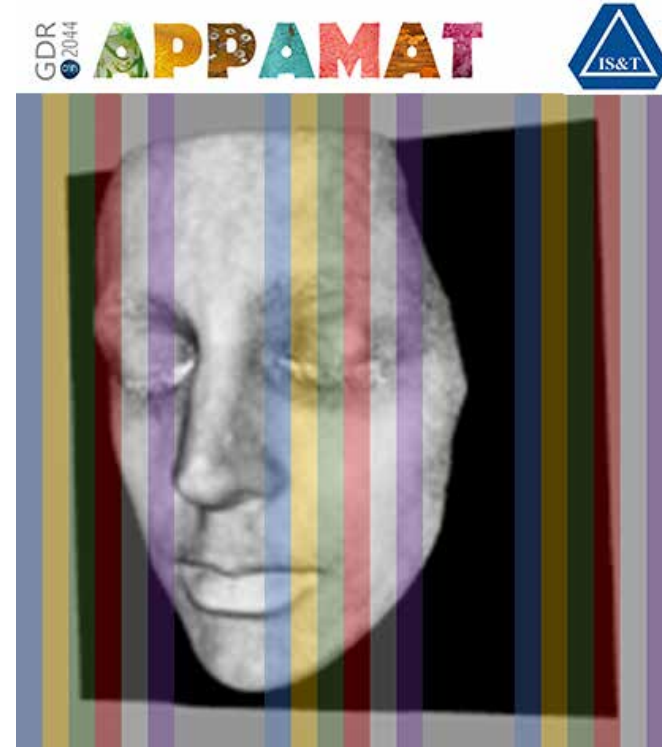


# Colour Difference Threshold for 3D Faces

Ruili He

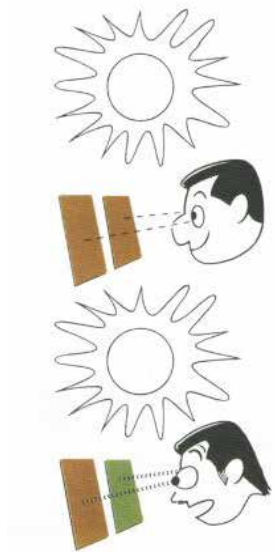
13 November 2023



# Introduction



- § Understanding colour-difference threshold is important in many applications.
- § Many studies have measured discrimination thresholds for uniform colour patches.
- § How about the colour-difference threshold for 2D and 3D facial appearance?



