The Bayes Filter

System equation	$\boldsymbol{x}_k = F_{k-1}\boldsymbol{x}_{k-1} + \boldsymbol{\epsilon}_{k-1}$ $\boldsymbol{\epsilon}_k \sim N(\mathbf{0}, \Sigma_{\epsilon,k})$
Observation equation	$\boldsymbol{b}_k = A_k\boldsymbol{x}_k + \boldsymbol{e}_k$ $\boldsymbol{e}_k \sim N(\mathbf{0}, \Sigma_{e,k})$
Initial conditions	$E\{\boldsymbol{x}_0\} = \hat{\boldsymbol{x}}_0$ $E\{(\boldsymbol{x}_0 - \hat{\boldsymbol{x}}_{0\mid 0})(\boldsymbol{x}_0 - \hat{\boldsymbol{x}}_{0\mid 0})^{\mathrm{T}}\} = P_{0\mid 0}$
Other conditions	$E\{\boldsymbol{\epsilon}_k\boldsymbol{e}_j^{\mathrm{T}}\} = 0,$ for all k, j
Prediction of state vector	$\hat{\boldsymbol{x}}_{k\mid k-1} = F_{k-1}\hat{\boldsymbol{x}}_{k-1\mid k-1}$
Prediction of covariance matrix	$P_{k\mid k-1} = F_{k-1}P_{k-1\mid k-1}F_{k-1}^{\mathrm{T}} + \Sigma_{\epsilon,k}$
Covariance matrix for updating	$P_{k\mid k} = (P_{k\mid k-1}^{-1} + A_k^{\mathrm{T}}\Sigma_{e,k}^{-1}A_k)^{-1}$
Kalman gain matrix	$K_k = P_{k\mid k}A_k^{\mathrm{T}}\Sigma_{e,k}^{-1}$
Updating of state vector	$\hat{\boldsymbol{x}}_{k\mid k} = \hat{\boldsymbol{x}}_{k\mid k-1} + K_k(\boldsymbol{b}_k - A_k\hat{\boldsymbol{x}}_{k\mid k-1})$