

COLOUR CONSTANCY FOR REAL 3D AND 2D SCENES UNDER TYPICAL AND ATYPICAL ILLUMINANT CHANGES

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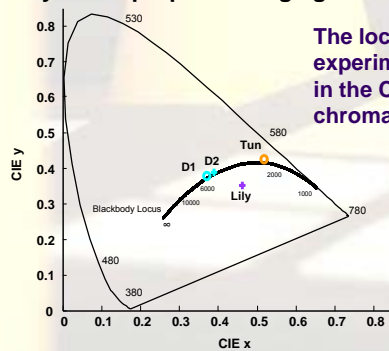
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1 INTRODUCTION

Previous studies comparing colour constancy across diverse illumination changes have drawn an inconclusive picture¹⁻³ as it is not yet firmly established if typical illumination changes, which are likely to occur during a daily routine (e.g. change between daylight and tungsten), lead to higher levels of colour constancy than atypical ones. Using a real surface matching task we investigated if either (a) the learning illuminant or (b) the nature of illumination change (typical vs atypical) had an effect on observers' colour constancy performance.

2 METHODS

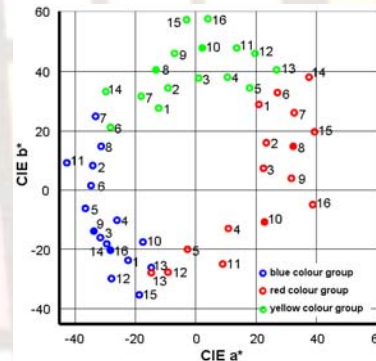
- Four different illuminants were used. Three of them lay on and one off the Blackbody locus. D1 and D2 were mimicking daylight, Tun was a tungsten light and Lily was a purple looking light.



- Colour constancy was tested for four different illuminant change conditions:

Condition	Change	learning a colour under...	matching under ...
D1 to Tun	typical	D1	Tun
Tun to D1	typical	Tun	D1
D2 to Lily	atypical	D2	Lily
Lily to D2	atypical	Lily	D2

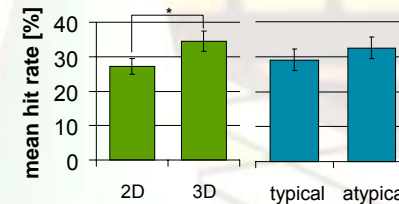
- Real surface colours were presented as two-dimensional (2D) swatches on a palette and as three-dimensional (3D) geometrical volumes in a complex scene.



- 48 colours from the Natural Color System (NCS) were chosen and divided into three groups: blue, red and yellow. Each group had 2 target colours.

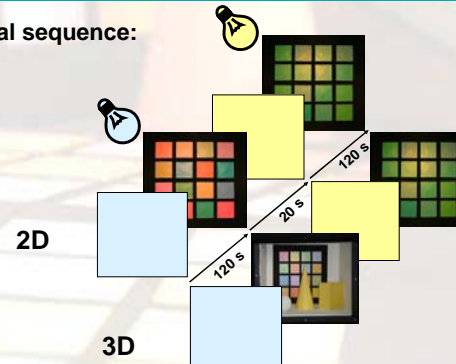
The circles in the CIE a*b* chromaticity diagram represent all 48 colours of the experiment under illuminant D1. Filled dots indicate the target colours.

- Three-way mixed ANOVAs revealed that there was ...
- no significant effect between the illuminant change condition D1 to Tun and Tun to D1 nor D2 to Lily and Lily to D2.
- a significant effect between 2D and 3D, $p=0.025$.
- no significant effect between the typical and the atypical illuminant changes.



3 PROCEDURE

- Trial sequence:



- Twenty-eight colour-normal observers were randomly assigned to one of the four illuminant change conditions.
- Each observer completed two tasks; learning a colour in 2D and learning a colour in 3D.
- A task consisted of 18 trials, in which each target colour was presented three times.

4 RESULTS

Illuminant change condition	Hit rate	
	2D	3D
D1 to Tun	23 %	37 %
Tun to D1	26 %	29 %
D2 to Lily	41 %	38 %
Lily to D2	20 %	32 %

5 SUMMARY AND CONCLUSIONS

- Observers' performance was not dependent on the illuminant under which a colour was learned, i.e. whether a colour was learned under D1 and matched under Tun or was learned under Tun and matched under D1 did not affect observers' performance. The same occurred for the illuminant changes between D2 and Lily.
- Observers' colour constancy was significantly improved when colours were learned in 3D.
- There was no evidence that the visual system compensates more effectively for typical than for atypical illuminant changes.

6 REFERENCES

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