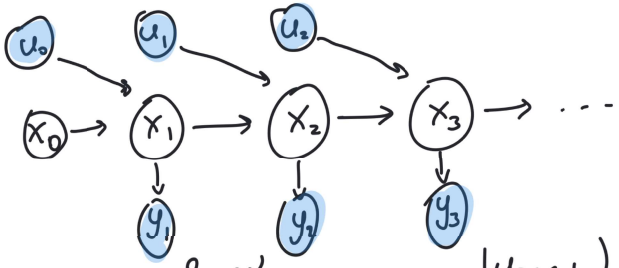
The filtering problem



$$p(x_{0:n} \mid y_{1:n}, u_{0:n-1}) \overset{\text{Bayes' Rule}}{=} \frac{p(x_{0:n}, y_{1:n} \mid u_{0:n-1})}{p(y_{1:n} \mid u_{0:n-1})}$$

Constants

$$\propto p(x_{0:n}, y_{1:n} \mid u_{0:n-1})$$

$\Downarrow$ Linear Gaussian

Kalman filter

PREDICTIVE SCIENCE LABORATORY

Controlling a drone:

x : position, velocity ($\mathbb{R}^3$, $\mathbb{R}^3$)

y : GPS

u : control rotor

$$p(x_{n+1} \mid y_{1:n}, u_{0:n-1}, u_n) = \int p(x_{n+1} \mid x_n, u_n)\, p(x_n \mid y_{1:n}, u_{0:n-1})\, dx_n$$

$$\int p(x_{0:n} \mid y_{1:n}, u_{0:n-1})\, dx_{0:n-1}$$

$p(x_{n+1} \mid y_{1:n}, u_{0:n-1}, u_n)$: where I can go if I apply u_n

$p(x_{n+1} \mid x_n, u_n)$: going to x_{n+1} given current state and u_n

$p(x_n \mid y_{1:n}, u_{0:n-1})$: prob. of current state given what you know

$\times$

What is the best action u_n?