1: **Algorithm FastSLAM 2.0(z_t, u_t, Y_{t-1}):**
2: *for* $k = 1$ *to* M *do* // *loop over all particles*
3: *retrieve* $\left\langle x_{t-1}^{[k]}, N_{t-1}^{[k]}, \left\langle \mu_{1,t-1}^{[k]}, \Sigma_{1,t-1}^{[k]}, i_1^{[k]} \right\rangle, \ldots, \left\langle \mu_{N_{t-1}^{[k]},t-1}^{[k]}, \Sigma_{N_{t-1}^{[k]},t-1}^{[k]}, i_{N_{t-1}^{[k]}}^{[k]} \right\rangle \right\rangle$ *from* Y_{t-1}
4: *for* $j = 1$ *to* $N_{t-1}^{[k]}$ *do* // *calculate sampling distribution*
5: $\hat{x}_{j,t} = g(x_{t-1}^{[k]}, u_t)$ // *predict pose*
6: $\bar{z}_j = h(\mu_{j,t-1}^{[k]}, \hat{x}_{j,t})$ // *predict measurement*
7: $H_{x,j} = \nabla_{x_t} h(\mu_{j,t-1}^{[k]}, \hat{x}_{j,t})$ // *Jacobian wrt pose*
8: $H_{m,j} = \nabla_{m_j} h(\mu_{j,t-1}^{[k]}, \hat{x}_{j,t})$ // *Jacobian wrt map feature*
9: $Q_j = Q_t + H_{m,j} \Sigma_{j,t-1}^{[k]} H_{m,j}^T$ // *measurement information*
10: $\Sigma_{x,j} = \left[H_{x,j}^T Q_j^{-1} H_{x,j} + R_t^{-1} \right]^{-1}$ // *Cov of proposal distribution*
11: $\mu_{x_t,j} = \Sigma_{x,j} H_{x,j}^T Q_j^{-1} (z_t - \bar{z}_j) + \hat{x}_{j,t}$ // *mean of proposal distribution*
12: $x_{t,j}^{[k]} \sim \mathcal{N}(\mu_{x_t,j}, \Sigma_{x,j})$ // *sample pose*
13: $\hat{z}_j = h(\mu_{j,t-1}^{[k]}, x_t^{[k]})$ // *measurement prediction*
14: $\pi_j = |2\pi Q_j|^{-\frac{1}{2}} \exp\left\{ -\frac{1}{2} (z_t - \hat{z}_j)^T Q_j^{-1} (z_t - \hat{z}_j) \right\}$ // *correspondence likelihood*
15: *endfor*
16: $\pi_{1+N_{t-1}^{[k]}} = p_0$ // *likelihood of new feature*
17: $\hat{c} = \operatorname{argmax} \pi_j$ // *ML correspondence*
18: $N_t^{[k]} = \max\{N_{t-1}^{[k]}, \hat{c}\}$ // *new number of features*
19: *for* $j = 1$ *to* $N_t^{[k]}$ *do* // *update Kalman filters*
20: *if* $j = \hat{c} = 1 + N_{t-1}^{[k]}$ *then* // *is new feature?*
21: $x_t^{[k]} \sim p(x_t \mid x_{t-1}^{[k]}, u_t)$ // *sample pose*
22: $\mu_{j,t}^{[k]} = h^{-1}(z_t, x_t^{[k]})$ // *initialize mean*
23: $H_{m,j} = \nabla_{m_j} h(\mu_{j,t}^{[k]}, x_t^{[k]})$ // *Jacobian wrt map feature*
24: $\Sigma_{j,t}^{[k]} = (H_{m,j}^{-1})^T Q_t H_{m,j}^{-1}$ // *initialize covariance*
25: $i_{j,t}^{[k]} = 1$ // *initialize counter*
26: $w^{[k]} = p_0$ // *importance weight*
27: *else if* $j = \hat{c} \leq N_{t-1}^{[k]}$ *then* // *is observed feature?*
28: $x_t^{[k]} = x_{t,j}^{[k]}$
29: $K = \Sigma_{j,t-1}^{[k]} H_{m,j}^T Q_j^{-1}$ // *calculate Kalman gain*

see next page for continuation