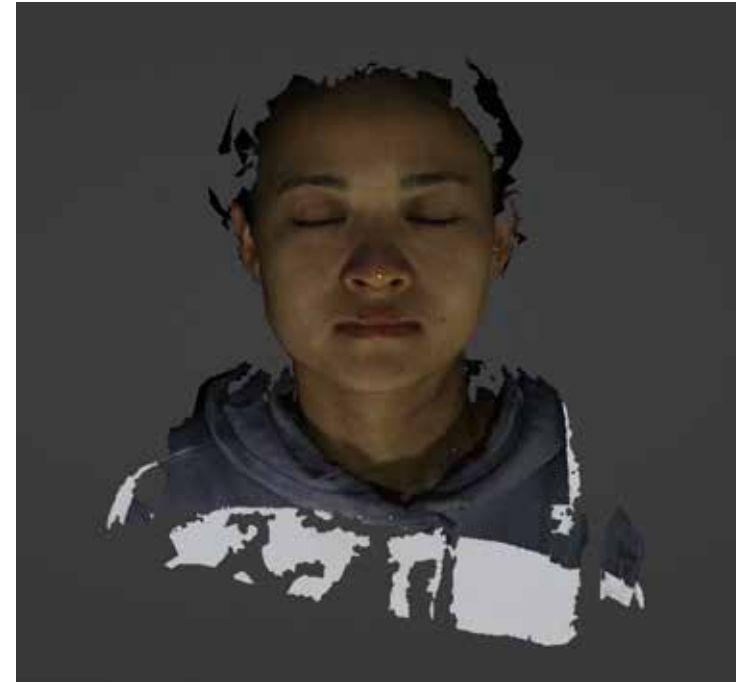
# 3D Face Acquisition



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§ 3dMDface system

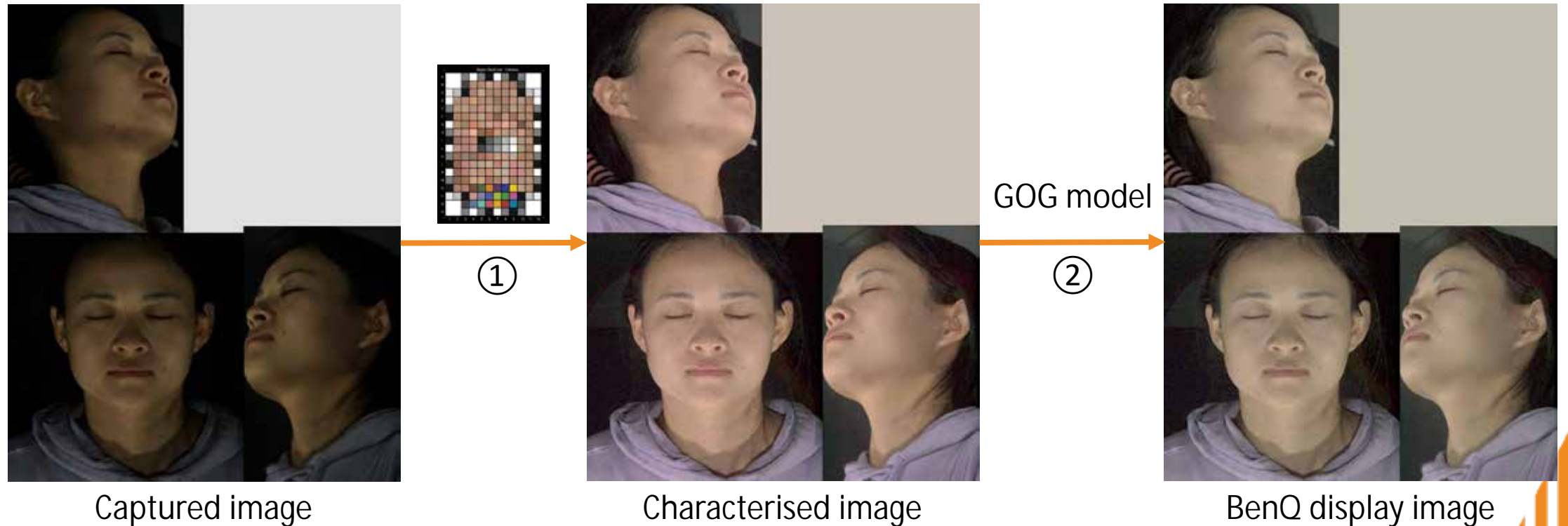
§ Obj file and bmp images



