



Addis Ababa University

College of Built Environment and Engineering
Department of Artificial Intelligence

Assignment Title: Assignment Two(2) Project one(1) Traveling Ethiopia

Course: Artificial Intelligence

Program: Master of Science in Artificial Intelligence

Topic: Assignment Two(2) Project one(1) Traveling Ethiopia

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Traveling Ethiopia Relaxed Search Problem

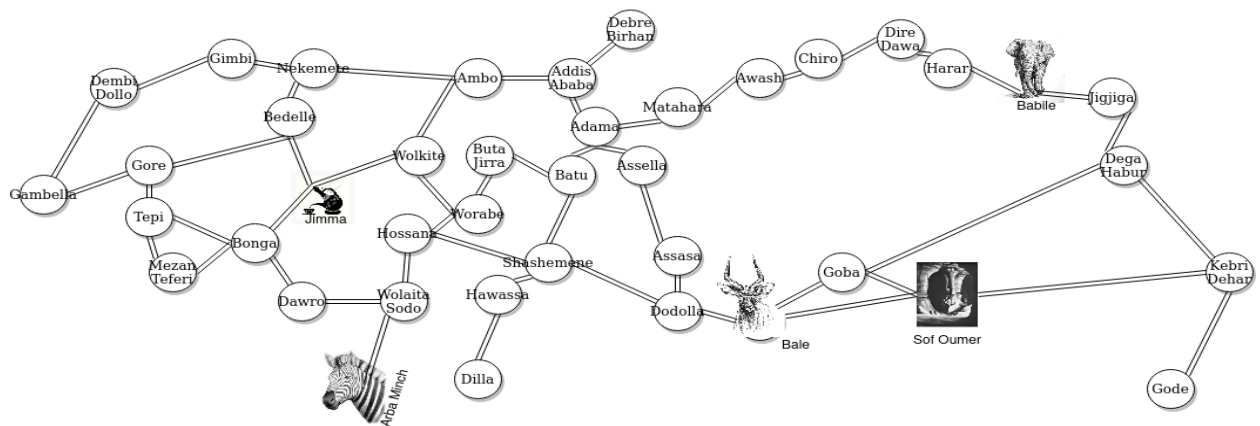


Figure 1: Traveling Ethiopia

Questions

1. Consider Figure 1 (A generic state space graph for traveling Ethiopia search problem) to solve the following problems.

1.1 Convert Figure 1, a State space graph for traveling Ethiopia search problem, into some sort of manageable data structure such as, stack or queue.

Converting State Space Graph → Queue (BFS)

- ❖ Go as deep as possible before backtracking
- ❖ Last discovered node is explored first

Breadth-First Search (BFS)

- ❖ Uses a QUEUE (FIFO)
- ❖ Expands nodes level by level
- ❖ Guarantees the shortest path (fewest edges)

BFS Search Tree

Level 0:
Addis Ababa

Level 1:
├── Ambo
├── Adama
└── Debre Birhan

Level 2:
From Ambo:
| ├── Nekemte
| └── Wolkite
From Adama:
| ├── Batu
| ├── Assella
| └── Metehara

Level 3:
From Batu:
| └── Shashemene
From Assella:
| └── Assasa
From Metehara:
| └── Awash

Level 4:
From Shashemene:
| └── Dodolla
From Awash:
| └── Chiro

Level 5:
From Dodolla:
| └── Bale
From Chiro:
| └── Dire Dawa

Level 6:
From Bale:
| └── Goba

Level 7:
From Goba:
| └── Sof Oumer 🎯 (GOAL FOUND)

BFS Solution Path

Addis Ababa → Adama → Batu → Shashemene → Dodolla → Bale → Goba → Sof Oumer

- ❖ Shortest path
- ❖ Optimal in number of steps

Converting State Space Graph → STACK (DFS)

Depth-First Search (DFS)

- ❖ Uses a STACK (LIFO)
- ❖ Goes as deep as possible first
- ❖ Does not guarantee shortest path

DFS result depends on expansion order.

Below is one valid DFS traversal following your map.

DFS Search Tree

```
Addis Ababa
├── Ambo
│   ├── Nekemte
│   │   ├── Gimbi
│   │   │   ├── Dembi Dollo
│   │   │   │   ├── Gambella
│   │   │   │   │   (dead end, backtrack)
│   │   │   └── Wolkite
│   │   └── Jimma
│   │       ├── Bonga
│   │       │   ├── Dawro
│   │       │   │   ├── Wolaita Sodo
│   │       │   │   │   ├── Hawassa
│   │       │   │   │   │   ├── Shashemene
│   │       │   │   │   │   │   ├── Dodolla
│   │       │   │   │   │   │   │   ├── Bale
│   │       │   │   │   │   │   │   │   ├── Goba
│   │       │   │   │   │   │   │   │   └── Sof Oumer 🏁
```

DFS Solution Path

Addis Ababa → Ambo → Wolkite → Jimma → Bonga → Dawro
→ Wolaita Sodo → Hawassa → Shashemene → Dodolla
→ Bale → Goba → Sof Oumer

- ❖ Goal reached
- ❖ Not shortest
- ❖ Valid DFS