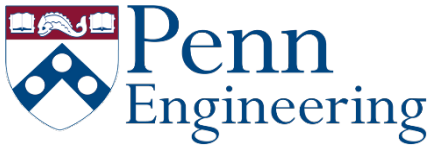
Robotics

Estimation and Learning
with Dan Lee

Week 2.

Kalman Filter

2.1 Kalman Filter Model
2.2 Maximum-A-Posterior Estimation
2.3 Nonlinear Variations



Week 2.
Kalman Filter

2.1. Kalman Filter: Motivation

Kalman filter is used for optimal tracking for linear system.

For example, pedestrian and vehicle tracking

Intuition behind KF

- Dynamics

Intuition behind KF

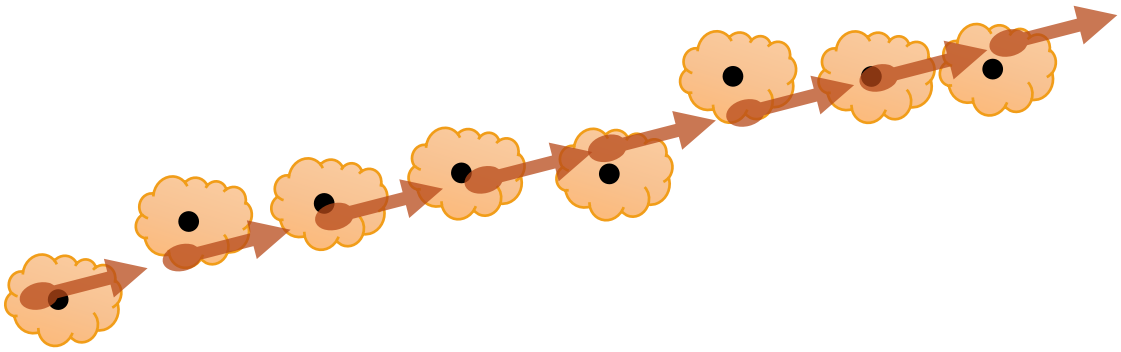
- Dynamics

Application

- Track a moving target
  - Soccer ball

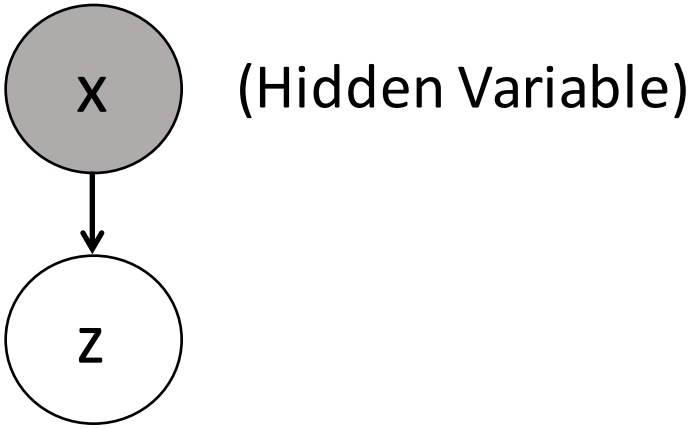
Intuition behind KF

- Multiple measurements: ●, ●, ●, …
- Each measurement is *noisy*: 
- What is the *true* state of the object? 



State and Measurement

- State (x): any quantity of interest
- Measurement (z): what we observe



State

- Example: “What characterizes the state of a ball?”
  - Position, Velocity, Acceleration
  - Rotation
  - Color
  - Size
  - Weight
  - Temperature
  - Elasticity
  - …

Measurement

- Example: What do we observe or measure?
  - Distance
  - Angle
  - Inertia change
  - Color
  - …

Measurement