

**CIE TC 8-01**  
**Recent colour appearance**  
**studies at Derby**

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**CIE TC8-02**

## Recent studies at CII

1. Testing colour appearance models' performance under different illuminants using images

Suchitra Sueeprasan

2. New magnitude estimation data

Grace Juan

3. CMCCAT2000

ChungJing Li

4. A revised CIECAM97s model

ChungJing Li

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## Testing colour appearance models' performance under different illuminants using images

- cross-media comparison between CRT & print images
- 4 complex images
- D50, A, A (Print) to D93, D53 , D93 (CRT) respectively
- 20 observers using a categorical judgement method
- 8 CAMs and 2 CATs
- CIECAM97s based models gave an overall better performance

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## New magnitude estimation data

- Conducting magnitude estimation experiment including about 40,000 estimations
- Investigating the change of colour appearance due to backgrounds, sample sizes, textures
- Verifying Helmholtz-Kohlaush effect
- Accumulating saturation results
- Testing various colour appearance models
- Refining CIECAM97s scales

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# CMCCAT2000

## A simpler Model

The *CMCCAT97* reverse mode is not exactly reversible and very complicated.

## Accurate prediction to experimental data sets

The *CMCCAT97* is derived to only fit L&R data.

Incomplete adaptation factor accounting for luminance differences between reference and test fields

A Large improvement in fitting the *McCann* data.

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# CMCCAT2000

- Different data sets agree well with each other except for the *McCann* data.
- The model is robust, not affected much by different colour difference formulae or measures of fit used.
- The mean CIELAB is the right measure to be used for deriving the CAT.

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# CIICAM

A software was developed to optimise coefficients in CIECAM97s to fit the LUTCHI, and Juan & Luo data sets.

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# CIICAM

## 1. CMCCAT2000's spectral sensitivities

$$M_{CMCCAT2000} = \begin{pmatrix} 0.7982 & 0.3389 & -0.1371 \\ -0.5918 & 1.5512 & 0.0406 \\ 0.0008 & 0.0239 & 0.9753 \end{pmatrix}$$

## 2. CMCCAT2000's $D$ factor with $L_{A1}=L_{A2}$

$$D = F[0.08 \log(L_A) + 0.76]$$

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# CIICAM

3. Set power factor  $p = 1$

$$R_c = [D(R_{wr}/R_w) + 1 - D]R$$

$$G_c = [D(G_{wr}/G_w) + 1 - D]G$$

$$B_c = [D(B_{wr}/(B_w)^p) + 1 - D]B^p$$

4. Set noise factor to 3.05 and  $N_c = 0.95$   
for dim surround -CAM97s2

$$A = [2R_a' + G_a' + 0.05B_a' - 3.05]N_{bb}$$

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## 4. Lightness

CAM97s2

$$J = 100(A/A_w)^{cz}, \text{ where } z = 1 + F_{LL}(Y_b/Y_w)^{0.5}$$

CIICAM

$$J = 100(A/A_w)^{cz}, \text{ where } z = 0.85 + (Y_b/Y_w)^{0.5}$$

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## CAM97s2: Saturation and Chroma

$$s = (5000e (a^2 + b^2)^{0.5} (10/13) N_c N_{cb}) / [R_a' + G_a' + (21/20)B_a']$$