# Colour Characterisation



1. Colour characterisation for 3dMD cameras
2. Colour characterisation for BenQ PG2401 display



# Colour Manipulation



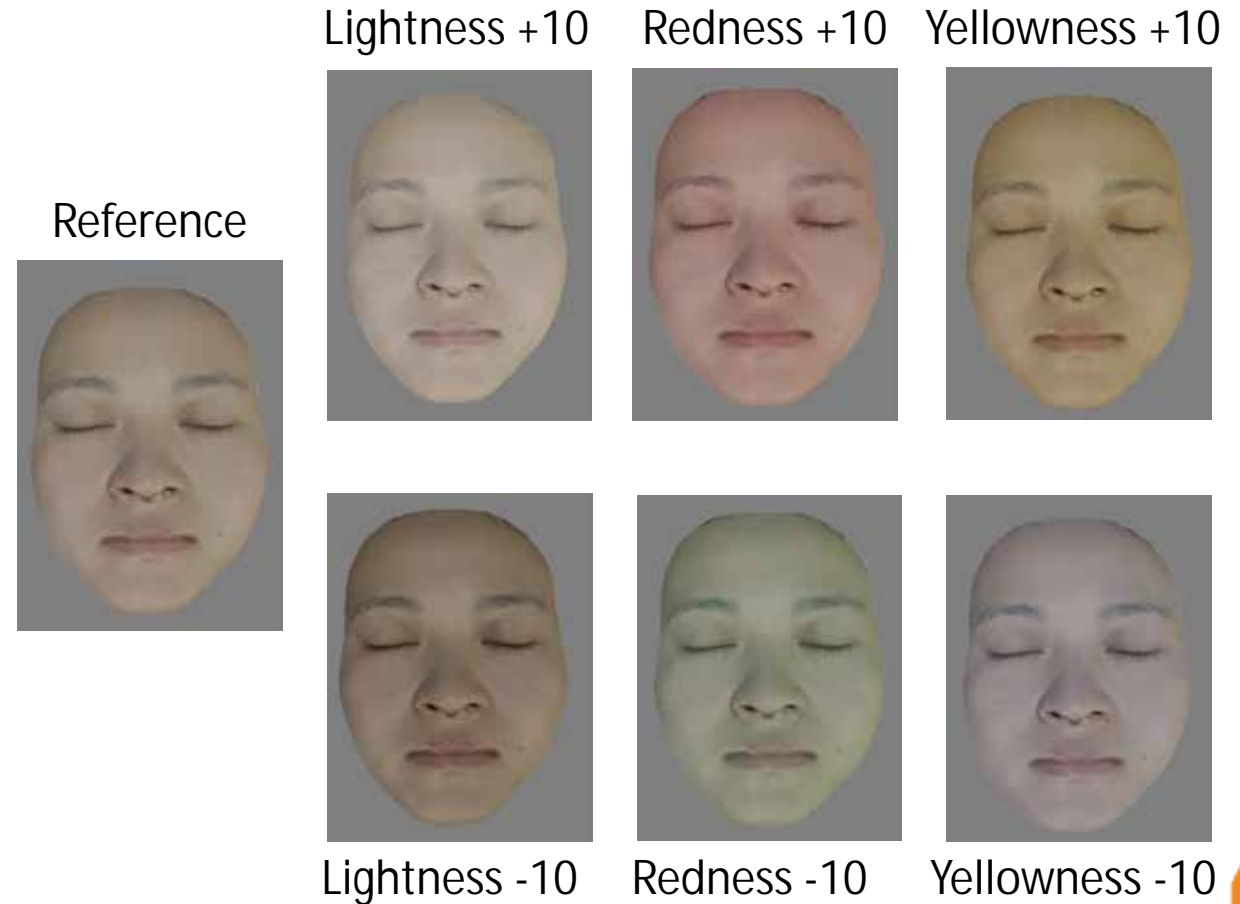
§ Based on the characterised image, the colour of each pixel was changed in terms of:

