

### Time Update (“Predict”)

(1) Project the state ahead

$$\mathbf{x}_{k+1}^f = \mathbf{M}\mathbf{x}_k^a$$

(2) Project the error covariance ahead

$$\mathbf{P}_{k+1}^f = \mathbf{M}\mathbf{P}_k^a\mathbf{M}^T + \mathbf{Q}$$

### Measurement Update (“Correct”)

(1) Compute the Kalman gain

$$\mathbf{K}_{k+1} = \mathbf{P}_{k+1}^f \mathbf{H}^T (\mathbf{H} \mathbf{P}_{k+1}^f \mathbf{H}^T + \mathbf{R})^{-1}$$

(2) Update estimate with measurement

$$\mathbf{x}_{k+1}^a = \mathbf{x}_{k+1}^f + \mathbf{K}_{k+1}(\mathbf{y}_{k+1} - \mathbf{H}\mathbf{x}_{k+1}^f)$$

(3) Update the error covariance

$$\mathbf{P}_{k+1}^a = (\mathbf{I} - \mathbf{K}_{k+1}\mathbf{H})\mathbf{P}_{k+1}^f$$

### Initialization

Initial estimates for  $\mathbf{x}_k^a$  and  $\mathbf{P}_k^a$