



AI & Problem Solving



Problem formulation

- Suppose that the agent's sensors give it enough information to tell exactly which state it is in (i.e., the world is accessible);
- Suppose that it knows exactly what each of its actions does.
- Then it can calculate exactly which state it will be in after any sequence of actions



Types of problems

- When the environment is completely accessible and the agent can calculate its state after any sequence of action, we call it a **single-state problem**.
- When the world is not fully accessible, the agent must reason about sets of states that it might get to, rather than single states. We call this a **multiple-state problem**.



Components of a Well defined problems and solutions

- **Data type**
- **Components:**
- **A Problem**
- **An Operator**
- **The Goal Test function**
- **A Path Cost function**



Measuring problem solving Performance

The effectiveness of a search technique can be measured in at least three ways.

- 1) Does it find a solution?
- 2) Is it a good solution/low cost ?
- 3) What is the search cost associated with the time and memory required to find a solution?



7	2	4
5		6
8	3	1

Start State

	1	2
3	4	5
6	7	8

Goal State



Components of Agent

- **States:** A state description specifies the location of each of the eight tiles and the blank in one of the nine squares.
- **Initial state:** Any state can be designated as the initial state. Note that any given goal can be reached from exactly half of the possible initial states (Exercise 3.4).
- **Actions:** The simplest formulation defines the actions as movements of the blank space *Left*, *Right*, *Up*, or *Down*. Different subsets of these are possible depending on where the blank is.
- **Transition model:** Given a state and action, this returns the resulting state; for example, if we apply *Left* to the start state in Figure 3.4, the resulting state has the 5 and the blank switched.
- **Goal test:** This checks whether the state matches the goal configuration shown in Figure 3.4. (Other goal configurations are possible.)
- **Path cost:** Each step costs 1, so the path cost is the number of steps in the path.