ØLightness: -10:0.5:10

ØRedness:-10:0.5:10

ØYellowness: -10:0.5:10

§ Colour varies from 6 dimensions



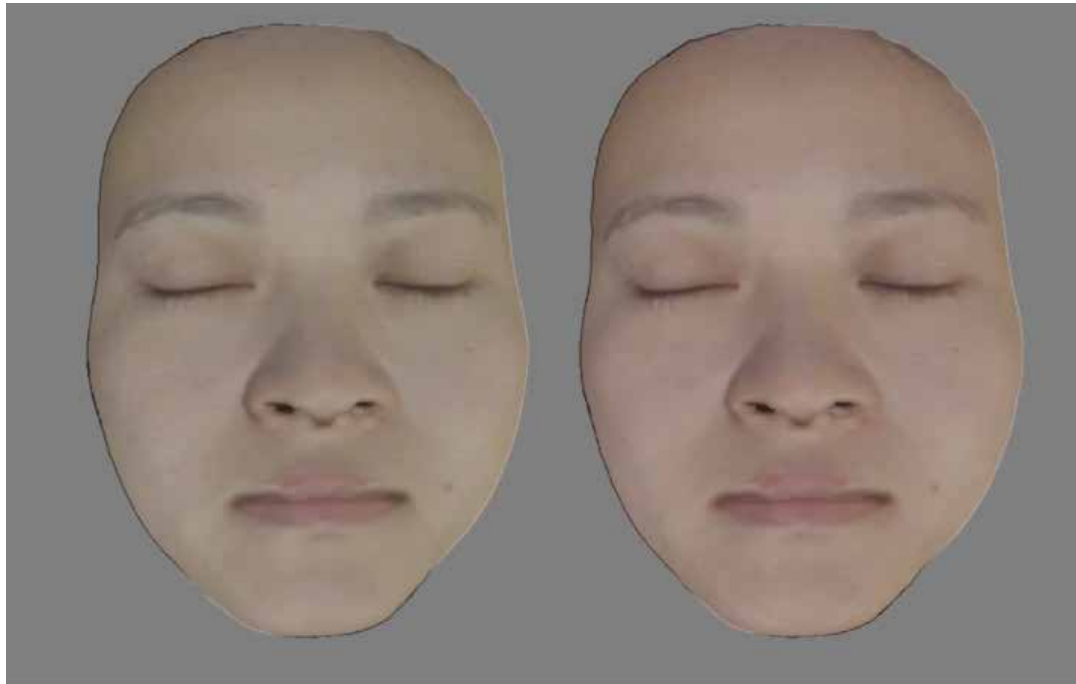
# Visual Experiments



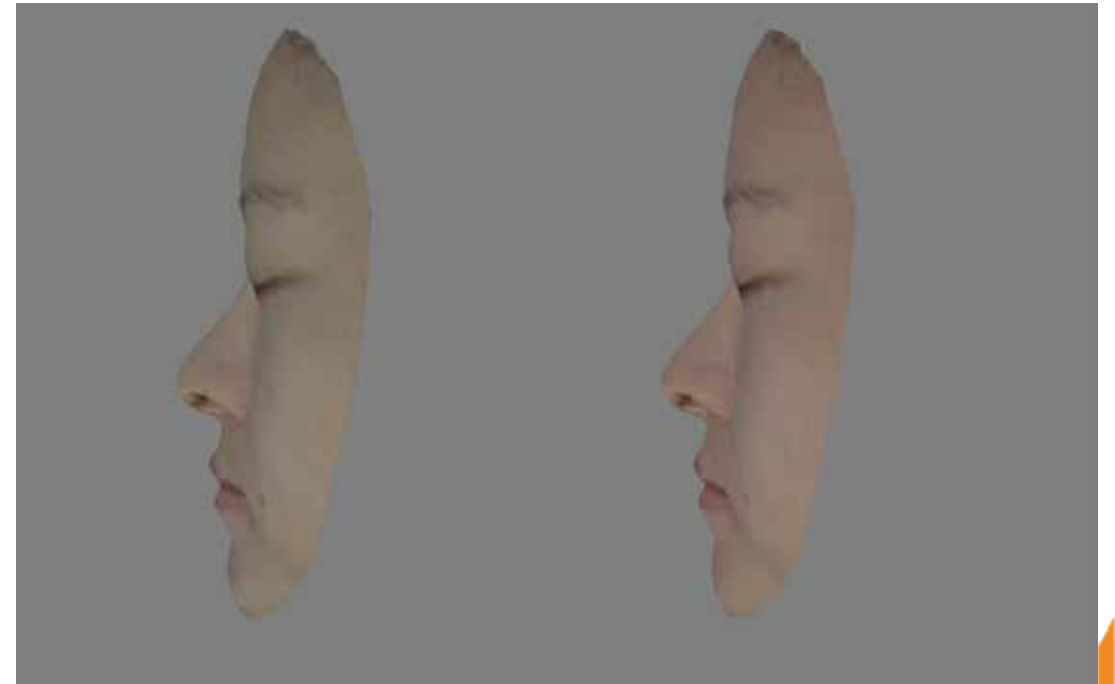
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§ The 3D faces were presented on the display in two conditions:

