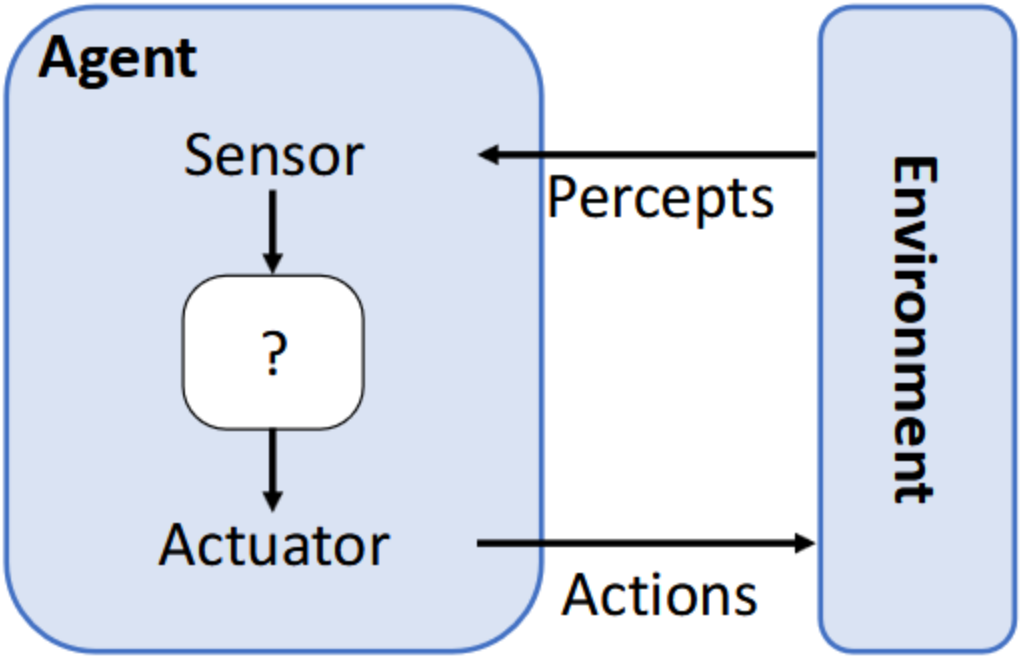
Agent -> anything that perceives its environment through sensors and acts upon it through actuators.

Ex: Human agent

- Sensors: Eyes, ears*
- Actuators: Hands, legs, vocal tract

Percepts -> the content an agent's sensors are perceiving.



Yuck a lot of terminology :'(

Percept Sequence -> The complete history of everything the agent has perceived.

Agent Function -> a mapping of any given percept sequence to an action

Agent Program -> a concrete implementation to realize an agent function internally.

Performance Measure -> a simple rule that assigns a score (reward) to how well the outcomes of an agent’s actions turned out over a chosen time interval.

Rational Agent -> selects an action that is expected to maximize its performance measure.

Task Environments -> the "problems" to which rational agents are the "solutions".

PEAS

Performance Measures : how desirable is the sequence of environments the agent has experienced.

Environment : what are the key elements in the surroundings of the agent that can influence the agent?

Actuators : what allows the agent to take actions

Sensors : what allows the agent to perceive its surroundings

Finally an example,

Automated Taxi: Peas

- Performance measures: arrive at destination safely, fast, profit maximizing
- Environment: streets, other traffic, customers, weather, pedestrians
- Actuators: steering, break, gas, display/speaker
- Sensors: cameras, radar, speedometer, GPS, engine sensors

Properties of Task Environments

- Partially Observable: when an agent's sensors do not have access to the complete state of the environment.
- Multi-Agent: there are multiple agents
- Stochastic: outcomes of an action may vary with environment conditions
- Dynamic: the environment itself may change with the passage of time\
- Continuous: speed and location are continuous value
- Fully Observable: agent's sensors give it access to the complete state of the environment at any point in time
- Deterministic: the next state of the environment is completely determined by the current state and the action executed by the agent.
- Static: the environment itself does not change with the passage of time
- Discrete: the environment has a discrete set of percepts and actions
- Single agent: only one agent

