Problem Set 3

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

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OUT: Feb. 21, 2024
DUE: Mar. 13, 2024 11:59 PM
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1. **[10 pts]**

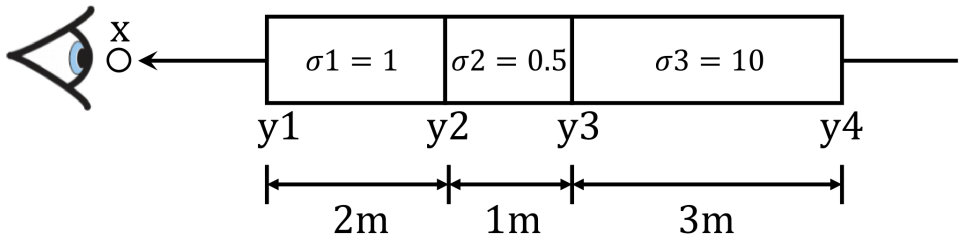

Figure 1: A ray through a non-homogeneous medium. The medium is composed of 3 segments ($y1y2$, $y2y3$, $y3y4$). Each segment has a different absorption coefficient, shown as $\sigma_1, \sigma_2, \sigma_3$ in the figure. The length of each segment is also annotated in the figure (1m means 1 meter).

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

- $T(y1, y2) = e^{-\sigma_1 \cdot 2} = e^{-1 \cdot 2} = e^{-2}$
- $T(y2, y4) = e^{-\sigma_2 \cdot 1} \cdot e^{-\sigma_3 \cdot 3} = e^{-0.5 \cdot 1} \cdot e^{-10 \cdot 3} = e^{-30.5}$
- $T(x, y4) = e^{-\sigma_1 \cdot 2} \cdot e^{-\sigma_2 \cdot 1} \cdot e^{-\sigma_3 \cdot 3} = e^{-1 \cdot 2} \cdot e^{-0.5 \cdot 1} \cdot e^{-10 \cdot 3} = e^{-32.5}$
- $T(x, y3) = e^{-\sigma_1 \cdot 2} \cdot e^{-\sigma_2 \cdot 1} = e^{-1 \cdot 2} \cdot e^{-0.5 \cdot 1} = e^{-2.5}$