

1:	Algorithm SEIF_measurement_update ($\bar{\xi}_t, \bar{\Omega}_t, \bar{\mu}_t, z_t, c_t$):
2:	$Q_t = \begin{pmatrix} \sigma_r^2 & 0 & 0 \\ 0 & \sigma_\phi^2 & 0 \\ 0 & 0 & \sigma_s^2 \end{pmatrix}$
3:	for all observed features $z_t^i = (r_t^i \ \phi_t^i \ s_t^i)^T$ do
4:	$j = c_t^i$
5:	if landmark j never seen before
6:	$\begin{pmatrix} \bar{\mu}_{j,x} \\ \bar{\mu}_{j,y} \\ \bar{\mu}_{j,s} \end{pmatrix} = \begin{pmatrix} \bar{\mu}_{t,x} \\ \bar{\mu}_{t,y} \\ s_t^i \end{pmatrix} + r_t^i \begin{pmatrix} \cos(\phi_t^i + \bar{\mu}_{t,\theta}) \\ \sin(\phi_t^i + \bar{\mu}_{t,\theta}) \\ 0 \end{pmatrix}$
7:	endif
8:	$\delta = \begin{pmatrix} \delta_x \\ \delta_y \end{pmatrix} = \begin{pmatrix} \bar{\mu}_{j,x} - \bar{\mu}_{t,x} \\ \bar{\mu}_{j,y} - \bar{\mu}_{t,y} \end{pmatrix}$
9:	$q = \delta^T \delta$
10:	$\hat{z}_t^i = \begin{pmatrix} \sqrt{q} \\ \text{atan2}(\delta_y, \delta_x) - \bar{\mu}_{t,\theta} \\ \bar{\mu}_{j,s} \end{pmatrix}$
11:	$H_t^i = \frac{1}{q} \begin{pmatrix} \sqrt{q}\delta_x & -\sqrt{q}\delta_y & 0 & 0 \cdots 0 & -\sqrt{q}\delta_x & \sqrt{q}\delta_y & 0 & 0 \cdots 0 \\ \delta_y & \delta_x & -1 & 0 \cdots 0 & -\delta_y & -\delta_x & 0 & 0 \cdots 0 \\ 0 & 0 & 0 & \underbrace{0 \cdots 0}_{3j-3} & 0 & 0 & 1 & \underbrace{0 \cdots 0}_{3N-3j} \end{pmatrix}$
12:	endifor
13:	$\xi_t = \bar{\xi}_t + \sum_i H_t^{iT} Q_t^{-1} [z_t^i - \hat{z}_t^i + H_t^i \bar{\mu}_t]$
14:	$\Omega_t = \bar{\Omega}_t + \sum_i H_t^{iT} Q_t^{-1} H_t^i$
15:	return ξ_t, Ω_t

Table 12.3 The measurement update step in SEIFs.