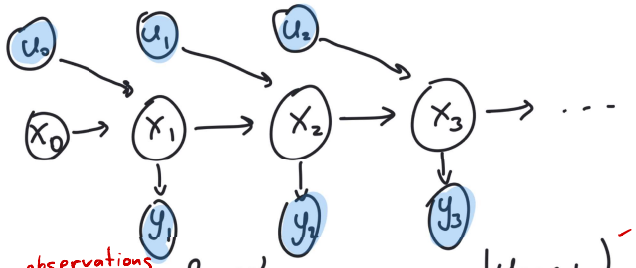
The filtering problem



need to characterize / find

$p(x_{0:n} \mid y_{1:n}, u_{0:n-1})$ — trajectory; observations & knowns; posterior

$\overset{\text{Bayes' Rule}}{=}$ FORMAL ANSWER

$\frac{p(x_{0:n}, y_{1:n} \mid u_{0:n-1})}{p(y_{1:n} \mid u_{0:n-1})}$ — joint; constants, set to what is observed/known

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

Linear Gaussian → Kalman filter

Ex: Controlling a drone

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

y : GPS

u : control rotor

marginalize

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

$p(x_{n+1} \mid y_{1:n}, u_{0:n-1}, u_n) \overset{\text{sum rule (L.T.P)}}{=} \int p(x_{n+1} \mid x_n, u_n)\, p(x_n \mid y_{1:n}, u_{0:n-1})\, dx_n$

where I can jump if I apply u_n

transition: going to x_{n+1} given current state and u_n × prob. of current state given what you know

get this from the filtering problem

Question:

What is the best action u_n?