MANCHESTER 1824
The University of Manchester

COMP37111: Advanced Computer Graphics

Workshop 6 : The Rendering Equation and BRDF

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Breakout 1

Task 1: Rendering equation components

Take turns to use this wheel of fortune[1] to pick a question to answer (nominate one person to host the wheel and spin it on behalf of the group). Don't worry if you're unsure what the answer is, just get help from the rest of the group. If you're not sure as a group if the answer is right or wrong, make a note of it so you can get help when you rejoin the main room.

$$\underbrace{L_o(\mathbf{x}, \boldsymbol{\omega}, \lambda, t)}_{\text{(a)}} = \underbrace{L_e(\mathbf{x}, \boldsymbol{\omega}, \lambda, t)}_{\text{(b)}} + \underbrace{\int_{\Omega}}_{\text{(f)}} \overbrace{f_r(\mathbf{x}, \boldsymbol{\omega}', \boldsymbol{\omega}, \lambda, t)}^{\text{(c)}} \underbrace{L_i(\mathbf{x}, \boldsymbol{\omega}', \lambda, t)}_{\text{(d)}} \overbrace{(-\boldsymbol{\omega}' \cdot \mathbf{n})}^{\text{(e)}} \underbrace{\delta\boldsymbol{\omega}'}_{\text{(f)}}$$

Figure 1: The rendering equation

With reference to Figure 1:

1. What does (a) represent?
2. What does (b) represent?
3. What is (c) called? (not what does it represent!)
4. What does (c) represent? (not what is it called!)
5. What does (d) represent?
6. What does (e) represent?
7. What do the two bits labelled (f) mean?
8. What's the relationship between (b) and (d)?
9. Who is the guy in Figure 2, and which term would he be interested in?
10. Why is it ω in (b) but ω' in (d)?
11. Why is it ω in (a) but $-\omega$ in (e)?
12. What does $\mathbf{x}$ represent?
13. What does t represent?
14. What does λ represent?
15. What shape does Ω represent?

Task 2: Cryptic questions

Discuss in your group:

[1] https://wheelofnames.com/kqg-zut

Figure 2: Some bloke, maybe wearing a wig?

1. Which artist is not in the pink after claiming $f_r(\mathbf{x}, \boldsymbol{\omega}', \boldsymbol{\omega}, \lambda, t) \approx 0$?
2. What's the difference between white and shiny?
3. What colour is a mirror? The colour reflect on the mirror
4. Why do mirrors reflect left and right, but not up and down? because each pixel on the mirror reflect it own position

Breakout 2

Task 3: What's that material?

Figure 3 shows the BRDFs of various materials taken from Park and Lee (2014); take it in turns to pick one, describe what the profile might mean in terms of specular and diffuse reflection, and come up with a real-world material that might have a similar BRDF.

Task 4: What's that BRDF?

Take it in turns to pick a material from Figure 4. Describe the material, and then try to describe what the shape of its BRDF might look like. If you get really good at doing this using words, try doing it just by mime.

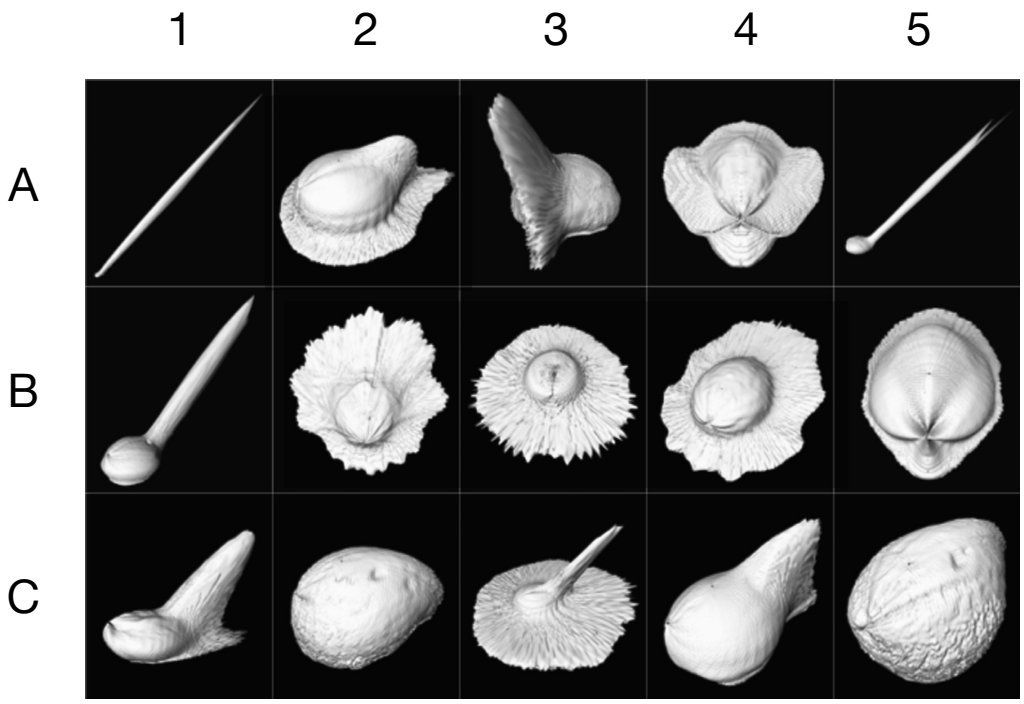

Figure 3: Various BRDFs represented as volume renderings.

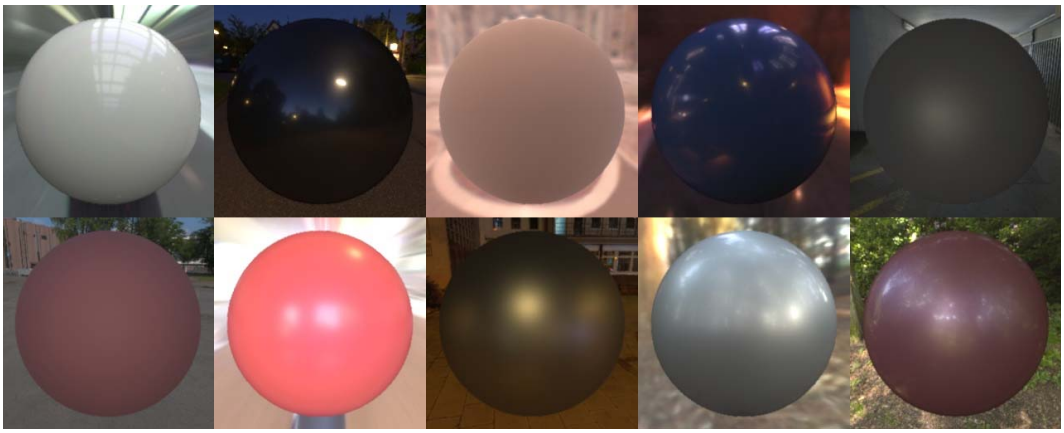

Figure 4: A miscellany of materials taken from Georgoulis et al. (2017).

References

Georgoulis, S. et al. (2017). "Material Classification under Natural Illumination Using Reflectance Maps". In: *2017 IEEE Winter Conference on Applications of Computer Vision (WACV)*, pp. 244–253. DOI: 10.1109/WACV.2017.34.

Park, Hyungjun and Joo-Haeng Lee (2014). "Adaptive B-spline volume representation of measured BRDF data for photorealistic rendering". In: *Journal of Computational Design and Engineering* 2.1, pp. 1–15. ISSN: 2288-5048. DOI: 10.1016/j.jcde.2014.11.001.