CSCI 0461A - Computer Graphics

Ray Tracing Wrap-Up & Discussion about Bias in Computer Graphics.
Goals for today.

- Identify the difference between ray casting, ray tracing, and path tracing.
- How to cast rays through refractive materials?
- What is subsurface scattering?
- Discussion about bias in computer graphics technologies.
- How to make computer graphics a welcoming environment for all.
## Ray Casting? Ray Tracing? Path Tracing?

<table>
<thead>
<tr>
<th>name</th>
<th>what it does</th>
<th>lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ray Caster</td>
<td>camera rays only</td>
<td>direct</td>
</tr>
<tr>
<td>Ray Tracer</td>
<td>camera rays + deterministic secondary rays</td>
<td>direct</td>
</tr>
<tr>
<td>Monte Carlo Ray Tracer</td>
<td>camera rays + multiple random secondary rays</td>
<td>indirect</td>
</tr>
<tr>
<td>Path Tracer</td>
<td>camera rays + single random secondary ray</td>
<td>indirect</td>
</tr>
</tbody>
</table>
For more on ray tracing, see the following books.
Translucent materials refract rays according to the ratio of refraction indices.

\[ \vec{r'} = (\eta_1/\eta_2) (\vec{v} - (\vec{v} \cdot \vec{n})\vec{n}) - \vec{n} \sqrt{1 - (\eta_1/\eta_2)^2 (1 - (\vec{v} \cdot \vec{n})^2)}. \]

- Stuff in square-root is negative? **Total Internal Reflection** (TIR) - return reflection ray.
- Rays may be entering or exiting the material.
Subsurface Scattering: light may also enter a material, scatter and exit at a different point.
Use Medical & Cosmetics Scales? Quarter-Circle?

- Skin: White (Type I, 0) & Dark (Type IV, 36)
- Hair: Straight (Type 1a), curly (Type 4c), kinky (Type VIII - l’Oréal)
- Problem: places white or straight hair at “center” or “origin.”

Paper Proposal: map types to quarter-circle? multi-dimensional? Pantone-based scale?

Countering Racial Bias in Computer Graphics Research

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Discussion questions.

- What is your perception of the representation of underrepresented groups in films and games?
  - Please consider reflecting on movies including "Brave", "Frozen", "Coco" and "Soul", as well as shorts such as "Out".
- What would you like to see from films or games to better reflect a commitment to diversity, equity and inclusion?
- What are your thoughts on Professor Kim’s presentation and proposal from the paper to map skin & hair types to a quarter-circle?

[ACM SIGGRAPH](https://www.siggraph.org/siggraph-365/diversity-equity-and-inclusion/)

- All members thrive
- All members are valued for their skills and ideas
- All members are enabled to tell their stories
Discussion Report.

- Watch rest of video: [https://www.youtube.com/watch?v=ROuE8xYLpX8](https://www.youtube.com/watch?v=ROuE8xYLpX8) (we paused at 20 minutes).
- Pick one paper to read:
  - Paper 2: *Sex and Gender in the Computer Graphics Research Literature* (Supplemental).
- Please complete the following Google Form, reflecting on the paper you chose, the remainder of the video and the discussion we had in class.
  - Form link: [https://forms.gle/jNse3ivXWyjwZbbZA](https://forms.gle/jNse3ivXWyjwZbbZA)
  - The form is anonymous, only upload a screenshot confirming your submission in Canvas.