Abgabe - Übungsblatt [7]

Einführung in die Computergraphik und Visualisierung

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First Exercise

$S_{ABC} = \frac{1}{2}||(BA) \times (AC)|| = \frac{1}{2}||(0,4) \times (2,-4)|| = 4$

$S_{APB} = \frac{1}{2}||(PA) \times (AB)|| = \frac{1}{2}||(0.5,-2) \times (0,-4)|| = 1$

$S_{APC} = \frac{1}{2}||(PA) \times (AC)|| = \frac{1}{2}||(0.5,-2) \times (2,-4)|| = 1$

$S_{BPC} = \frac{1}{2}||(PB) \times (BC)|| = \frac{1}{2}||(0.5,-2) \times (2,0)|| = 2$

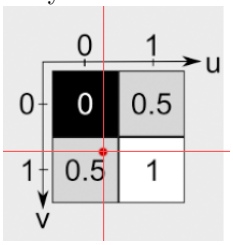
$P_{barycentric} = (\frac{S_{BPC}}{S_{ABC}}, \frac{S_{APC}}{S_{ABC}}, \frac{S_{APB}}{S_{ABC}}) = (\frac{1}{2}, \frac{1}{4}, \frac{1}{4})$

$P_{UV} = A_{bar} \cdot A_{UV} + B_{bar} \cdot B_{UV} + C_{bar} \cdot C_{UV} = \frac{1}{2}(0,0.5) + \frac{1}{4}(0.2,0.8) + \frac{1}{4}(0.6,0.7) = (0,0.25) + (0.05,0.2) + (0.15,0.175) = (0.2,0.625)$

Second Exercise

Nearest neighbor filering:

$P_{UV} = (0.2, 0.625)$
Gray value 0.5 is assigned.



Third Exercise

Bilinear filtering:

$\alpha = x - i$
$\beta = y - i$
$U_{\alpha,j} = (1-\alpha)U_{i,j} + \alpha U_{i+1,j}$
$U_{\alpha,j+1} = (1-\alpha)U_{i,j+1} + \alpha U_{i+1,j+1}$
$I(x,y) = U_{\alpha\beta} = (1-\beta)U_{\alpha,j} + \beta U_{\alpha,j+1}$

$P_{UV} = (0.2, 0.625) \Rightarrow \alpha = 0.2, \beta = 0.625$
$i = 0, j = 0 \Rightarrow \alpha = x = 0.2, \beta = y = 0.625$

$U_{\alpha,0} = (1-\alpha)U_{0,0} + \alpha U_{1,0} = (1-0.2)\cdot 0 + 0.2 \cdot 0.5 = 0.1$
$U_{\alpha,1} = (1-\alpha)U_{0,1} + \alpha U_{1,1} = (1-0.2)\cdot 0.5 + 0.2 \cdot 1 = 0.6$
$I(x,y) = U_{\alpha\beta} = (1-\beta)U_{\alpha,0} + \beta U_{\alpha,1} = (1-0.625)\cdot 0.1 + 0.625 \cdot 0.6 = 0.375 \cdot 0.1 + 0.375 = 0.4125$

Gray value 0.4125 is assigned