

Graph Layout Optimization for Malawi Districts

1. Node Distribution and Problem Analysis

The initial layout of Malawi's district graph often results in overlapping nodes, excessive edge crossings, and uneven spacing, making the visualization hard to interpret. A good layout should evenly distribute nodes in space, reduce cluttered intersections, and maintain proximity between connected districts.

2. Algorithm Identification

I used the Force-Directed Graph Drawing algorithm is a type of algorithm used for drawing graphs in a visually appealing way and the main goal of this algorithm is to position nodes of a graph in two-dimensional or three dimensions. The graph is implemented via D3.js. This physics-inspired approach models nodes as repelling particles and edges as attractive springs. It simulates physical forces like gravity, repulsion, and collision avoidance to organically find a stable and readable layout.

3. Approach Explanation

The approach includes the following steps:

1. Load the nodes and their initial (x, y) positions along with the adjacency list.
2. Use D3's `forceSimulation` to run a layout process with:
 - `forceLink` for edge attraction.
 - `forceManyBody` for node repulsion.
 - `forceCenter` to keep layout centered.
 - `forceCollide` to prevent node overlap.
3. After simulation stabilizes, node positions are normalized to stay within the [0, 1] range. 4.