$$C = 2.44s^{0.69} (J/100)^{0.67n} (1.64 - 0.29^n)$$

## CIICAM: Saturation and Chroma

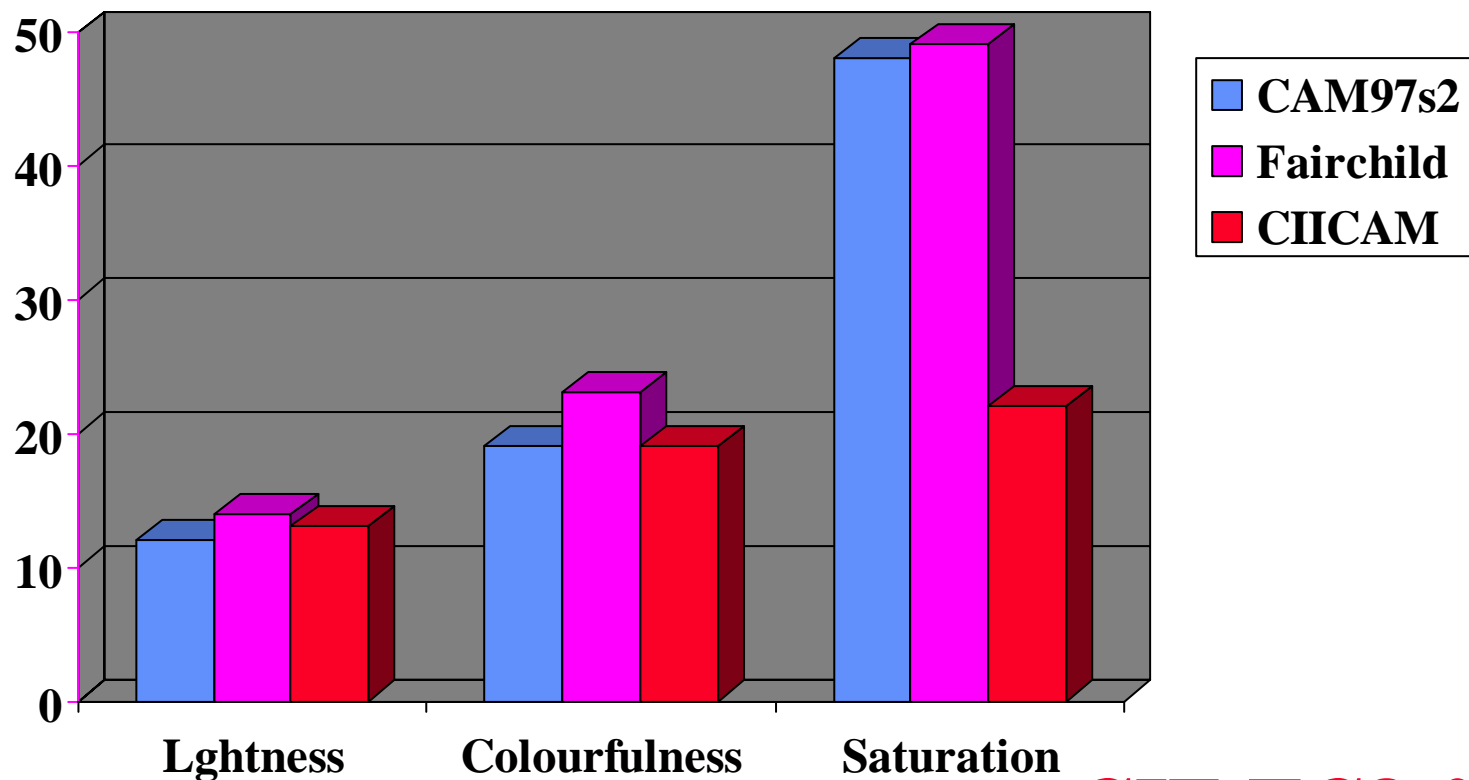
$$s_1 = (5000e (a^2 + b^2)^{0.5} (10/13) N_{cb}) / [R_a' + G_a' + (21/20)B_a']$$

$$C = 2.44 N_c s_1^{0.69} (J/100)^{0.67n} (1.64 - 0.29^n)$$

$$s = 50(C/J)^{0.5}$$

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# Testing performance of different CIECAM97s based models (CV)



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# Conclusion

1. CIICAM includes the CMCCAT2000 which is simple and predicts the most accurate to the available **corresponding-colour data sets**.
2. CIICAM's lightness scale takes into account the lightness contrast effect for all physical sizes.
3. CIICAM's saturation scale fits well to the only available saturation data set.