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 \(\alpha\) direction is \(|\alpha' - \alpha_1|\). To calculate the weights for the other three bins, we first define an exponential function \(f\) as follows,

\[
f(d, l) = \exp\left(-\frac{d}{l}\right) \tag{1}\]

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 \(\alpha\) and \(\beta\), the distances are calculated as,

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

Therefore, the weights voted to the neighbor bins in \(\alpha\) and \(\beta\) directions are,

\[
\begin{align*}
W_\alpha(\sigma) &= \frac{f(d_{\alpha_1}, l_\alpha)}{f(d_{\alpha_0}, l_\alpha)} \cdot W_0(\sigma) = f(d_{\alpha_1} - d_{\alpha_0}, l_\alpha) \cdot W_0(\sigma) \\
W_\beta(\sigma) &= \frac{f(d_{\beta_1}, l_\beta)}{f(d_{\beta_0}, l_\beta)} \cdot W_0(\sigma) = f(d_{\beta_1} - d_{\beta_0}, l_\beta) \cdot W_0(\sigma)
\end{align*} \tag{2, 3}\]

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,

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

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