

## Introduction

### 1.1) Uncertainty in Robotics

"Robotics is the Science of perceiving and manipulating the physical world through computer-controlled mechanical devices"

→ Uncertainty arises if the robot lacks critical information for carrying out its task.

→ It arises from 5 different factors:

→ Environment

→ Sensors → Limited capability  
→ Noise

→ Robot → Unpredictable, due to control noise  
wear & tear.

→ Models

{ Models are abstractions of the real world }

→ Computation

→ Robots are real-time systems, which limits the amount of computation that can be carried out.

### 1.2) Probabilistic Robotics

"This book provides a comprehensive overview of Probabilistic algorithms for robotics."

Key Idea: Instead of relying on a single "best guess" as to what might be the case, Probabilistic algorithms represent information as probability distributions over whole space of possible hypotheses.

### 1.3> Implications

"A robot that can carries a notation of its own uncertainty and that acts accordingly is superior to one that does not"

#### Kidnapped robot problem

↳ Mobile robot must recover from localization failure.

→ Advantage comes at a cost of:

- ↳ Computational inefficiency
- ↳ need to approximate.

