Shaheer Aslam

2021587

SSIM between two simple gray scale images

Image A with pixel values

100	150
120	130

Image B with pixel values

102	148
118	132

Constants:

Stability constants $K_1 = 0.01$

$K_2 = 0.03$

The dynamic range L for 8 bit grayscale images is 255

Calculate C_1 and C_2 using:

$$C_1 = (K_1 \times L)^2 \text{ and } C_2 = (K_2 \times L)^2$$

assuming

$C_1 = (0.01 \times 255)^2 \Rightarrow 6.5025$

$C_2 = (0.03 \times 255)^2 \Rightarrow 58.5225$

① Mean (μ)

$$\mu_A = \frac{100 + 150 + 120 + 130}{4} = 125$$

$$\mu_B = \frac{102 + 148 + 118 + 132}{4} = 125$$

② Variance (σ^2)

$$\sigma_A^2 = \frac{(100-125)^2 + (150-125)^2 + (120-125)^2 + (130-125)^2}{4}$$

$$= 325$$

$$\sigma_B^2 = \frac{(100-125)^2 + (150-125)^2 + (120-125)^2 + (130-125)^2}{4}$$

$$= 325$$

③ Covariance (σ_{AB})

$$\sigma_{AB} = (100-125)(102-125) + (150-125)(148-125) + (120-125) \cdot (118-125) + (130-125)(132-125)$$

$$= 325$$

④ SSIM Calculation

$$SSIM(A,B) = \frac{(2\times 125 \times 125 + C_1)(2\times 325 + C_2)}{(125^2 + 125^2 + C_1)(325 + 325 + C_2)}$$

$$= \frac{(31250 + 6.5025)(650 + 58.5225)}{(15625 + 15625 + 6.5025)(650 + 650 + 58.5)}$$

$$= \frac{31256.5025 \times 708.5225}{31256.5025 \times 1358.5225}$$

$$= \frac{22150345.889675}{42451.8740125}$$

$$= 0.521372911$$