

		k=0	k=1	k=2	k=3
<div> <div>Reality</div> <div> $\mathbf{A}_{real} = \begin{bmatrix} 0.5 & 0.1 \\ 0.3 & 0.2 \end{bmatrix}$ $\mathbf{B}_{real} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ </div> <div>$\mathbf{x}_{real} \longrightarrow$</div> </div> <div> <div>Model</div> <div> $\mathbf{A} = \begin{bmatrix} 0.4 & 0.2 \\ 0.3 & 0.35 \end{bmatrix}$ $\mathbf{B} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $\mathbf{C} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ $\mathbf{D} = [0]$ $\mathbf{Q} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ $\mathbf{R} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ </div> <div>$u \longrightarrow$</div> </div> <div> <div>Initial values</div> <div> $\hat{\mathbf{x}}_{0 0} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ $\mathbf{P}_{0 0} = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ </div> <div>$\mathbf{y} \longrightarrow$</div> </div>			$\begin{bmatrix} 1.0000 \\ 1.0000 \end{bmatrix}$	$\begin{bmatrix} 1.6000 \\ 1.5000 \end{bmatrix}$	$\begin{bmatrix} 1.9500 \\ 1.7800 \end{bmatrix}$
			1.0000	1.0000	1.0000
			$\begin{bmatrix} 1.2000 \\ 1.1000 \end{bmatrix}$	$\begin{bmatrix} 1.8000 \\ 1.4000 \end{bmatrix}$	$\begin{bmatrix} 2.2000 \\ 1.5000 \end{bmatrix}$
1.	predicted estimate: state	$\hat{\mathbf{x}}_{k k-1} = \mathbf{A}\hat{\mathbf{x}}_{k-1 k-1} + \mathbf{B}u_{k-1}$	$\begin{bmatrix} 1.0000 \\ 1.0000 \end{bmatrix}$	$\begin{bmatrix} 1.6729 \\ 1.7201 \end{bmatrix}$	$\begin{bmatrix} 2.0027 \\ 2.0527 \end{bmatrix}$
2.	predicted estimate: state-covariance	$\mathbf{P}_{k k-1} = \mathbf{A}\mathbf{P}_{k-1 k-1}\mathbf{A}^T + \mathbf{Q}$	$\begin{bmatrix} 2.4000 & 0.3800 \\ 0.3800 & 2.4250 \end{bmatrix}$	$\begin{bmatrix} 2.1458 & 0.1402 \\ 0.1402 & 2.1564 \end{bmatrix}$	$\begin{bmatrix} 2.1386 & 0.1324 \\ 0.1324 & 2.1479 \end{bmatrix}$
3.	gain	$\mathbf{K}_k = \mathbf{P}_{k k-1}\mathbf{C}^T \left(\underbrace{\mathbf{C}\mathbf{P}_{k k-1}\mathbf{C}^T + \mathbf{R}}_{\text{innovation: covariance}} \right)^{-1}$	$\begin{bmatrix} 0.7022 & 0.0330 \\ 0.0330 & 0.7044 \end{bmatrix}$	$\begin{bmatrix} 0.6815 & 0.0141 \\ 0.0141 & 0.6826 \end{bmatrix}$	$\begin{bmatrix} 0.6808 & 0.0134 \\ 0.0134 & 0.6818 \end{bmatrix}$
4.	updated estimate: state	$\hat{\mathbf{x}}_k = \hat{\mathbf{x}}_{k k-1} + \mathbf{K}_k \left(\underbrace{\mathbf{y}_k - \mathbf{C}\hat{\mathbf{x}}_{k k-1}}_{\text{innovation: measurement}} \right)$	$\begin{bmatrix} 0.0000 \\ 0.0000 \end{bmatrix}$	$\begin{bmatrix} 1.1437 \\ 1.0770 \end{bmatrix}$	$\begin{bmatrix} 1.7550 \\ 1.5034 \end{bmatrix}$
5.	updated estimate: state-covariance	$\mathbf{P}_{k k} = (\mathbf{I} - \mathbf{K}_k\mathbf{C})\mathbf{P}_{k k-1}$	$\begin{bmatrix} 2.0000 & 0.0000 \\ 0.0000 & 2.0000 \end{bmatrix}$	$\begin{bmatrix} 0.7022 & 0.0330 \\ 0.0330 & 0.7044 \end{bmatrix}$	$\begin{bmatrix} 0.6815 & 0.0141 \\ 0.0141 & 0.6826 \end{bmatrix}$