Initialisation of parameters

$$\mathbf{P}_0, \mathbf{x}_0, \mathbf{H}_0^{[1]}, \mathbf{\Phi}_0^{[1]}, \mathbf{Q}_0, \mathbf{R}_0,$$

Time update

Compute *a priori* estimate:
$$\hat{\mathbf{x}}_k^- = \boldsymbol{\phi}_{k-1}(\mathbf{x}_{k-1}, \mathbf{u}_{k-1})$$
Compute Jacobian matrix:
$$\mathbf{\Phi}_{k-1}^{[1]} = \left. \frac{\partial \boldsymbol{\phi}_{k-1}(\mathbf{x}, \mathbf{u})}{\partial \mathbf{x}} \right|_{\mathbf{x} = \hat{\mathbf{x}}_{k-1}^-, \mathbf{u}_{k-1}}$$
Compute *a priori* error covariance:
$$\mathbf{P}_k^- = \mathbf{\Phi}_{k-1}^{[1]} \mathbf{P}_{k-1} \mathbf{\Phi}_{k-1}^{[1]T} + \mathbf{Q}_{k-1}$$

Measurement update

Compute Jacobian matrix:
$$\mathbf{H}_k^{[1]} = \left. \frac{\partial \mathbf{h}_k(\mathbf{x})}{\partial \mathbf{x}} \right|_{\mathbf{x} = \hat{\mathbf{x}}_k^-}$$
Compute Kalman gain:
$$\mathbf{K}_k = \mathbf{P}_k^- \mathbf{H}_k^{[1]T} [\mathbf{H}_k^{[1]} \mathbf{P}_k^- \mathbf{H}_k^{[1]T} + \mathbf{R}_k]^{-1}$$
Compute *a posteriori* estimate:
$$\hat{\mathbf{x}}_k = \hat{\mathbf{x}}_k^- + \mathbf{K}_k [\mathbf{z}_k - \mathbf{h}_k(\hat{\mathbf{x}}_k^-)]$$
Update error covariance:
$$\mathbf{P}_k = [\mathbf{I} - \mathbf{K}_k \mathbf{H}_k^{[1]}] \mathbf{P}_k^-$$

Output