from previous time

$$\mu_1 = A\mu_{fused} + Bu$$

$$\begin{aligned} \sigma_1^2 &= A\sigma_{fused}^2 A + Q \\ &= A^2\sigma_{fused}^2 + Q \end{aligned}$$

$$\begin{aligned} K &= \sigma_1^2 C(C\sigma_1^2 C + \sigma_2^2)^{-1} \\ &= \frac{C\sigma_1^2}{C^2\sigma_1^2 + \sigma_2^2} \end{aligned}$$

$$\mu_{fused} = \mu_1 + K(\mu_2 - C\mu_1)$$

$$\sigma_{fused}^2 = (1 - KC)\sigma_1^2$$

1. predicted estimate: state $\hat{\mathbf{x}}_{k|k-1} = \mathbf{A}\hat{\mathbf{x}}_{k-1|k-1} + \mathbf{B}\mathbf{u}_{k-1}$
2. predicted estimate: state-covariance $\mathbf{P}_{k|k-1} = \mathbf{A}\mathbf{P}_{k-1|k-1}\mathbf{A}^T + \mathbf{Q}_k$
3. gain $\mathbf{K}_k = \mathbf{P}_{k|k-1}\mathbf{C}^T\left(\underbrace{\mathbf{C}\mathbf{P}_{k|k-1}\mathbf{C}^T + \mathbf{R}_k}_{\text{innovation: covariance}}\right)^{-1}$
4. updated estimate: state $\hat{\mathbf{x}}_{k|k} = \hat{\mathbf{x}}_{k|k-1} + \mathbf{K}_k\left(\underbrace{\mathbf{y}_k - \mathbf{C}\hat{\mathbf{x}}_{k|k-1}}_{\text{innovation: measurement}}\right)$
5. updated estimate: state-covariance $\mathbf{P}_{k|k} = (\mathbf{I} - \mathbf{K}_k\mathbf{C})\mathbf{P}_{k|k-1}$