Grokking Artificial intelligence Algorithms
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Section 2 Search Fundamentals

When we think about what makes us intelligent, the ability to plan before carrying out actions is a prominent attribute. Before embarking on a trip to a different country, before starting a new project, before writing functions in code, planning happens. Planning happens at different levels of detail in different contexts to strive for the best possible outcome when carrying out the tasks involved in accomplishing goals

Time Complexity

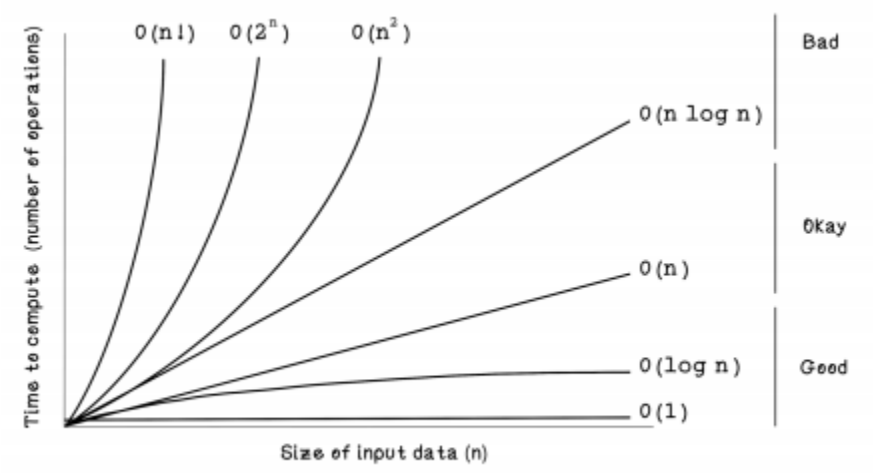


Figure 2.3 Big O complexity

Data vs. Information

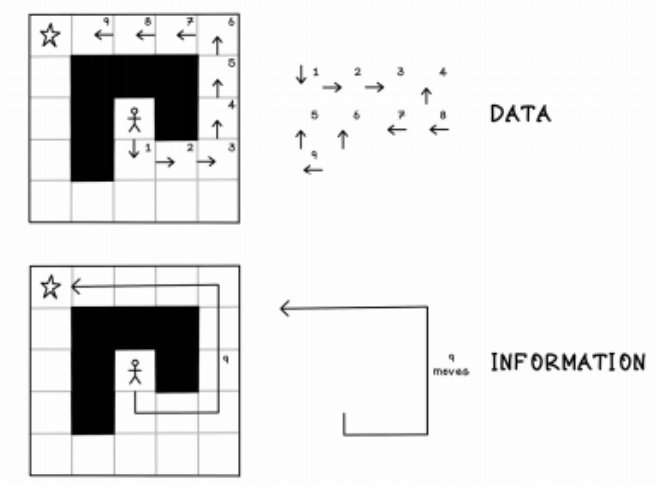


Figure 2.7 Data versus information

Data Structures

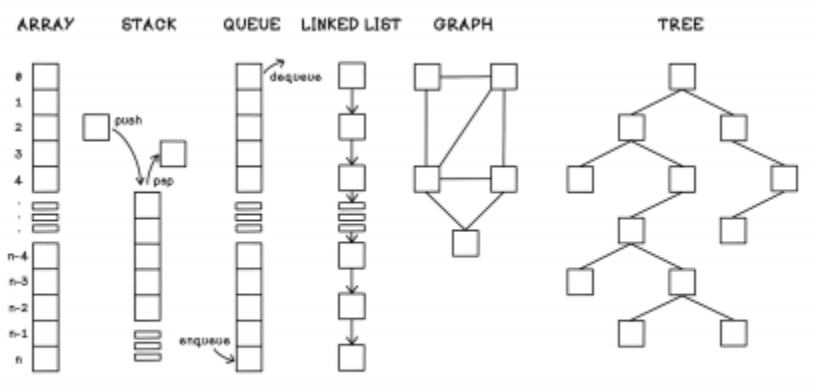


Figure 2.8 Data structures used with algorithms

