichromat (Normal color vision persons)
- Protan (L cone deficient persons) ≈ 2% Congenital, rare in women
- Deutan (M cone deficient persons) ≈ 6% Congenital, rare in women
- Tritan (S cone deficient persons) < 0.01% Acquired, rare in men&women

Luminance Channels
Scotopic Luminance (V'), Photopic Luminance (V)

Chromatic Channels
R/G (r-g), Y/B (y-b)

Wavelength (nm): 350, 400, 450, 500, 550, 600, 650

How's the color simulator work ?

475nm, 575nm

Original

T sim

P sim

D sim

Brettel, Viénot & Mollon, 1997

How's the performance of the simulator evaluated ?

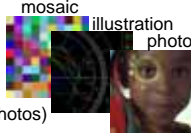
Experiment

" Which is original ? "
" Right or Left ? "

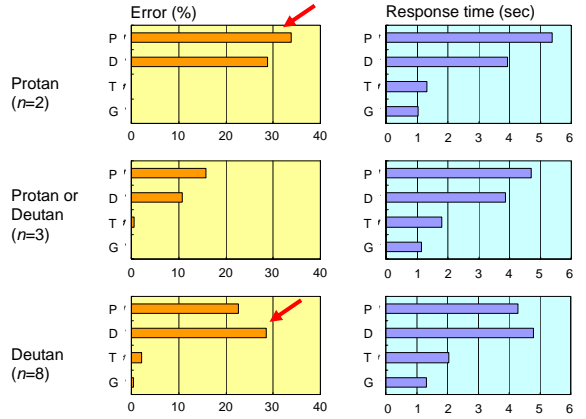


Experimental Conditions

- Subjects (classified by Ishihara Plate, 100-Hue Test)
 - Normal Trichromat (n=2)
 - Protan (n=1), Deutan (n=8)
 - Protan or Deutan (n=2)
- Images
 - 60 images (9 mosaics + 33 illustrations + 17 photos)
- Simulations
 - P-simulation(P), D-simulation(D), T-simulation(T), Grayscale-image(G)



How's the performance of the simulator evaluated ?



What is "CRS" ?

Color-Recovery-System, CRS®

A lighting system to prevent the perceptive color loss for cataractous elderly, installed to a fitting room and awarded GOOD DESIGN AWARD in 2005.



Cataract

What is cataract ?

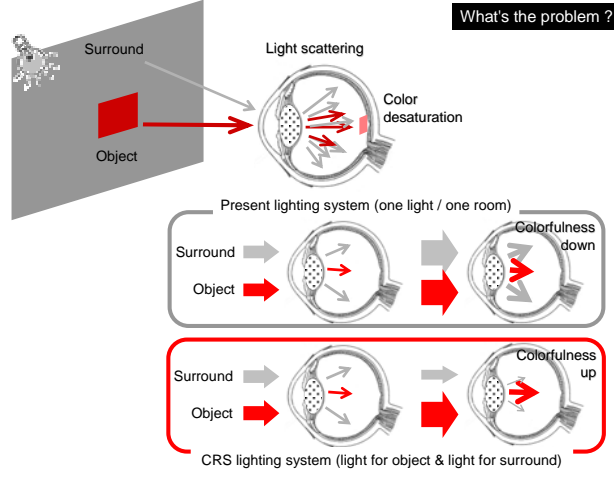
The lens becomes progressively opaque or hazy, resulting in blurred vision

Statistics

- In Japan, 1,600,000 people have cataracts
- 85% of patients are 65 y.o. and over
- 70% of 60-70 y.o. are cataractous
- 90% of 70-80 y.o. are cataractous

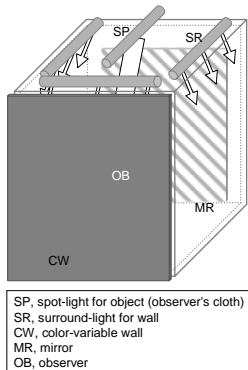
Elderly = Cataract

What's the problem ?



Color recovery system, CRS®
Lighting for elderly in a fitting room

How's the performance of the system evaluated ?



	SP	SR	CW
Normal Lighting	60%	100%	White
CRS Lighting	100%	40%	Black

Relative luminance at the center of lamp
32W fluorescent lamps of 6700K + 3000K makes 5000K color temp.

Evaluations

- Colorimetric measurements
- Psychophysical experiments (Color naming experiments)
- Questionnaire by customers

3. Questionnaire by customers
(Oct.2004-Feb.2005)

How's the performance of the system evaluated ?

Q2. Did colors and patterns of the clothes look clearer and more distinct than usual ?

