To determine the importance factor, it will prove useful to calculate the actual proposal distribution of the path particles in the temporary set. Under the assumption that the set of path particles in $Y_{t-1}$ is distributed according to $p(x_{1:t-1} \mid z_{1:t-1}, u_{1:t-1}, c_{1:t-1})$ (which is an asymptotically correct approximation), path particles in the temporary set are distributed according to:

$$p([x_{1:t}^k]_{1:t-1} \mid z_{1:t-1}, u_{1:t}, c_{1:t-1}) = p(x_{t}^k \mid x_{t-1}^k, u_t) \ p(x_{1:t-1}^k \mid z_{1:t-1}, u_{1:t-1}, c_{1:t-1})$$  \hspace{1cm} (13.19)$$

The factor $p(x_{t}^k \mid x_{t-1}^k, u_t)$ is the sampling distribution used in Equation (13.12).

The target distribution takes into account the measurement at time $z_t$, along with the correspondence $c_t$:

$$p(x_{1:t}^k \mid z_{1:t}, u_{1:t}, c_{1:t})$$

$$p(x_{1:t}^k \mid z_{1:t}, u_{1:t}, c_{1:t})$$  \hspace{1cm} (13.20)$$

The resampling process accounts for the difference of the target and the proposal distribution. As usual, the importance factor for resampling is