

Graph Visualization of Malawi Districts

Problem Analysis and Solution

Understanding the Problem

The task was to improve the way Malawi's districts are displayed as a connected graph. In the original version, the nodes (representing districts) were cluttered, with overlapping positions and tangled connections, which made the graph hard to interpret.

The main objectives were:

- To space out the nodes clearly so none of them overlap.
- To place connected districts closer to one another.
- To reduce the number of edge crossings for better readability.

All nodes needed to stay within a fixed square boundary ranging from (0, 0) to (1, 1), ensuring a neat and contained visualization.

The Chosen Solution: Force-Directed Layout

To clean up the graph, I used a force-directed layout algorithm. This method simulates physical forces:

- Districts that are connected are drawn towards each other (like they're linked by springs).
- All nodes push away from each other (like magnets), preventing overlap.

This natural-looking layout helps automatically arrange the nodes in a way that:

- Keeps them evenly spaced.
- Makes connections shorter and more intuitive.
- Groups related districts visually.

What I Did

Here's how I approached the task:

1. Extracted all relevant data — district names, their initial coordinates, and the links between them.
2. Ran a force-directed simulation using D3.js to reposition the nodes.
3. Ensured the updated positions were still within the 1x1 coordinate space.
4. Created a simple HTML page to preview the layout and check the overall appearance.
5. Exported the new coordinates and captured screenshots of the final result.

Final Outcome

After running the simulation, the graph was much easier to read:

- Districts were evenly spaced with no overlaps.
- Connected districts were naturally grouped.
- The layout looked clean, balanced, and visually clear.

All updated node positions and layout screenshots are included in the GitHub repository for reference.