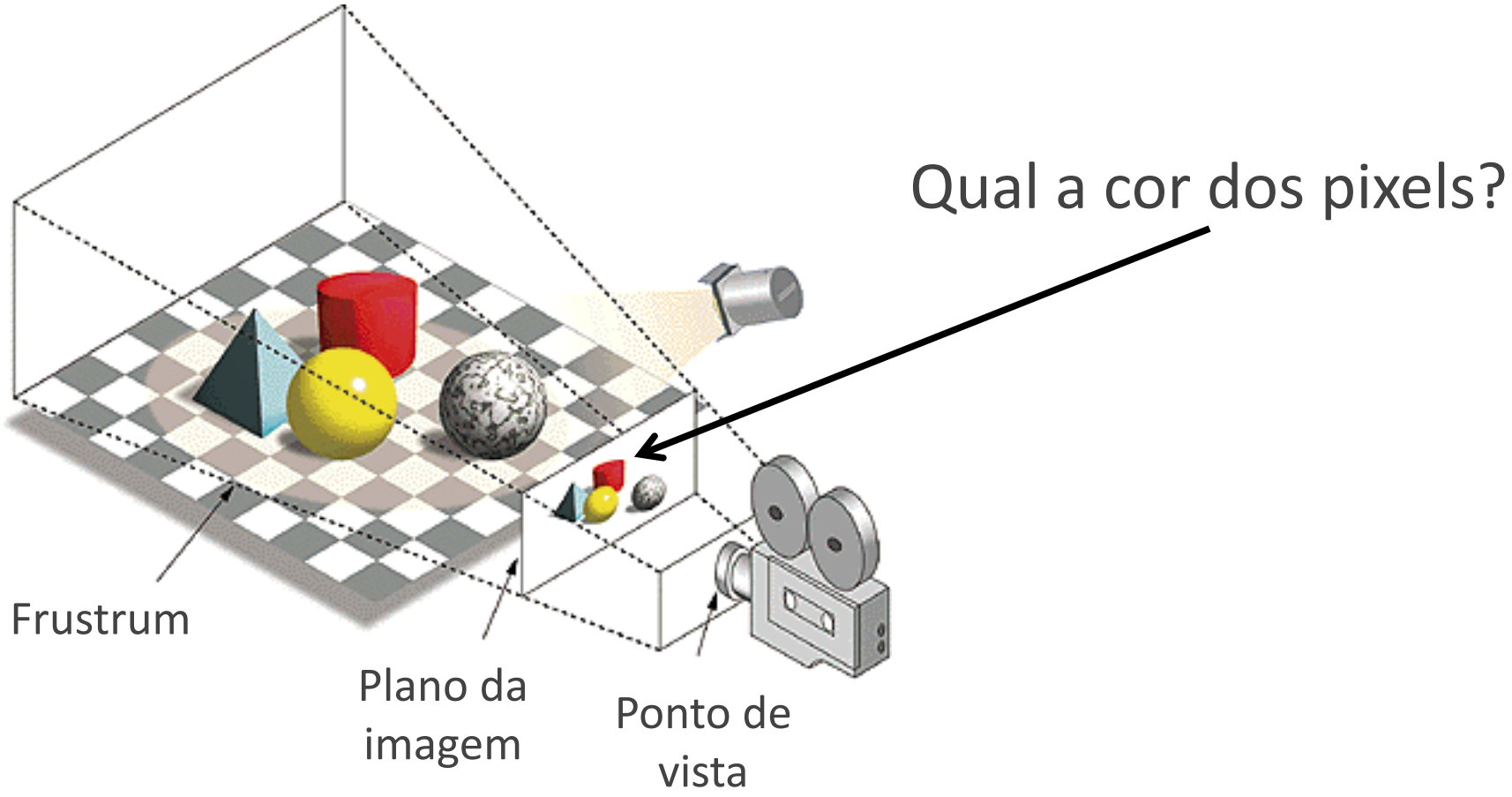
Universidade Federal de Alagoas
Instituto de Matemática

