



## MatMix 1.0,

# a novel material probe for quantitatively measuring visual perception of materials



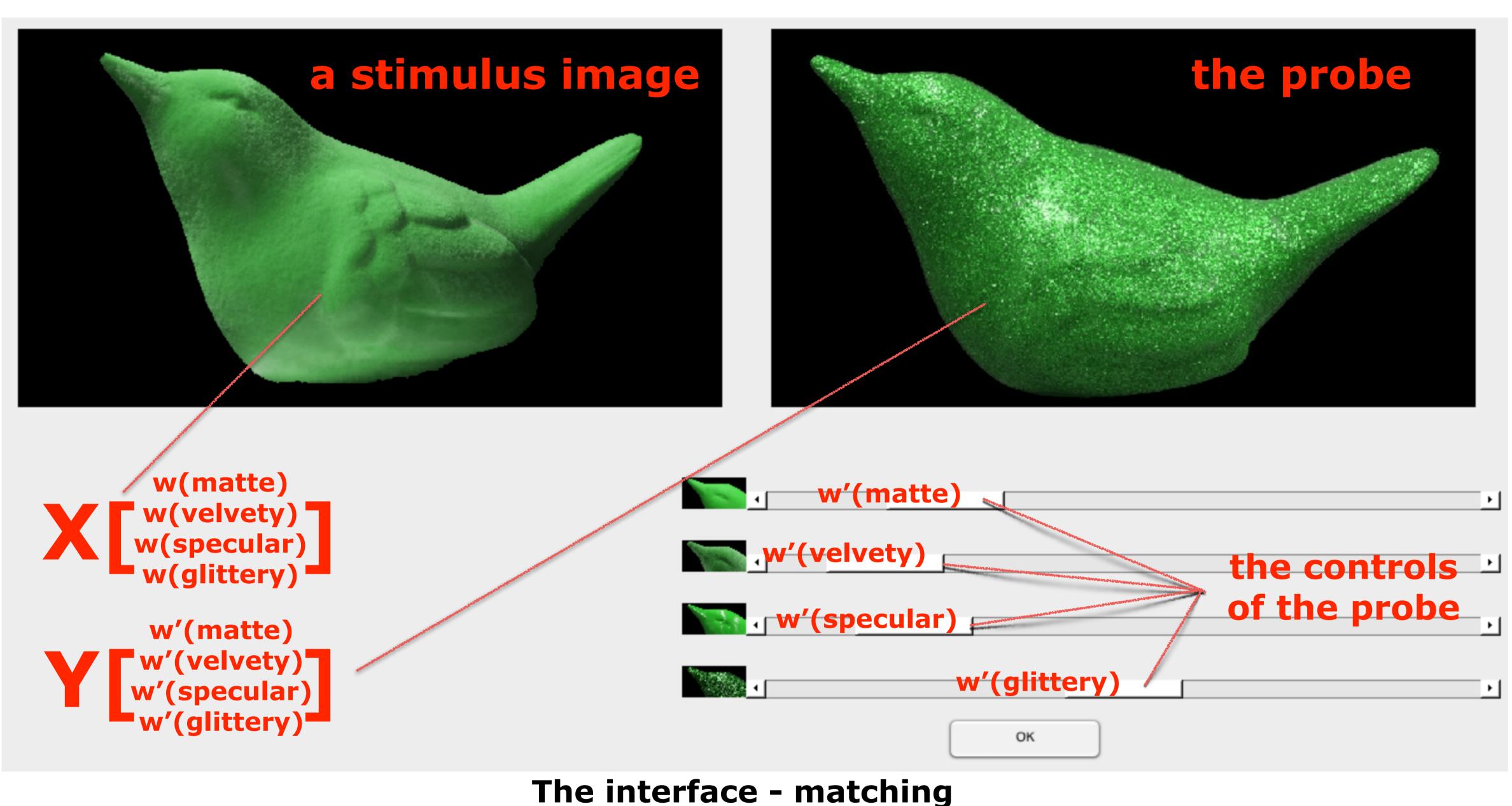


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#### Introduction

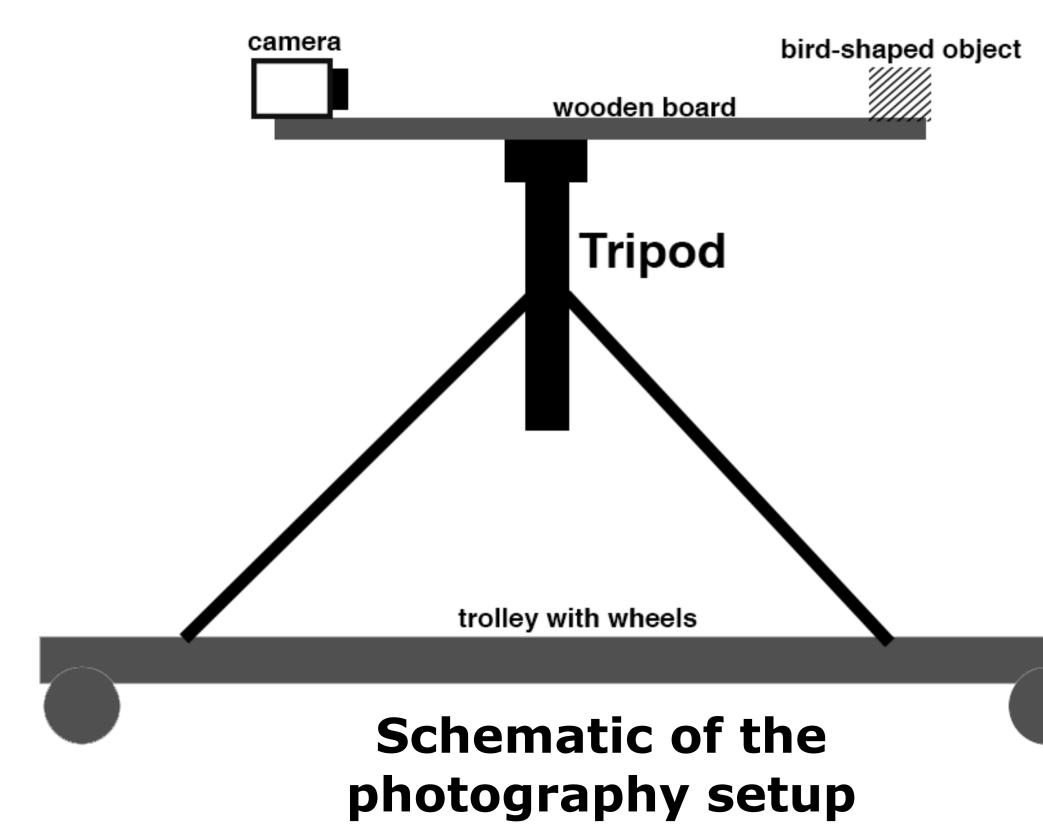
- How can we measure the visual perception of material qualities quantitatively?
- In this study, we developed a material probe (MatMix 1.0) to tackle the abovementioned question and tested the probe with human observers.