Still condition



Rotating condition



# Visual Experiments



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§ Visual colour difference assessments in a dark room

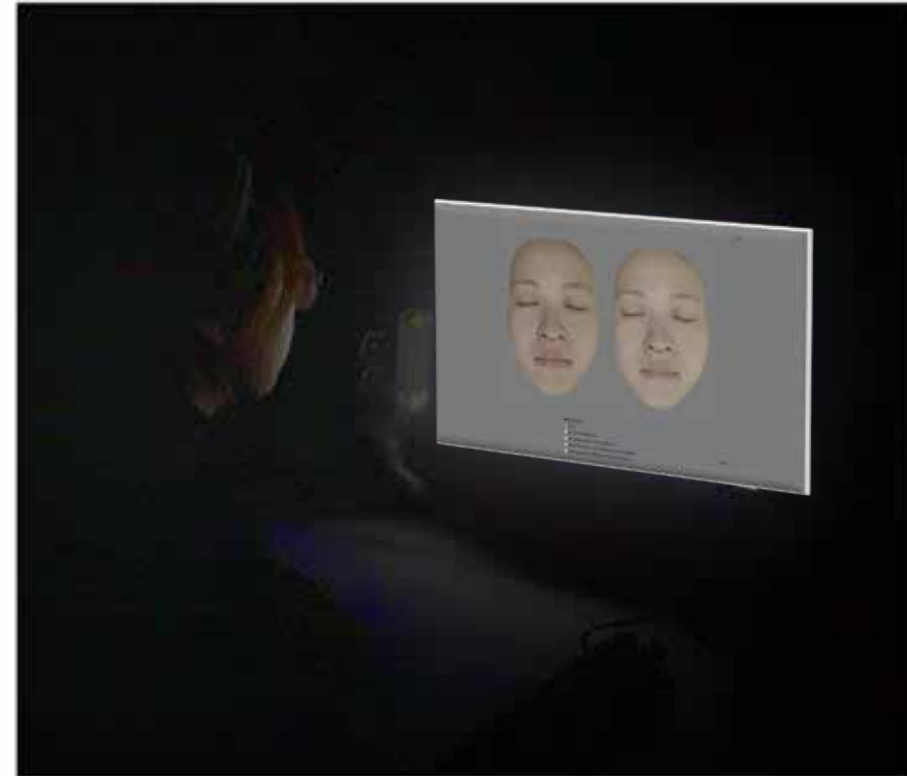
§ 11 female observers

§ Three options:

