

$$\hat{\mathbf{P}}_k = E \left\{ \hat{\mathbf{e}}_k \hat{\mathbf{e}}_k^T \right\}$$

$$\mathbf{x}_{k|k} = \hat{\mathbf{x}}_k$$

$$\tilde{\mathbf{P}}_k = E \left\{ \tilde{\mathbf{e}}_k \tilde{\mathbf{e}}_k^T \right\}$$

$$\mathbf{x}_{k|k-1} = \tilde{\mathbf{x}}_k$$

$$\mathbf{P}_{k|k} = \hat{\mathbf{P}}_k$$

$$\mathbf{P}_{k|k-1} = \tilde{\mathbf{P}}_k$$

Prior estimate

$$\tilde{\mathbf{x}}_k, \tilde{\mathbf{P}}_k$$

$$\mathbf{e}_{k|j} = \mathbf{x}_{k|j} - \mathbf{x}_k$$

$$\mathbf{e}_{k|k} = \hat{\mathbf{x}}_k - \mathbf{x}_k = \hat{\mathbf{e}}_k$$

$$\mathbf{e}_{k|k-1} = \tilde{\mathbf{x}}_k - \mathbf{x}_k = \tilde{\mathbf{e}}_k$$

Compute Kalman Gain

$$\mathbf{K}_k = \tilde{\mathbf{P}}_k \mathbf{H}_k^T (\mathbf{H}_k \tilde{\mathbf{P}}_k \mathbf{H}_k^T + \mathbf{R}_k)^{-1}$$

Project Ahead:

$$\tilde{\mathbf{x}}_{k+1} = \Phi_k \hat{\mathbf{x}}_k$$

$$\tilde{\mathbf{P}}_{k+1} = \Phi_k \hat{\mathbf{P}}_k \Phi_k^T + \mathbf{Q}_k$$

Update estimate
with measurement $\mathbf{z}_k$

$$\hat{\mathbf{x}}_k = \tilde{\mathbf{x}}_k + \mathbf{K}_k (\mathbf{z}_k - \mathbf{H}_k \tilde{\mathbf{x}}_k)$$

Compute error covariance
for update estimate

$$\hat{\mathbf{P}}_k = (\mathbf{I} - \mathbf{K}_k \mathbf{H}_k) \tilde{\mathbf{P}}_k$$

Prediction State

Correction State