Artificial Intelligence

Chapter 2

- **An agent:** is something that perceives and acts in an environment.
- **The agent function:**
  - specifies the action taken by the agent in response to any percept.
  - maps from percept histories to actions:
    [f: P* -> A]
  - runs on the physical architecture to
    produce f
- **The performance measure:** evaluates the behavior of the agent in an environment.
- **A rational agent:**
  - acts so as to maximize the expected value of the performance measure.
  - is one that does the right thing
- **A task environment:** specification includes the performance measure, the external environment, the actuators, and the sensors. In designing an agent, the first step must always be to specify the task environment as fully as possible.
- **The agent program:** implements the agent function.
  - agent = architecture + program

Rationality depends on 4 things :-

1. Performance measuring success
2. The agent's prior knowledge of the environment
3. The actions that the agent can perform
4. The agent's percept sequence to date

Rational is different to being perfect

- Rationality maximizes expected outcome while perfection maximizes actual outcome.

Rational is different to omniscient

- Percepts may not supply all relevant information

PEAS: Performance measure, Environment, Actuators, Sensors.

Properties of Task Environment :-

1. Fully Observable Vs. Partially Observable (Needed Memory).
2. Deterministic Vs. Stochastic
3. Episodic Vs. Sequential (depends on previous actions or not).
4. Static Vs. Dynamic
5. Discrete Vs. Continuous (Specified number of moves for example chess or not specified).

Task Environment	Observable	Agents	Deterministic	Episodic	Static	Discrete
Crossword puzzle	Fully	Single	Deterministic	Sequential	Static	Discrete
Chess with a clock	Fully	Multi	Deterministic	Sequential	Semi	Discrete
Poker	Partially	Multi	Stochastic	Sequential	Static	Discrete
Backgammon	Fully	Multi	Stochastic	Sequential	Static	Discrete
Taxi driving	Partially	Multi	Stochastic	Sequential	Dynamic	Continuous
Medical diagnosis	Partially	Single	Stochastic	Sequential	Dynamic	Continuous
Image analysis	Fully	Single	Deterministic	Episodic	Semi	Continuous
Part-picking robot	Partially	Single	Stochastic	Episodic	Dynamic	Continuous
Refinery controller	Partially	Single	Stochastic	Sequential	Dynamic	Continuous
Interactive English tutor	Partially	Multi	Stochastic	Sequential	Dynamic	Discrete

Figure 2.6 Examples of task environments and their characteristics.

What are the 4 basic kinds of agent programs?

1. Simple reflex agents respond directly to percepts.
2. Model-based reflex agents maintain internal state.
3. Goal-based agents act to achieve their goals.
4. Utility-based agents try to maximize their own expected "happiness."

All agents can improve their performance through **learning**.