0: No colour difference

1: Perceived colour difference

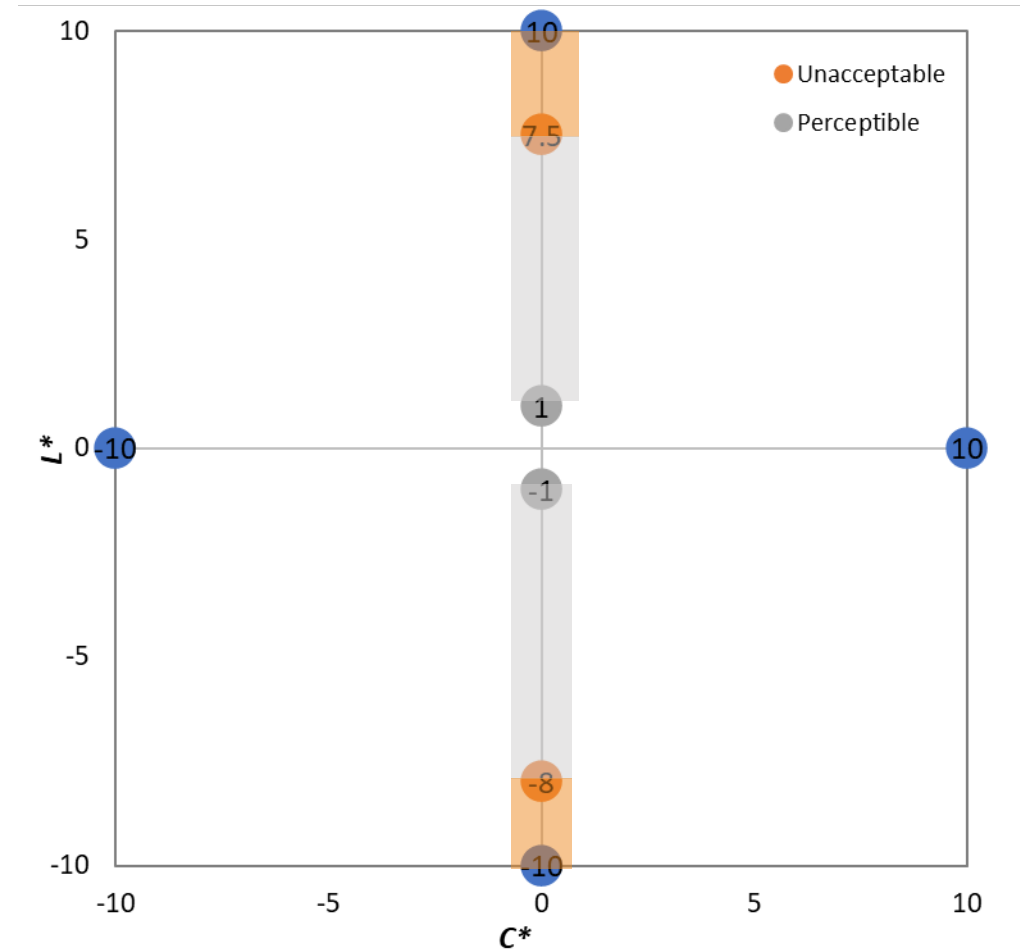
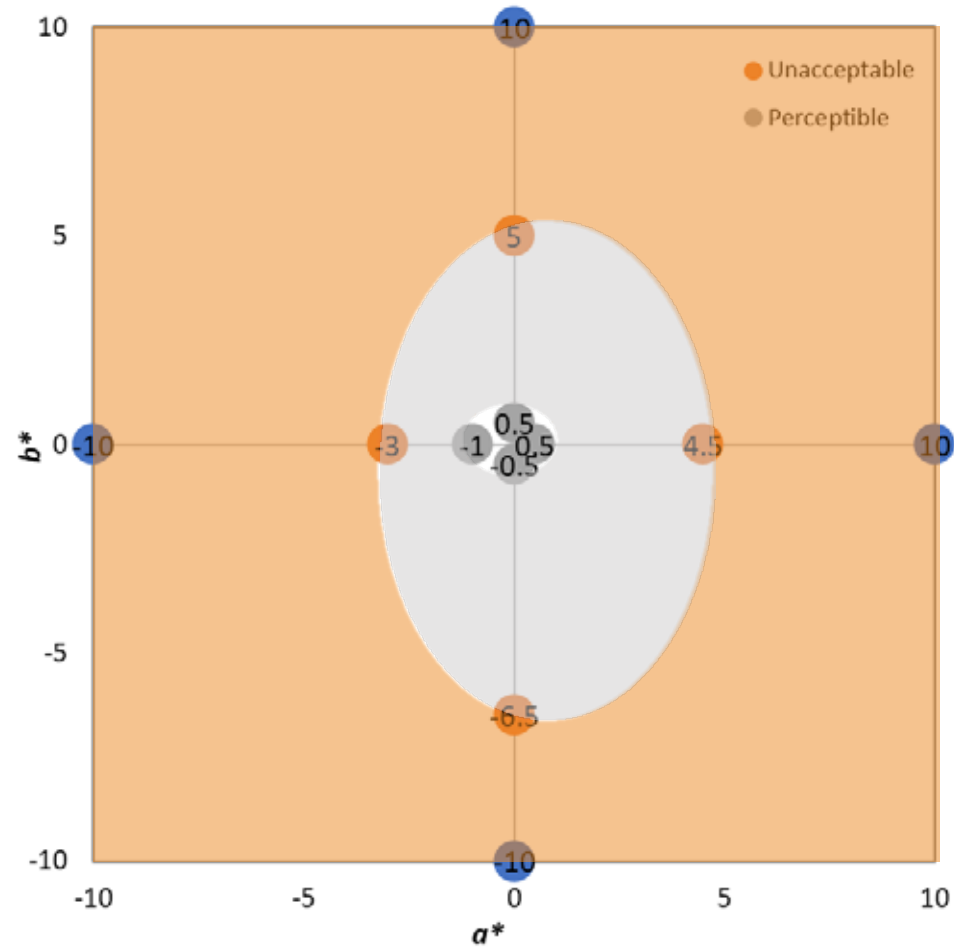
2: Unacceptable colour difference