Tree Attributes

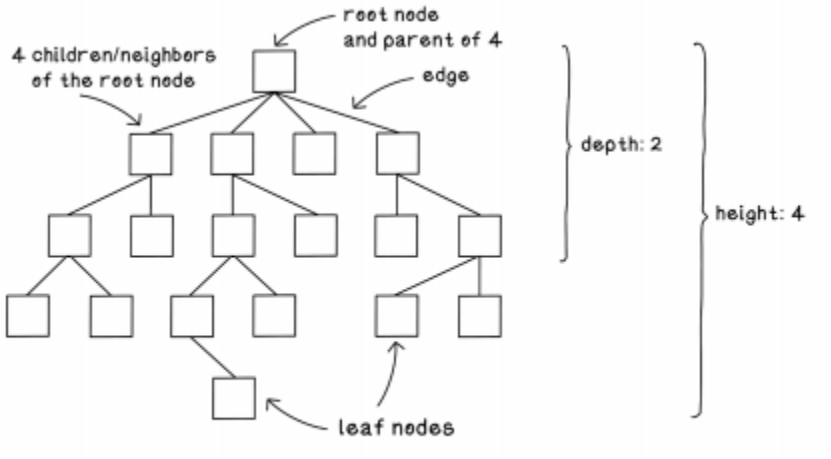


Figure 2.12 The main attributes of a tree

Breadth First Search pseudocode

```
run_bfs(maze, current_point, visited_points):
  let q equal a new queue
  push current_point to q
  mark current_point as visited
  while q is not empty:
    pop q and let current_point equal the returned point
    add available cells north, east, south, and west to a list neighbors
    for each neighbor in neighbors:
      if neighbor is not visited:
        set neighbor parent as current_point
        mark neighbor as visited
        push neighbor to q
        if value at neighbor is the goal:
          return path using neighbor
  return "No path to goal"
```

Breadth Search First Algorithm

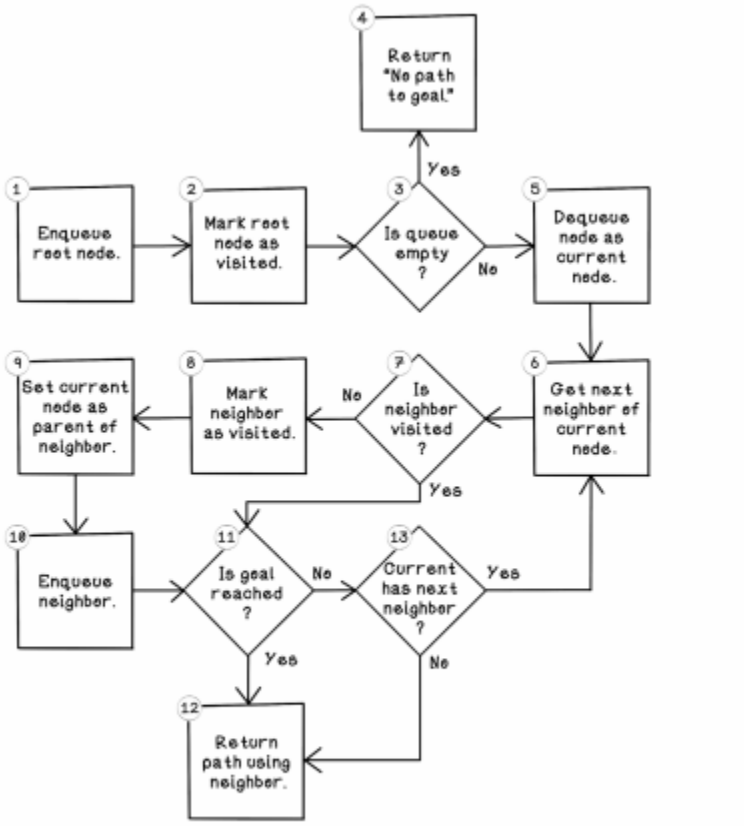
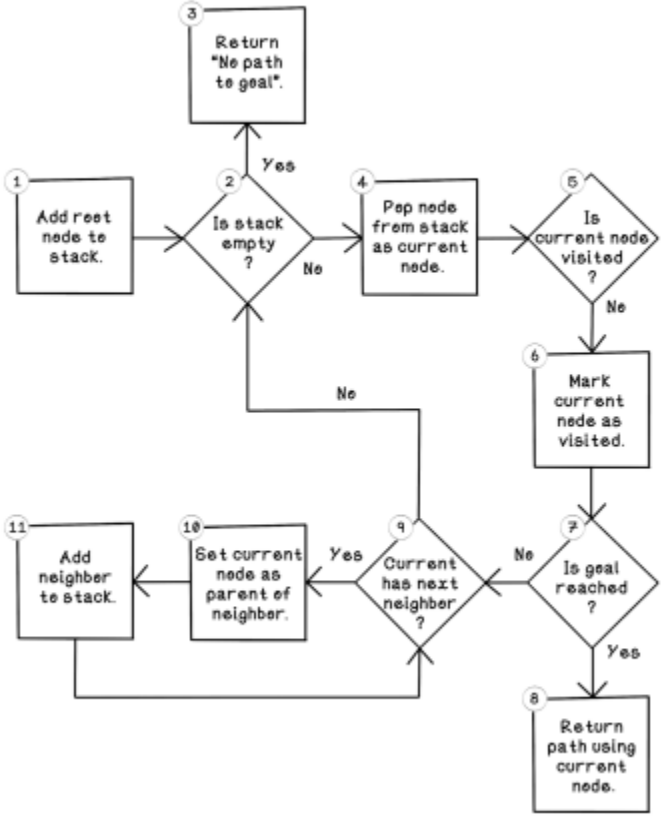