Iluminação Local

Prof. Thales Vieira

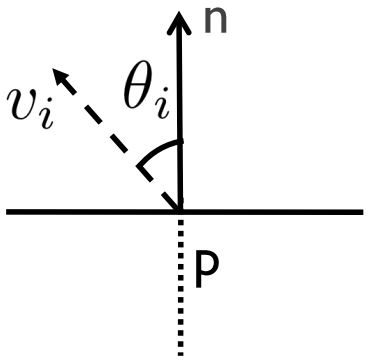
Motivação


Qual a cor dos pixels?
Frustrum
Plano da imagem
Ponto de vista

Problema de iluminação

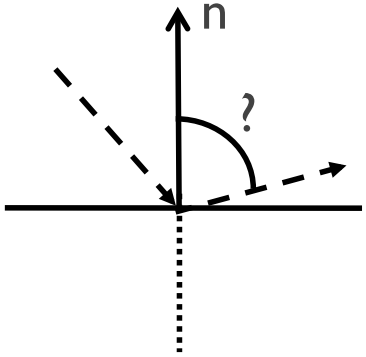
"Dado um ponto $p \in S$ numa superfície $S \subset \mathbb{R}^3$, fontes de luz $\mathcal{L}_i$ e um observador num ponto $\mathcal{O}$, determinar a energia luminosa $\mathcal{I}$, proveniente do ponto p, que é percebida pelo observador."

