Other DKF Variants: Iterated EKF

- Iterated linearization:

$$h(\mathbf{x}^{(i)}[n],n) \approx h(\hat{\mathbf{x}}_+^{(i)}[n],n) + \frac{\partial h(\mathbf{x}[n],n)}{\partial \mathbf{x}[n]}\Big|_{\mathbf{x}=\hat{\mathbf{x}}_+^{(i)}}(\mathbf{x}[n]-\hat{\mathbf{x}}_+^{(i)}[n]), \quad i=0,1,2,\ldots$$

- Iterated Kalman gain:

$$\mathbf{K}_2^{(i)}[n] = \mathbf{P}_-[n]\mathbf{C}(\hat{\mathbf{x}}_+^{(i)}[n],n)(\mathbf{R}_{vv}+\mathbf{C}(\hat{\mathbf{x}}_+^{(i)}[n],n)\mathbf{P}_-[n]\mathbf{C}^T(\hat{\mathbf{x}}_+^{(i)}[n],n))^{-1}$$

- Iterated state estimate:

$$\hat{\mathbf{x}}_+^{(i+1)}[n] = \hat{\mathbf{x}}_-[n] + \mathbf{K}_2^{(i)}[n](y[n] - h(\hat{\mathbf{x}}_-^{(i)}[n],n))$$

Iterated EKF

- Iterated covariance update:

$$\mathbf{P}_+^{(i+1)}[n] = (\mathbf{I} - \mathbf{K}_2^{(i)}[n]\mathbf{C}(\hat{\mathbf{x}}_+^{(i)}[n],n))\mathbf{P}_-[n]$$

- Iterate as many times as needed to reduce error covariance.
- Terminate when no appreciable change in state estimate is realized.
- Iterations increase computational complexity.