# Results



§ The average results for the still condition:

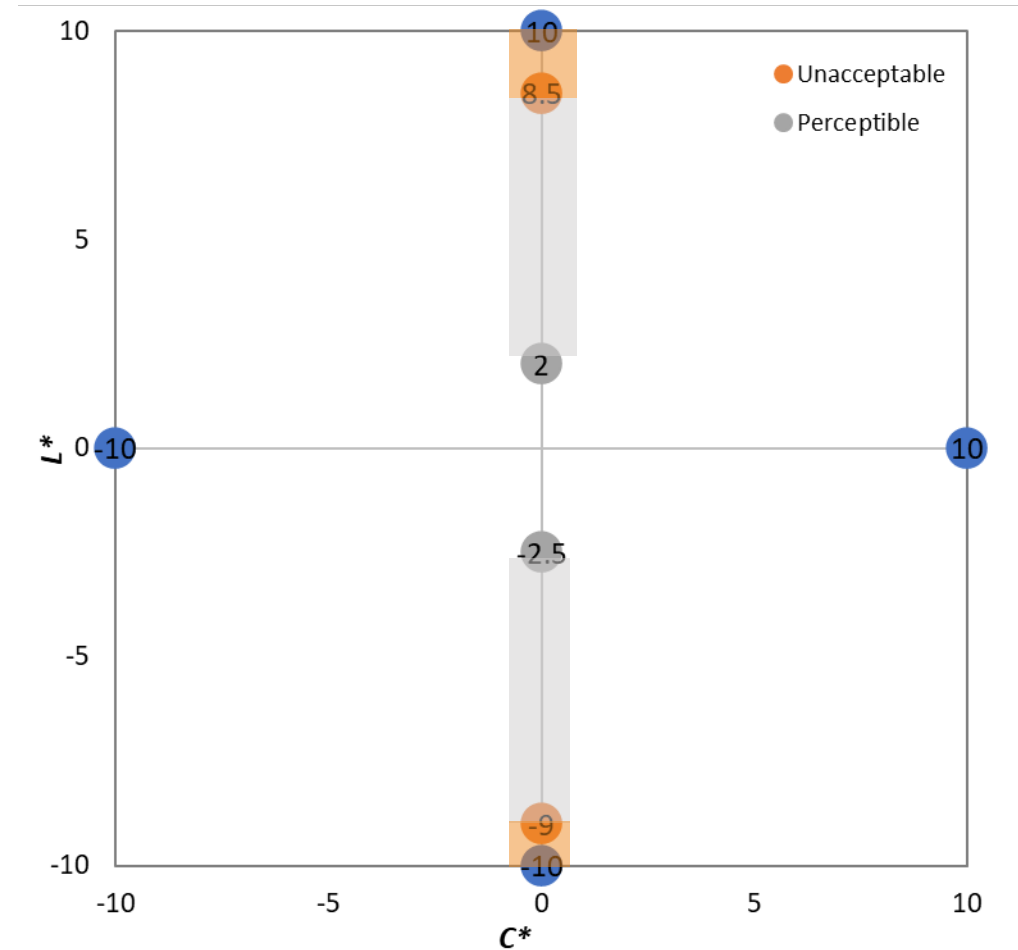
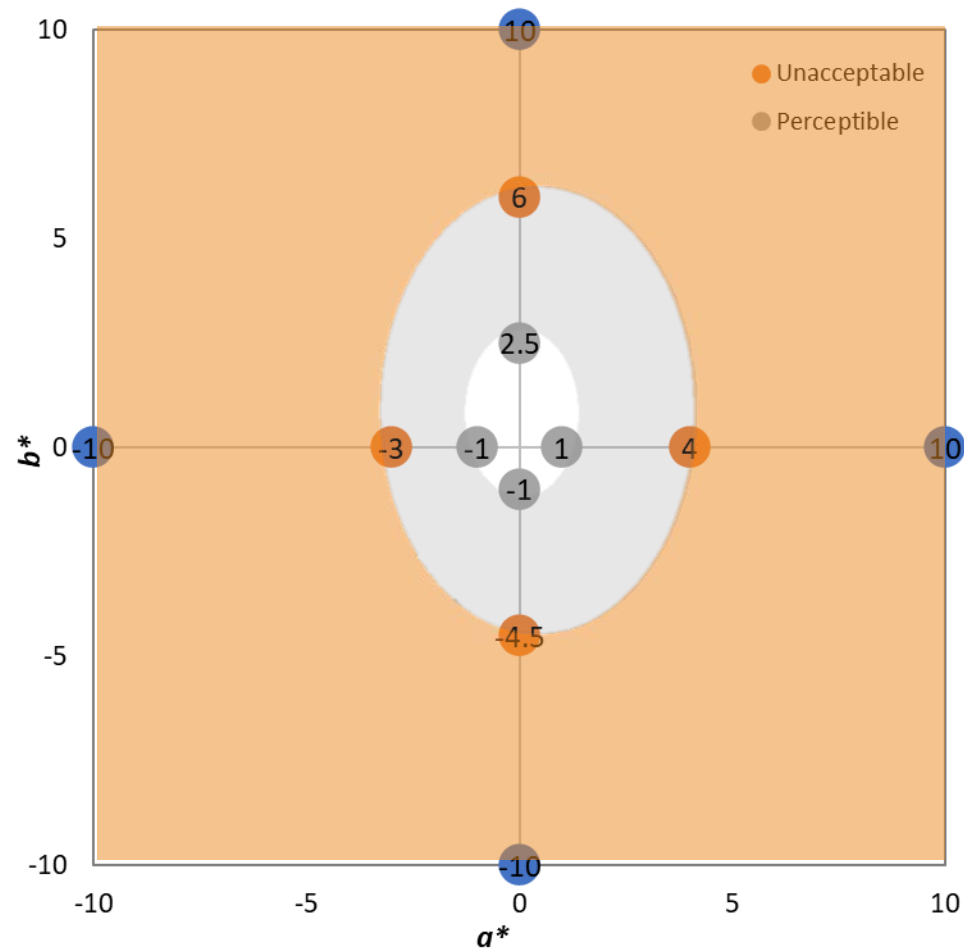