Interação Luz-Superfície

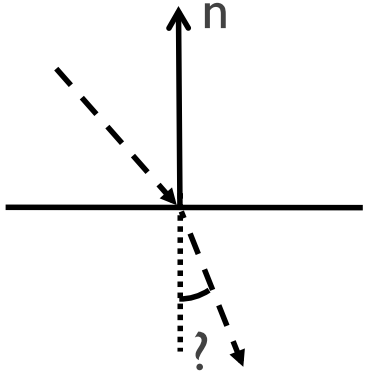


Energia Incidente =

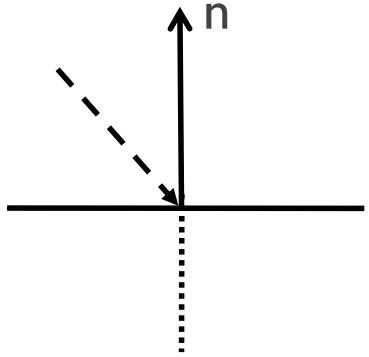
Refletida +



Transmitida +

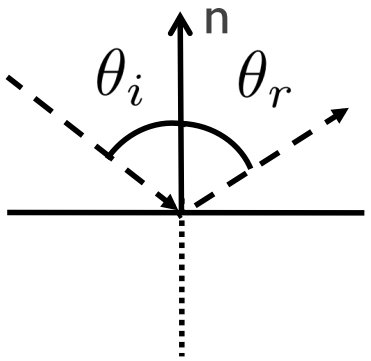


Absorvida



Geometria das superfícies

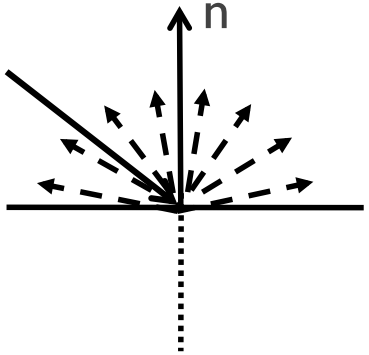
- Refletor especular perfeito



Suave

$$\theta_i = \theta_r$$

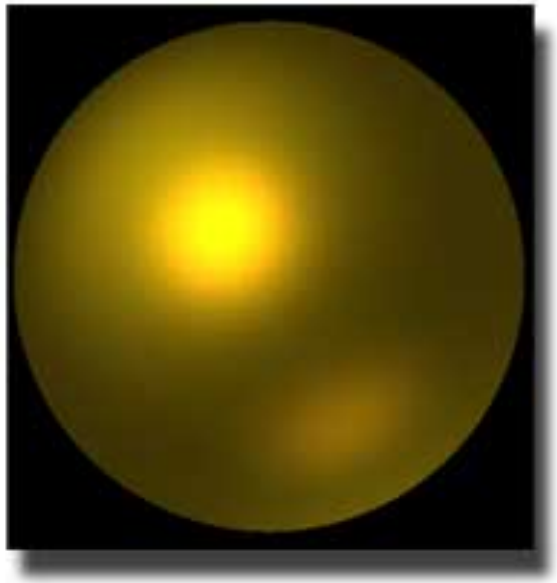
- Difusor perfeito



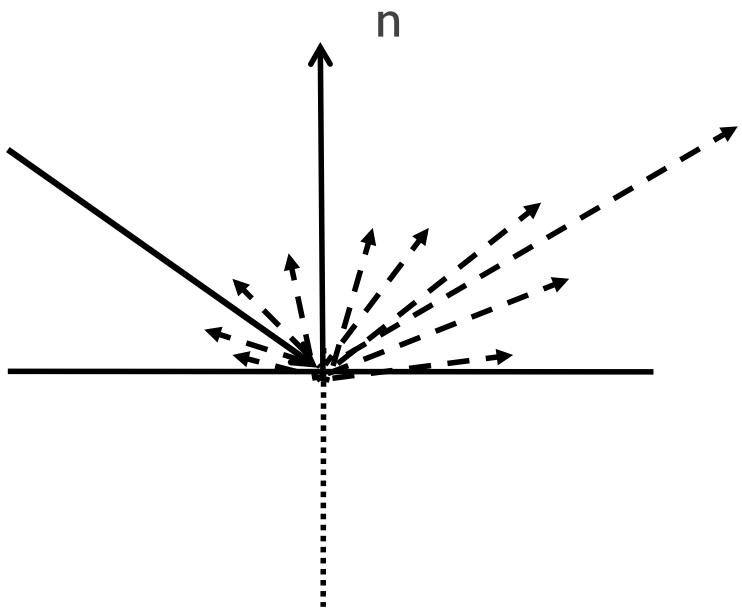
Rugosa

Reflexão especular-difusa

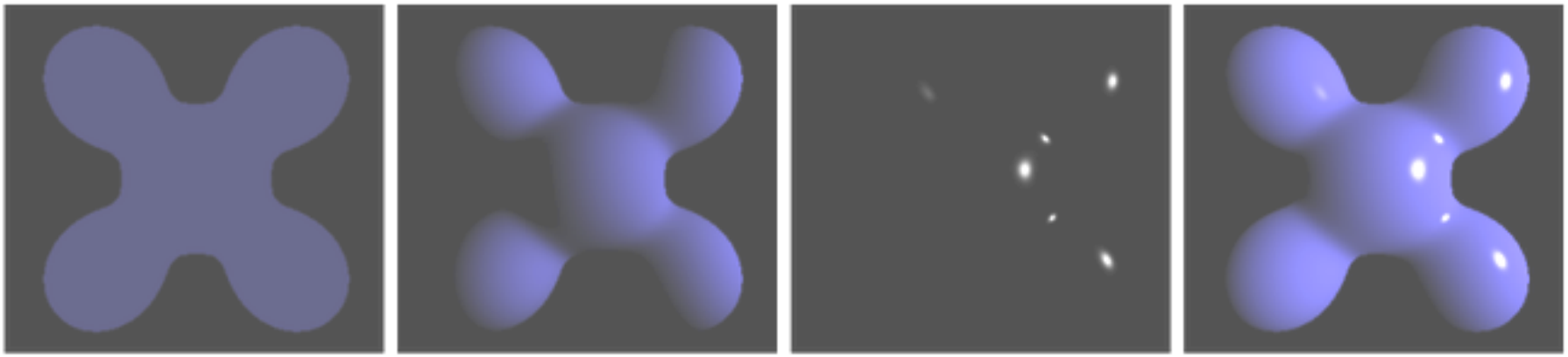
- Reflexão especular-difusa



Highlight



Modelo de Phong



Reflexão Ambiente + Reflexão Difusa + Reflexão Especular-Difusa = Reflexão de Phong

Luz Ambiente

Intensidade da luz ambiente

$$I_a \in [0, 1]$$

Coeficiente de reflexão ambiente

$$k_a \in [0, 1]$$

Reflexão ambiente: $I_a k_a$

Reflexão Difusa

Lei dos cossenos de Lambert:

