The reader may notice that this expression is the inverse of our normalization constant \( \eta^{[k]} \) in (13.27). Further transformations give us the following form:

\[
\begin{align*}
(13.52) \quad w_t^{[k]} &= \eta \int p(z_t | x_t^{[k]}, u_{1:t}, z_{1:t-1}, c_{1:t}) \\
&= \eta \int p(x_t | x_{1:t-1}^{[k]}, u_{1:t}, z_{1:t-1}, c_{1:t}) \ dx_t \\
&= \int \int p(z_t | m_{ct}, x_t, x_{1:t-1}^{[k]}, u_{1:t}, z_{1:t-1}, c_{1:t}) \\
&= \eta \int \int \int p(x_t | x_{1:t-1}^{[k]}, u_{1:t}, z_{1:t-1}, c_{1:t}) \ dx_t \\
&= \eta \int \int \int \int p(x_t | m_{ct}, x_t, c_t) \ dx_t
\end{align*}
\]

We find that this expression can once again be approximated by a Gaussian over measurements \( z_t \) by linearizing \( h \). As it is easily shown, the mean of the resulting Gaussian is \( \tilde{z}_t \), and its covariance is

\[
(13.53) \quad L_t^{[k]} = H^T_t Q_t H_t + H_m \Sigma_{ct, t-1} H_m^T + R_t
\]

Put differently, the (non-normalized) importance factor of the \( k \)-th particle is given by the following expression:

\[
(13.54) \quad w_t^{[k]} = |2\pi L_t^{[k]}|^{-\frac{1}{2}} \exp \left\{ -\frac{1}{2} \left( z_t - \tilde{z}_t \right) L_t^{[k]-1} \left( z_t - \tilde{z}_t \right) \right\}
\]

As in FastSLAM 1.0, particles generated in Steps 1 and 2, along with their importance factor calculated in Step 3, are collected in a temporary particle set.