CS2109S

AY22/23 Sem 2

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01. Introduction

- Agent Anything that can perceive its environment through sensors and acting upon that env. through actuators
- Agent Function Maps from percept histories to actions
- Rational Agent Chooses an action that is expected to maximize its performance measure, given by percept sequence and built-in knowledge
- Autonomous Agent If behavior is determined by its own expereince

Performance Measure of Function

- Motivation: For an agent to do the right thing, need a measure of goodness
- Performance vs. Cost
- 1. Best for whom?
- 2. What are we optimizing?
- 3. What information is available?
- 4. What are the side effects and costs?

Defining the Problem: PEAS

- 1. Performance measure
- 2. Environment
- 3. Actuators
- 4. Sensors

Characterizing the Environment

- Fully observable (vs. Partially) Agent's sensors can access complete state of env. all the time
- Deterministic (vs. Stochastic) Next state of env. is determined by current state and action executed by agent
 - Strategic If env. is deterministic except for actions of other agents
- Episodic (vs. Sequential) Agent's experience is divided into atomic episodes, where each episode includes perceiving and an action, and action depends on episode itself
- 4. Static (vs. Dynamic) Env. is unchanged while agent is deciding
 - Semi Time does not affect env., but affects performance score
- 5. Discrete (vs. Continuous) Discrete num. of percepts and actions
- 6. Single Agent (vs. Multi-agent) Agent operating by itself in an env.

Implementing Agents (in ascending complexity)

- 1. Simple Reflex Agents Fixed conditional rules
- Model-based Reflex Agents Stores percept history to make decisions about internal model of world with conditional rules. Eg. Roomba
- 3. Goal-based Agents Keep in mind a goal and action aims to achieve it
- 4. Utility-based Agents Find best way to achieve goal
- 5. Learning Agents Learn from previous experiences

Exploitation vs. Exploration

- Exploitation Maximize expected utility using current knowledge of world
- Exploration Learn more about the world to improve future gains. May not always maximize performance measure.