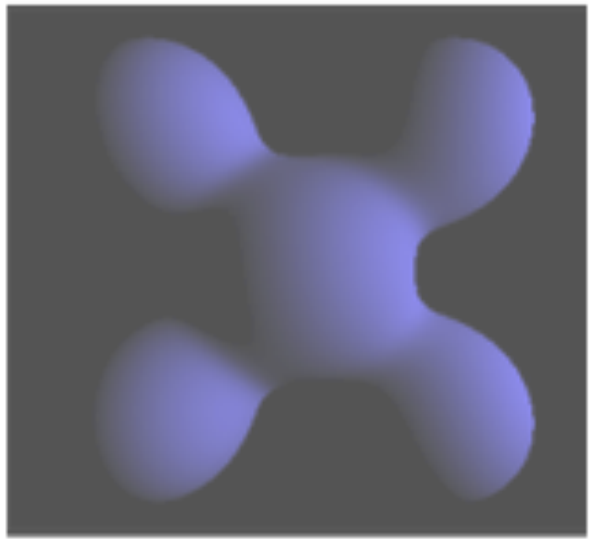
Se o raio incidente tem intensidade I_i *, então a intensidade da reflexão difusa é dada por* $I_d = I_i \cos(\theta_i) = I_i < v_i, n > .$

Coeficiente de reflexão difusa

$$k_d \in [0, 1]$$

Reflexão difusa:

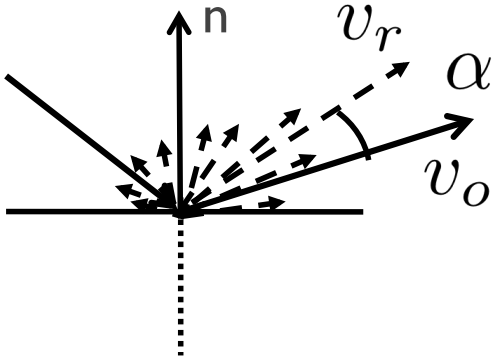
$$k_d I_d = k_d I_i < v_i, n >$$



Reflexão Especular-Difusa

Coeficiente de reflexão especular

$$k_s \in [0, 1]$$



Reflexão especular-difusa:

$$I_i k_s < v_r, v_o >^e$$

Juntando tudo…

$$I_r = I_a k_a + I_i k_d < v_i, n > + I_i k_s < v_r, v_o >^e$$

Juntando tudo com n luzes...

$$I_r = I_a k_a + I_i k_d < v_i, n > + I_i k_s < v_r, v_o >^e$$

$$I_r = I_a k_a + k_d \sum_{i=1}^{n} I_i < v_i, n > + k_s \sum_{i=1}^{n} I_i < v_r, v_o >^e$$

