Problem Set 3

16825 Learning for 3D Vision (Spring 2024)
https://piazza.com/cmu/spring2024/16825

OUT: Feb. 21, 2024
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1. **[10 pts]**

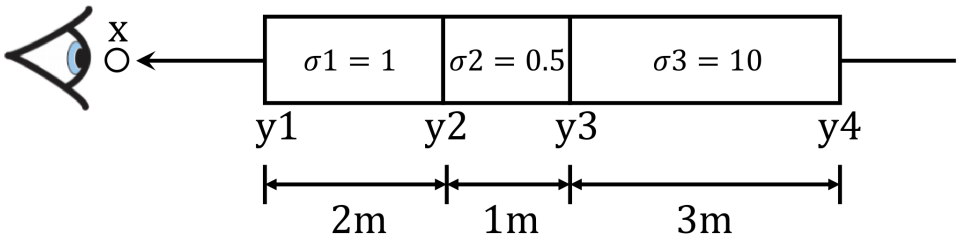

Figure 1: A ray through a non-homogeneous medium. The medium is composed of 3 segments ($y1y2$, $y2y3$, $y3y4$). Each segment has a different absorption coefficient, shown as $\sigma_1, \sigma_2, \sigma_3$ in the figure. The length of each segment is also annotated in the figure (1m means 1 meter).

As shown in Figure 1, we observe a ray going through a non-homogeneous medium. Please compute the following transmittance:

- $T(y1, y2)$
- $T(y2, y4)$
- $T(x, y4)$
- $T(x, y3)$

Solution

T(x, x_{t_i}) = $T(x, x_{t_{i-1}}) \cdot e^{-\sigma_{t_{i-1}} \cdot \Delta t_{i-1}}$
T(y1, y2) = $e^{-2} = 0.135$
T(y2, y4) = T(y2, y3) $\cdot T(y3, y4) = e^{-0.5} \cdot e^{-30}$ =5.6756852e-14
T(x, y4) = T(x, y1) $\cdot T(y1, y2) \cdot T(y2, y3) \cdot T(y3, y4) = e^{0} \cdot e^{-2} \cdot e^{-0.5} \cdot e^{-30}$ =7.6812047e-15
T(x, y3) = $e^{0} \cdot e^{-2} \cdot e^{-0.5} = 0.082$