Appendix

This section proves the expression about $w^{(i,j)}$ which is used in priori model of occlusion. $w^{(i,j)}$ represents the conditional probability of part $v^j$ being shaded given the fact that $v^i$ is shaded.

![Diagram of calculating $w^{(i,j)}$.](image)

**Proof:**

We assume that $c_o < d_{(i,j)} < 2c_o$, $c_o$ is the radius of the circular occlusion, and the diagram is provided in Figure 1. For simpleness, let $c = c_o$, $m = d_{(i,j)}$. The brown circular is the occlusion circular, where $v^i$ is located at point D, with a probability of $2\pi r \Delta r / \pi c^2$. Only when part $v^j$ is located at Curve $\hat{AE}$, the two parts will be shaded together, and this probability is $\text{length of } \hat{AE} / 2\pi m$, where $\text{length of } \hat{AE}$ can be approximated by $2\sqrt{(c + r)^2 - m^2}$. So we have

\[
\begin{align*}
\int_{m-c}^{c} \frac{(2\pi r / \pi c^2) \cdot (2\sqrt{(c + r)^2 - m^2} / 2\pi m) dr}{c^2 \pi m} &= \left[ 2 \int_{m-c}^{c} r \sqrt{(c + r)^2 - m^2} dr / c^2 \pi m \right] \\
&= 2 \left( \int_{m-c}^{c} (r + c) \sqrt{(c + r)^2 - m^2} d(r + c) - c \int_{m-c}^{c} \sqrt{(c + r)^2 - m^2} d(r + c) \right) / c^2 \pi m \\
&= 2 \left( 0.5 \int_{m-c}^{c} \sqrt{(c + r)^2 - m^2} (r + c)^2 - c \int_{m-c}^{c} \sqrt{(c + r)^2 - m^2} d(r + c) \right) / c^2 \pi m \\
&= 2 \left( \left[ (c + r)^2 - m^2 \right]^{1.5} / 3 \right)_{m-c}^{c} -c \left[ (r + c) \sqrt{(c + r)^2 - m^2} - m^2 \log \left( (r + c) + \sqrt{(c + r)^2 - m^2} \right) \right]_{m-c}^{c} / c^2 \pi m \\
&= 2 \left( 4c^2 - m^2 \right)^{1.5} / 3c^2 \pi m - 2\sqrt{4c^2 - m^2} / \pi m + m \left[ \log((2c + \sqrt{4c^2 - m^2})/m) \right] / c\pi. \quad (1)
\end{align*}
\]