Algorithm FastSLAM 1.0_known_correspondence(z_t, c_t, u_t, Y_{t-1}):

for $k = 1$ *to* M *do* // *loop over all particles*
  retrieve $\left\langle x_{t-1}^{[k]}, \left\langle \mu_{1,t-1}^{[k]}, \Sigma_{1,t-1}^{[k]} \right\rangle, \ldots, \left\langle \mu_{N,t-1}^{[k]}, \Sigma_{N,t-1}^{[k]} \right\rangle \right\rangle$ *from* Y_{t-1}

  $x_t^{[k]} \sim p(x_t \mid x_{t-1}^{[k]}, u_t)$ // *sample pose*

  $j = c_t$ // *observed feature*
  if feature j *never seen before*
    $\mu_{j,t}^{[k]} = h^{-1}(z_t, x_t^{[k]})$ // *initialize mean*
    $H = h'(x_t^{[k]}, \mu_{j,t}^{[k]})$ // *calculate Jacobian*
    $\Sigma_{j,t}^{[k]} = H^{-1} Q_t (H^{-1})^T$ // *initialize covariance*
    $w^{[k]} = p_0$ // *default importance weight*
  else
    $\hat{z} = h(\mu_{j,t-1}^{[k]}, x_t^{[k]})$ // *measurement prediction*
    $H = h'(x_t^{[k]}, \mu_{j,t-1}^{[k]})$ // *calculate Jacobian*
    $Q = H \Sigma_{j,t-1}^{[k]} H^T + Q_t$ // *measurement covariance*
    $K = \Sigma_{j,t-1}^{[k]} H^T Q^{-1}$ // *calculate Kalman gain*
    $\mu_{j,t}^{[k]} = \mu_{j,t-1}^{[k]} + K(z_t - \hat{z})$ // *update mean*
    $\Sigma_{j,t}^{[k]} = (I - K H)\Sigma_{j,t-1}^{[k]}$ // *update covariance*
    $w^{[k]} = |2\pi Q|^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}(z_t - \hat{z}_n)^T Q^{-1} (z_t - \hat{z}_n)\right\}$ // *importance factor*
  endif
  for all other features $j' \neq j$ *do* // *unobserved features*
    $\mu_{j',t}^{[k]} = \mu_{j',t-1}^{[k]}$ // *leave unchanged*
    $\Sigma_{j',t}^{[k]} = \Sigma_{j',t-1}^{[k]}$
  endfor
endfor

$Y_t = \emptyset$ // *initialize new particle set*
do M *times* // *resample* M *particles*
  draw random k *with probability* $\propto w^{[k]}$ // *resample*
  add $\left\langle x_t^{[k]}, \left\langle \mu_{1,t}^{[k]}, \Sigma_{1,t}^{[k]} \right\rangle, \ldots, \left\langle \mu_N^{[k]}, \Sigma_N^{[k]} \right\rangle \right\rangle$ *to* Y_t
endfor

return Y_t

Table 13.1 FastSLAM 1.0 with known correspondence.