# Results



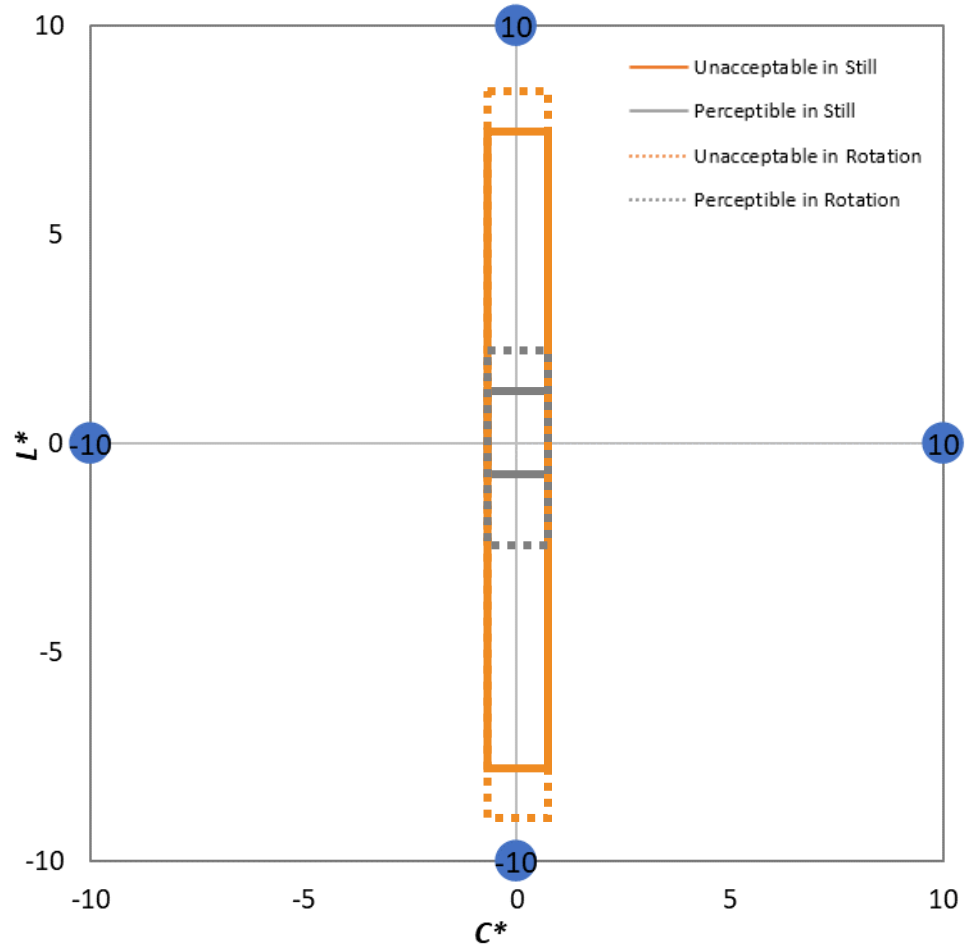
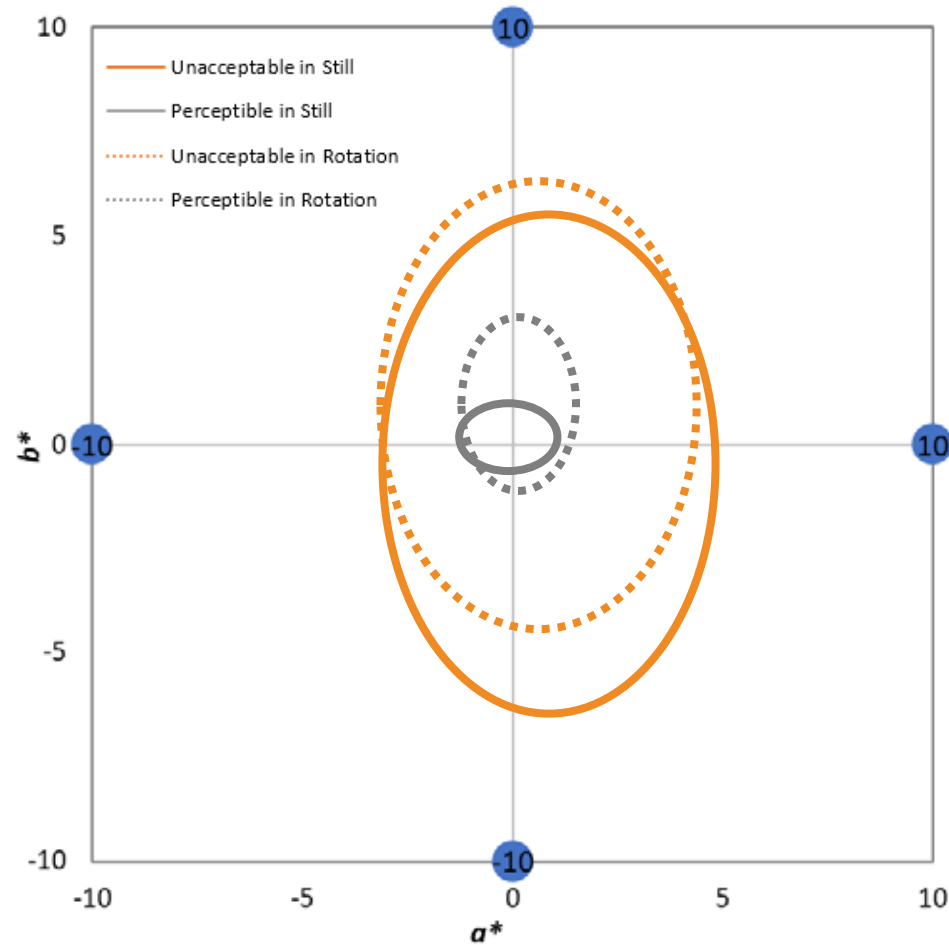
§ The average results for the rotating condition:



# Results



§ The perceptible and unacceptable colour difference for two conditions:



# Summary

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- § The perceptible and unacceptable colour-difference thresholds for 3D faces are different in lightness, redness and yellowness dimensions.
- § Observers are strict/sensitive on redness changes of facial skin tones while more tolerant for lightness changes.
- § The colour-difference thresholds for 3D faces in rotating are higher than those in still status.
- § Does the colour-difference evaluation depend on personal skin colour preference?



# Thank you

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