Figure 2.16 Flow of the breadth-first search algorithm

Depth First Search Pseudocode

```
run_dfs(maze, root_point, visited_points):
  let s equal a new stack
  add root_point to s
  while s is not empty
    pop s and let current_point equal the returned point
    if current_point is not visited:
      mark current_point as visited
      if value at current_node is the goal:
        return path using current_point
      else:
        add available cells north, east, south, and west to a list neighbors
        for each neighbor in neighbors:
          set neighbor parent as current_point
          push neighbor to s
  return "No path to goal"
```

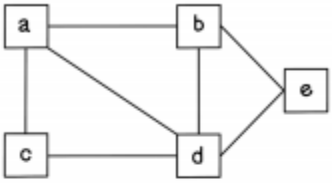
Depth Search First Algorithm



Types of Graphs

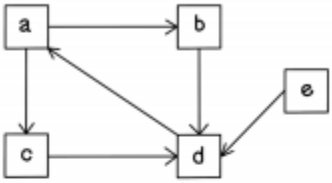
UNDIRECTED

No edges are directed.
Relationships between two nodes are mutual.



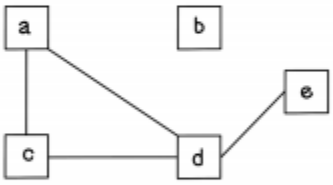
DIRECTED

Edges indicate direction.
Relationships between two nodes are explicit.



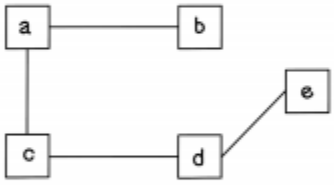
DISCONNECTED

One or more nodes are not connected by any edges.



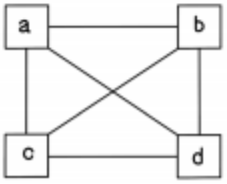
ACYCLIC

A graph that contains no cycles.



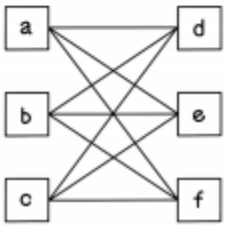
COMPLETE

Every node is connected to every other node by an edge.



COMPLETE BIPARTITE

Every node from one partition is connected to every node of the other partition.



WEIGHTED

A graph where the edges between nodes have a weight.