Initialisation of parameters

$$\mathbf{x}_0, \mathbf{P}_0, \mathbf{Q}_0, \mathbf{R}_0,$$

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:

$$\boldsymbol{\Phi}_{k-1}^{[1]} = \left. \frac{\partial \boldsymbol{\phi}_{k-1}(\mathbf{x},\mathbf{u})}{\partial \mathbf{x}} \right|_{\mathbf{x}=\hat{\mathbf{x}}_{k-1}^-, \mathbf{u}=\mathbf{u}_{k-1}}$$

Compute *a priori* error covariance:

$$\mathbf{P}_k^- = \boldsymbol{\Phi}_{k-1}^{[1]} \mathbf{P}_{k-1} \boldsymbol{\Phi}_{k-1}^{[1]T} + \mathbf{Q}_{k-1}$$

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:

$$\mathbf{P}_k = [\mathbf{I}_n - \mathbf{K}_k \mathbf{H}_k^{[1]}] \mathbf{P}_k^-$$

Output