

## **Title:** Optimal Path Finding from Kolabagan to UAP using A\* Algorithm

### **Introduction**

Urban traffic in Dhaka city often creates multiple possible routes between two places. Determining the shortest and optimal route is very important for saving time and reducing travel costs. In this project, we used graph representation of routes in JSON format and implemented the *A \* Algorithm* to find the shortest path from Kolabagan to University of Asia Pacific (UAP).

### **Data Representation (JSON Format)**

We represent all the locations (nodes) and their direct connections (edges) in JSON format.

- 1) Nodes: Represents geographical locations (Kolabagan, Panthapath, Rajabazar, Farmgate, Kawran Bazar, UAP). Each node has latitude and longitude coordinates.
- 2) Edges: Represents the direct connections between nodes with distance in kilometers.

### **Example JSON snippet:**

```
"edges": {  
  "Kolabagan": {  
    "Panthapath": 2.0,  
    "Rajabazar": 4.5,  
    "Farmgate": 5.0,  
    "Kawran Bazar": 6.5  
  },  
  "Panthapath": {  
    "UAP": 2.5  
  }  
}
```

## Algorithm Used: A\*

The *A algorithm*\* is widely used for finding the shortest path in weighted graphs.

- $f(n) = g(n) + h(n)$ 
  - ✓  $g(n)$  = actual cost (distance in km so far)
  - ✓  $h(n)$  = heuristic cost (straight-line distance using Haversine formula)

Steps:

1. Start from Kolabagan.
2. Explore all possible connected nodes.
3. Select the path with the minimum  $f(n)$  value.
4. Continue until the goal node (UAP) is reached.

## Results

Possible Routes:

1. Kolabagan → Panthapath → UAP = 4.5 km
2. Kolabagan → Rajabazar → UAP = 8.5 km
3. Kolabagan → Farmgate → UAP = 11 km
4. Kolabagan → Kawran Bazar → UAP = 14 km

Optimal Path = Kolabagan → Panthapath → UAP (4.5 km)

## Visualization

We created a map diagram where all nodes are plotted and the shortest path is highlighted using deep green.

- Shortest path (Kolabagan → Panthapath → UAP) is marked.
- Other longer paths are shown using light green, orange, red.

## Conclusion

This study demonstrates how *graph representation + A algorithm*\* can effectively find the shortest route in urban traffic networks. Data stored in JSON makes it reusable and easy to expand (can add time, traffic, cost). The shortest route from Kolabagan to UAP is via Panthapath, with a total distance of 4.5 km