

**3.1** A **state** is a situation that an agent can find itself in. We distinguish two types of states: world states (the actual concrete situations in the real world) and representational states (the abstract descriptions of the real world that are used by the agent in deliberating about what to do).

A **state space** is a graph whose nodes are the set of all states, and whose links are actions that transform one state into another.

A **search tree** is a tree (a graph with no undirected loops) in which the root node is the start state and the set of children for each node consists of the states reachable by taking any action.

A **search node** is a node in the search tree.

A **goal** is a state that the agent is trying to reach.

An **action** is something that the agent can choose to do.

A **successor function** described the agent's options: given a state, it returns a set of (action, state) pairs, where each state is the state reachable by taking the action.

The **branching factor** in a search tree is the number of actions available to the agent.

**3.7:**

a. Initial state: No regions colored.

Goal test: All regions colored, and no two adjacent regions have the same color.

Successor function: Assign a color to a region.

Cost function: Number of assignments.

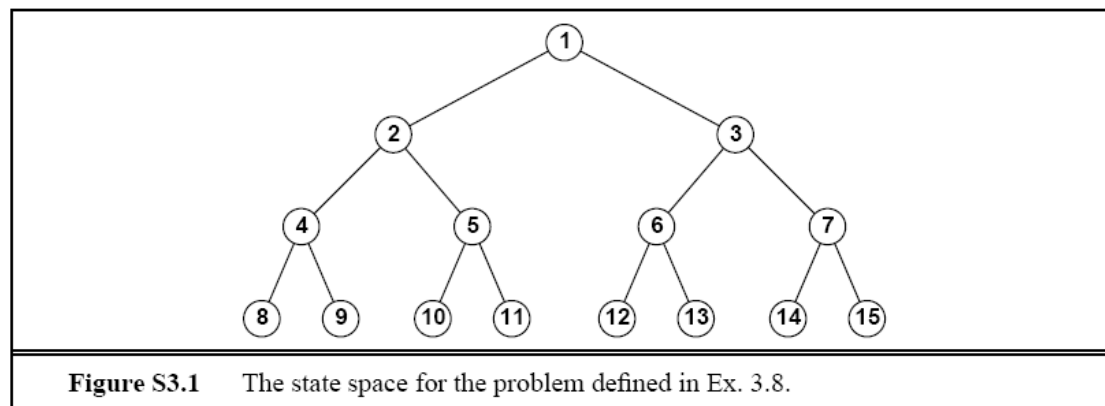
b. Initial state: As described in the text.

Goal test: Monkey has bananas.

Successor function: Hop on crate; Hop off crate; Push crate from one spot to another;

Walk from one spot to another; grab bananas (if standing on crate).

Cost function: Number of actions.



**3.8**

a. See Figure S3.1.

b. Breadth-first: 1 2 3 4 5 6 7 8 9 10 11

Depth-limited: 1 2 4 8 9 5 10 11

Iterative deepening: 1; 1 2 3; 1 2 4 5 3 6 7; 1 2 4 8 9 5 10 11