Robust Image Matching with Line Context - Appendix

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Bin Weights Calculation

Let $(\alpha', \beta'/2, \log r')$ be the coordinate of sample point p. The distance to its neighbor bin in α direction is $|\alpha' - \alpha_1|$. To calculate the weights for the other three bins, we first define an exponential function f as follows,

$$f(d,l) = \exp(-\frac{d}{l}) \tag{1}$$

function $f(d,l)$ represents the relative weight assigning to the bin at distance d with reference distance l. The reference distance is the distance between two neighboring bins in each corresponding direction. For directions α and β, the distances are calculated as,

$$\begin{aligned}
d_{\alpha_i} &= \min(\ |\alpha' - \alpha_i|,\ 360 - |\alpha' - \alpha_i|\ ), \quad i = 0,1 \\
d_{\beta_i} &= \min(\ |\beta' - \beta_i|,\ 360 - |\beta' - \beta_i|\ )/2, \quad i = 0,1 \\
l_\alpha &= \min(\ |\alpha_0 - \alpha_1|,\ 360 - |\alpha_0 - \alpha_1|\ ) \\
l_\beta &= \min(\ |\beta_0 - \beta_1|,\ 360 - |\beta_0 - \beta_1|\ )/2
\end{aligned}$$

Therefore, the weights voted to the neighbor bins in α and β directions are,

$$W_\alpha(\sigma) = \frac{f(d_{\alpha_1}, l_\alpha)}{f(d_{\alpha_0}, l_\alpha)} \cdot W_0(\sigma) = f(d_{\alpha_1} - d_{\alpha_0}, l_\alpha) \cdot W_0(\sigma) \tag{2}$$

$$W_\beta(\sigma) = \frac{f(d_{\beta_1}, l_\beta)}{f(d_{\beta_0}, l_\beta)} \cdot W_0(\sigma) = f(d_{\beta_1} - d_{\beta_0}, l_\beta) \cdot W_0(\sigma) \tag{3}$$

Let B_i denotes the space covered by innermost bins and B_o denote the space covered by outermost bins. The weight assigned to the neighboring bin in r direction is,

$$W_r(\sigma) = \begin{cases} 0 & \text{if } p \in B_i \ \& \ |\log r_1 - \log r'| > l_{\log r} \\ 0 & \text{if } p \in B_o \ \& \ |\log r_1 - \log r'| > l_{\log r} \\ f(d_{\log r}, l_{\log r}) \cdot W_0(\sigma) & \text{otherwise} \end{cases} \tag{4}$$

where $d_{\log r} = |\log r_1 - \log r'| - |\log r_0 - \log r'|$ and $l_{\log r} = |\log r_1 - \log r_0|$.