Algorithm SEIF_sparsification(ξ_t, Ω_t, μ_t**):**

define F_{m_0}, F_{x,m_0}, F_x *as projection matrices*
from y_t *to* m_0, $\{x, m_0\}$, *and* x, *respectively*

$$\Omega_t^0 = F_{x,m^+,m^0}\ F^T_{x,m^+,m^0}\ \Omega_t\ F_{x,m^+,m^0}\ F^T_{x,m^+,m^0}$$

$$\begin{aligned}\tilde{\Omega}_t \ = \ & \Omega_t - \Omega_t^0\ F_{m_0}\ (F^T_{m_0}\ \Omega_t^0\ F_{m_0})^{-1}\ F^T_{m_0}\ \Omega_t^0 \\ & + \Omega_t^0\ F_{x,m_0}\ (F^T_{x,m_0}\ \Omega_t^0\ F_{x,m_0})^{-1}\ F^T_{x,m_0}\ \Omega_t^0 \\ & - \Omega_t\ F_x\ (F_x^T\ \Omega_t F_x)^{-1}\ F_x^T\ \Omega_t\end{aligned}$$

$$\tilde{\xi}_t \ = \ \xi_t \ + \ (\tilde{\Omega}_t \ - \ \Omega_t)\ \mu_t$$

return $\tilde{\xi}_t, \tilde{\Omega}_t$

Table 12.4 The sparsification step in SEIFs.

Algorithm SEIF_update_state_estimate($\xi_t, \Omega_t, \bar{\mu}_t$**):**

for a small set of map features m_i *do*

$$F_i = \begin{pmatrix} 0\cdots0 & 1 & 0 & 0\cdots0 \\ \underbrace{0\cdots0}_{2(N-i)} & 0 & 1 & \underbrace{0\cdots0}_{2(i-1)x} \end{pmatrix}$$

$$\mu_{i,t} = (F_i\ \Omega_t\ F_i^T)^{-1}\ F_i\ [\xi_t - \Omega_t\ \bar{\mu}_t + \Omega_t\ F_i^T\ F_i\ \bar{\mu}_t]$$

endfor

for all other map features m_i *do*

$$\mu_{i,t} = \bar{\mu}_{i,t}$$

endfor

$$F_x = \begin{pmatrix} 1 & 0 & 0 & 0\cdots0 \\ 0 & 1 & 0 & 0\cdots0 \\ 0 & 0 & 1 & \underbrace{0\cdots0}_{3N} \end{pmatrix}$$

$$\mu_{x,t} = (F_x\ \Omega_t\ F_x^T)^{-1}\ F_x\ [\xi_t - \Omega_t\ \bar{\mu}_t + \Omega_t\ F_x^T\ F_x\ \bar{\mu}_t]$$

return μ_t

Table 12.5 The amortized state update step in SEIFs updates a small number of state estimates.