#### MatMix 1.0



- The observers were asked to move the sliders so that the materials of the probe was judged to match that of the stimulus. In the example shown above, the two materials obviously do not match.
- The position of each slider bar represents a value corresponding to a weight of a reflectance mode in the probe, ranging from 0 to 1.2.

#### Methods



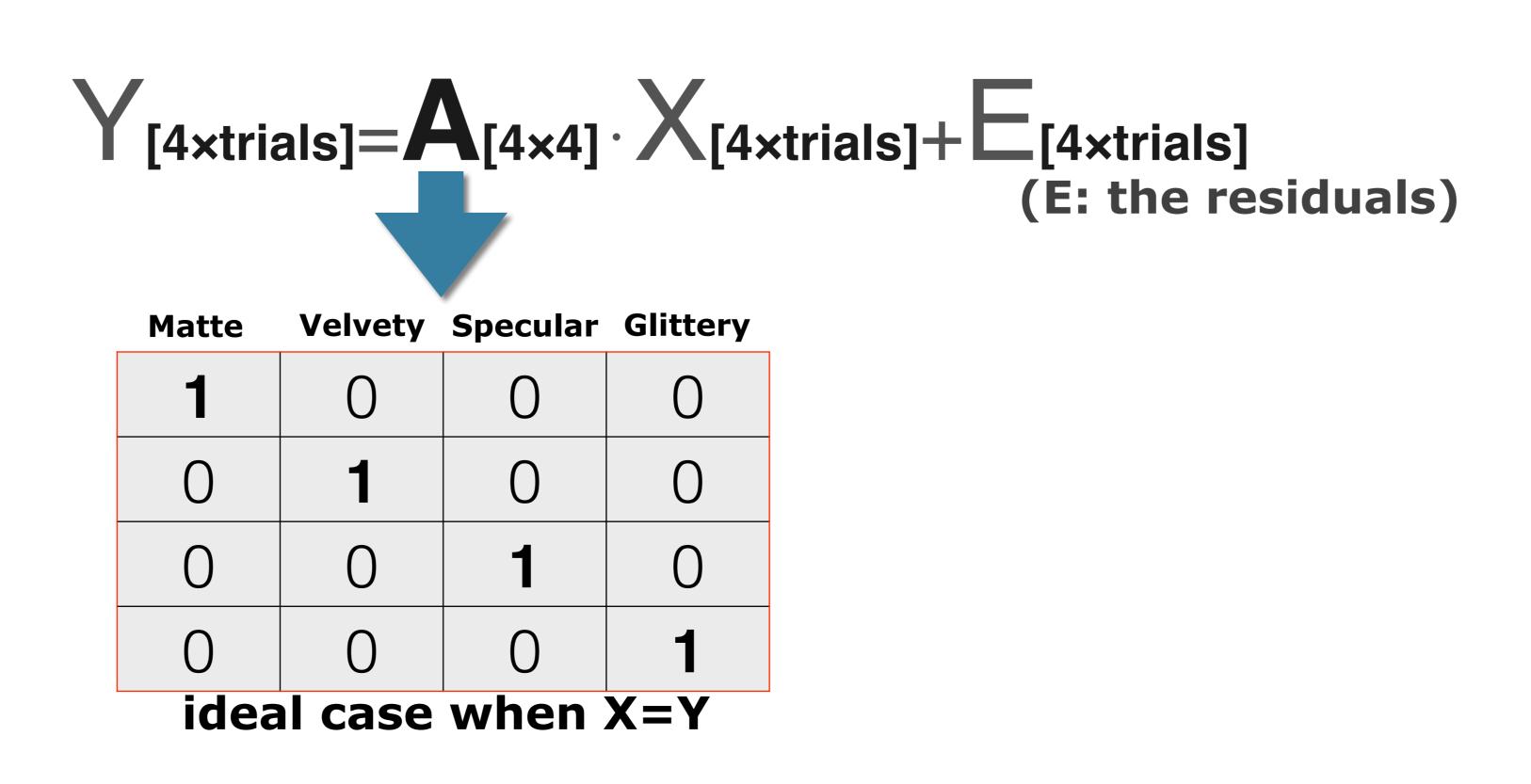
We tested the probe for stimuli consisting of 5 sets of optical mixtures, namely:

- The original set (office light)
- A set for a different view point (quite direct light)
- Systematical variation of the lighting on material perception (ambient, focus & brilliance light)

# **Experiments Glittery** office light experiment 2 quite direct light ambient light focus light brilliance light Basis images for optical mixing

### Analysis

Considering stimuli as input X and probing results as output Y, their linear relation (Matrix A) was solved by least-square solution per lighting condition.





Linear factor matrices A

0.15 **0.84** -0.07 0.20

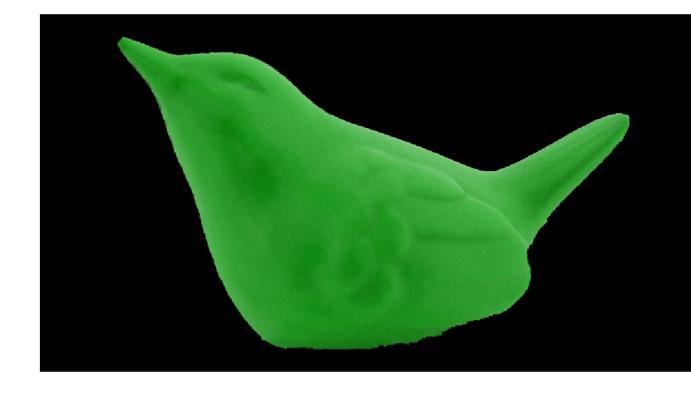
0.24 | 0.13 | **1.17** | 0.00

0.02 | 0.09 | 0.01 | **1.17** 

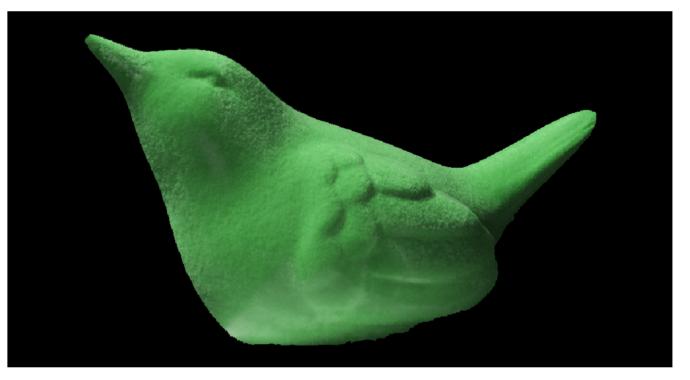
The diagonal values in the matrices A represent the perceptual relations between each material in the office light (the probe) and one of the 5 scenes (the stimuli).

The residuals in the matrices E represent how good the solved linear factor matrices A fit into the linear equation. On average, the residuals were less than 0.1.

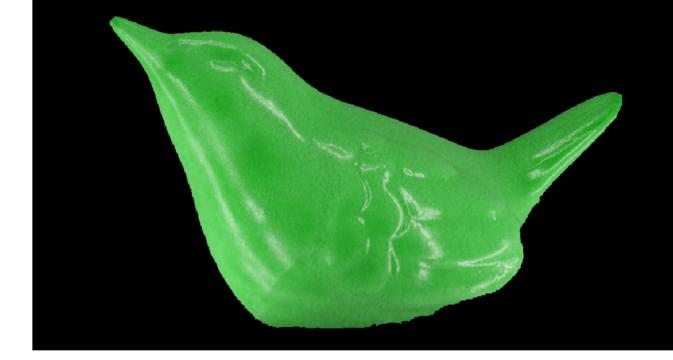
#### **Examples**



Half velvety and half specular mixture in ambient light appears to match matte in office light.



Half velvety and half specular mixture in focus light appears to match velvety in office light.



Half velvety and half specular mixture in brilliance light appears to match specular in office light.

#### Conclusions

- Inexperienced observers are able to handle MatMix 1.0 well and match on the basis of perceived material qualities.
- Due to complex material-lighting interactions, perceived material qualities will depend on both lighting and materials.

#### Acknowledgements

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