

**Title:** Colour constancy for real 3D and 2D scenes under typical and atypical illuminant changes

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## **Abstract**

Previous studies comparing colour constancy across diverse illumination changes have drawn an inconclusive picture 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 nature of illumination change (typical vs atypical) or (b) the learning illuminant had an influence on observers' colour constancy performance. For (a) observers learned a real surface colour under daylight and matched it either under tungsten (typical change) or a purple illuminant (atypical change). For (b) learning took place either under the tungsten or the purple illuminant and matching was always performed under daylight.

For all four experiments surface colours were either learned as part of a three-dimensional (3D) or a two-dimensional (2D) setup. We chose a mixed-design with the four illumination changes as between-subject factors and the two learning setups (3D/2D) as within-subject factors. In total, twenty-eight colour-normal observers participated. After learning a real surface colour for 20 s, an illumination change occurred and observers adapted for 2 min to the new illuminant before matching, which was always done in a 2D setup. Six different target colours were tested.

The results showed no evidence that observers performed better for typical than atypical illumination changes nor that the learning illuminant had a significant effect on observers' performance. However, learning real surface colours as part of a 3D setup significantly improved observers' colour constancy performance. We conclude that human colour constancy is able to cope with a wide variety of illuminant changes and benefits from the additional cues available in a 3D setup.