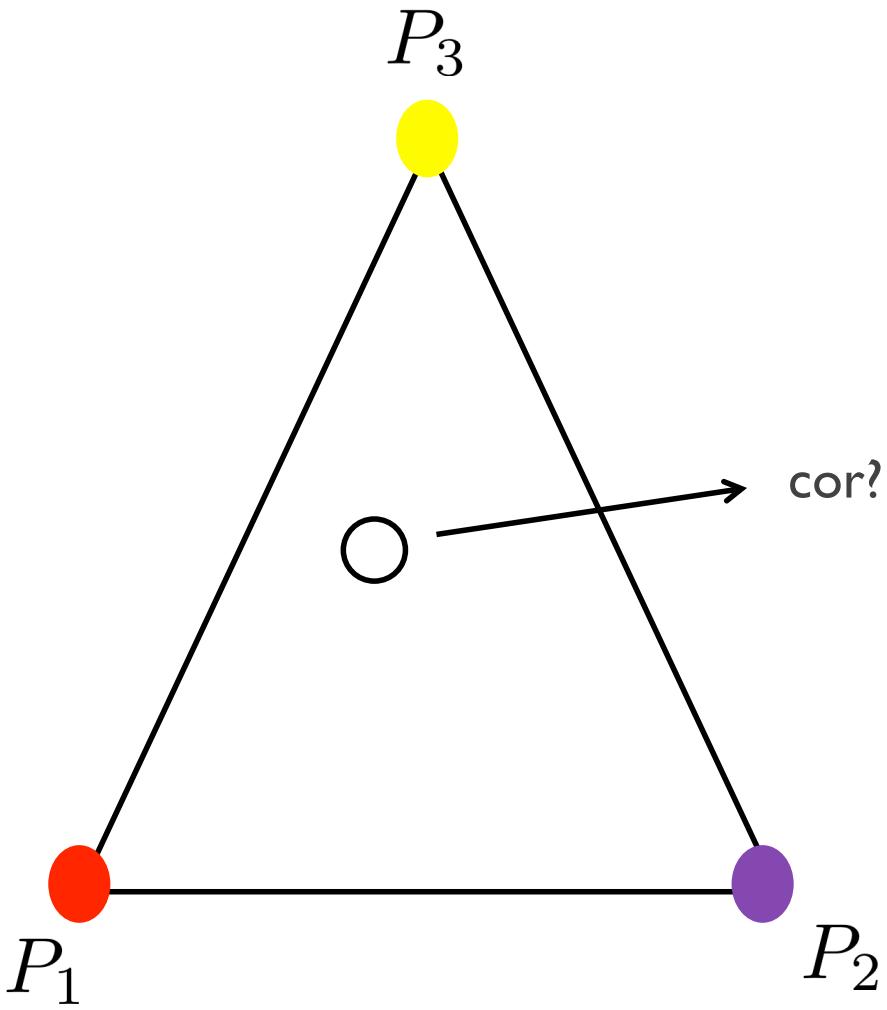
Juntando tudo com n luzes e atenuação…

$$I_r = I_a k_a + I_i k_d < v_i, n > + I_i k_s < v_r, v_o >^e$$

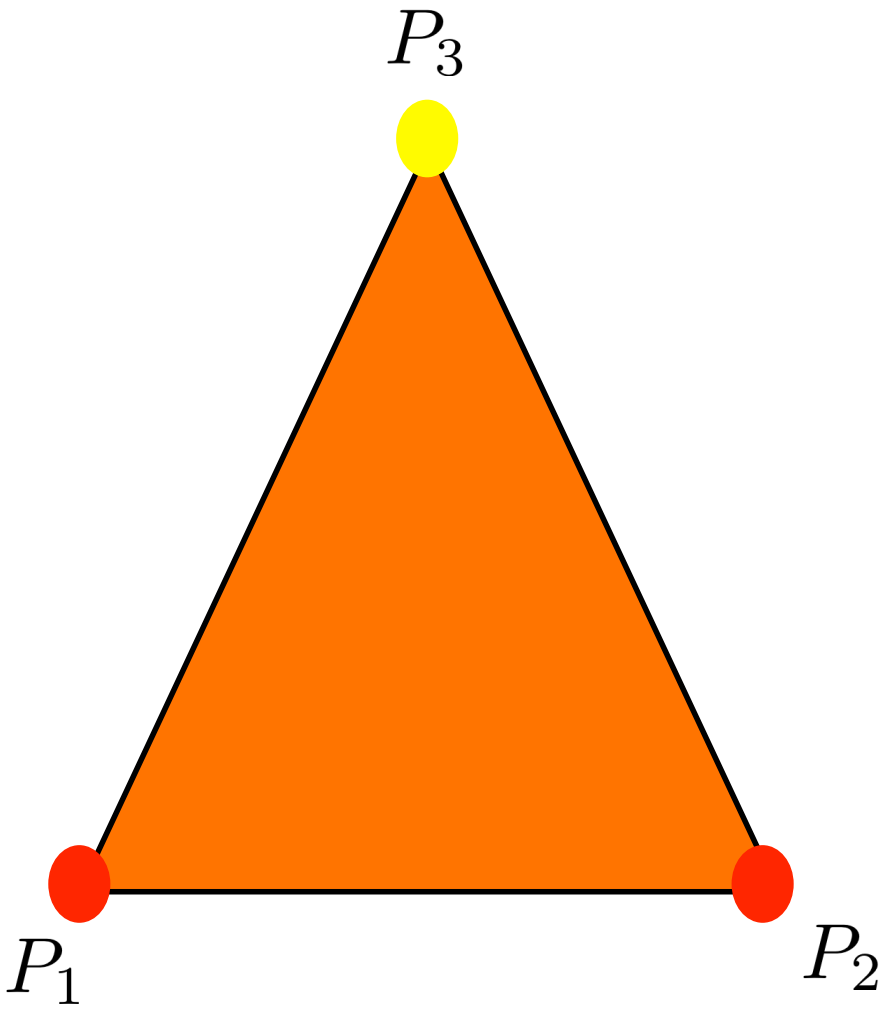
$$I_r = I_a k_a + k_d \sum_{i=1}^{n} I_i < v_i, n > + k_s \sum_{i=1}^{n} I_i < v_r, v_o >^e$$