MORE ON AGENT PROGRAMS

P -> set of possible percepts
T -> lifetime of an agent
$\sum_{t=1}^{T} |P|^t$ -> table size

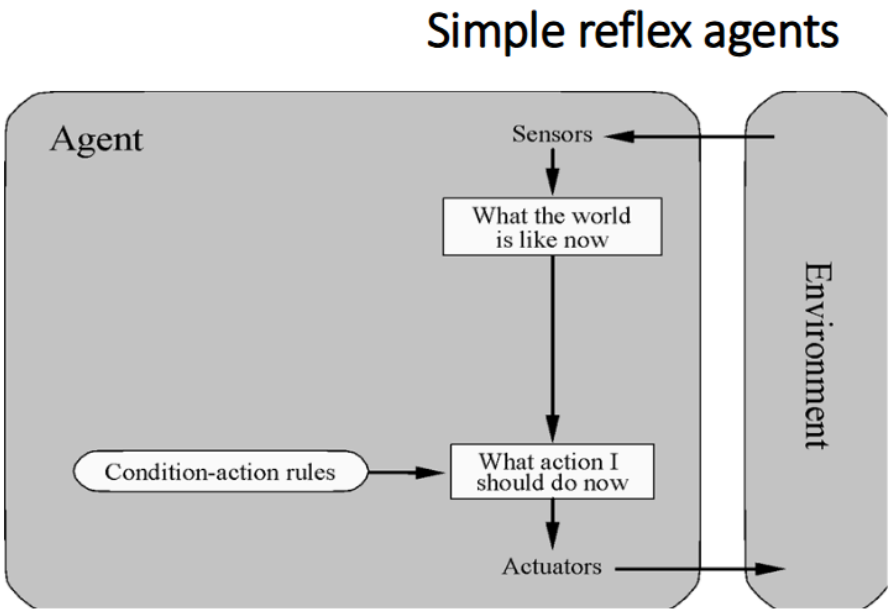
Example:

- Each pixel takes on RGB values 256^3
- 1920x1080 number of pixels
- $|P| = (256^3) \cdot (1920 \cdot 1080) \approx 34$ trillion

TYPE OF AGENT PROGRAMS

- Simple reflex agents
- Model-based reflex agents
- Goal-based agents
- Utility-based agents

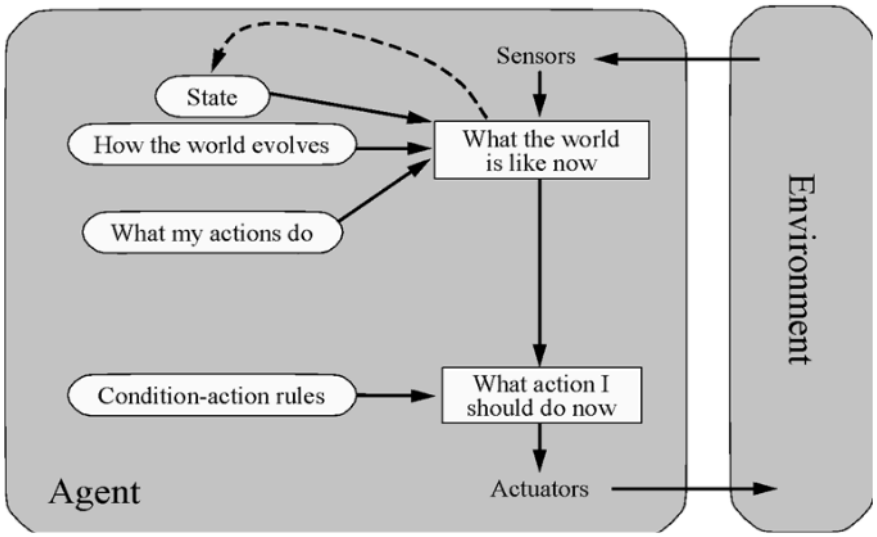
SIMPLE REFLEX AGENTS



No memory! Not suitable for partially observable environments!

MODEL BASED AGENTS

Model-based agents



Use an **internal state** to keep track of the environment!