$$I_r = I_a k_a + k_d \sum_{i=1}^{n} f_i I_i < v_i, n > + k_s \sum_{i=1}^{n} f_i I_i < v_r, v_o >^e$$

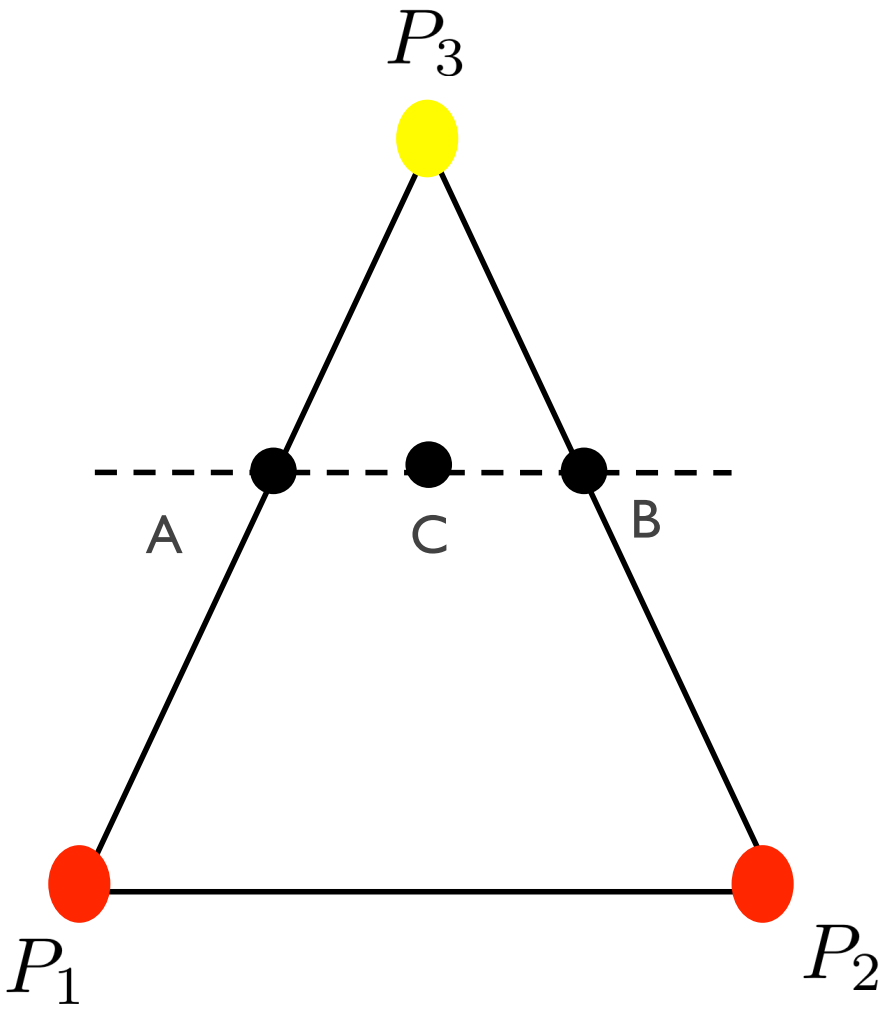
Colorização



Colorização constante



Colorização de Gouraud



Colorização de Phong