Algorithmic project: Color-Based Pathfinding Visualization on AI generated Images

Henry Marie MONT, Julian Rene LECLERC, Maxence Alain ROUCHOU

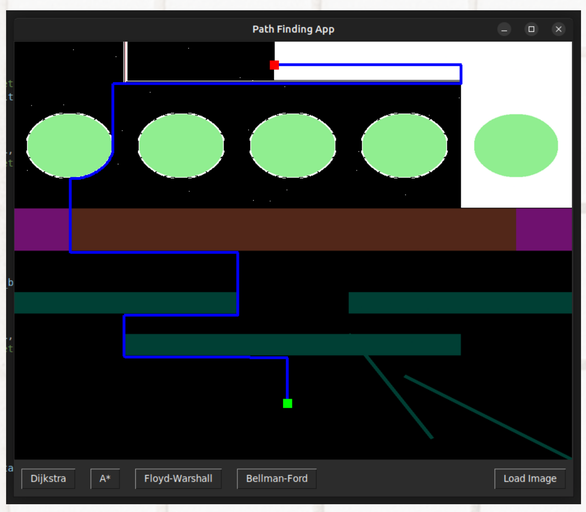
Objective

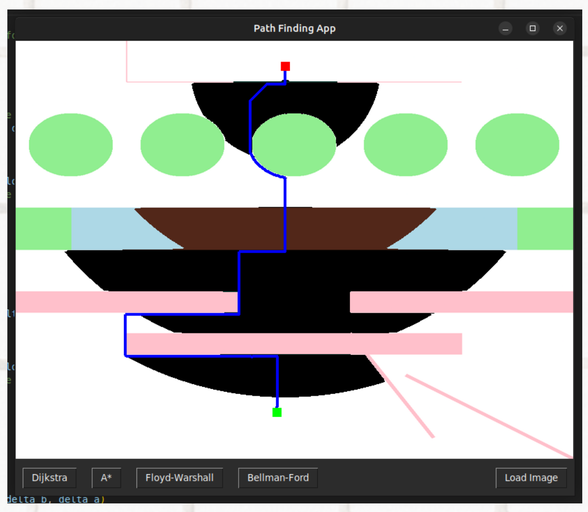
The objective is to develop a tool to calculate pathfinding on user-loaded images based on color variations. Trying to implement course knowledge to AI generated image, demonstrating the algorithms differences and hopefully providing interesting visuals.

Key features

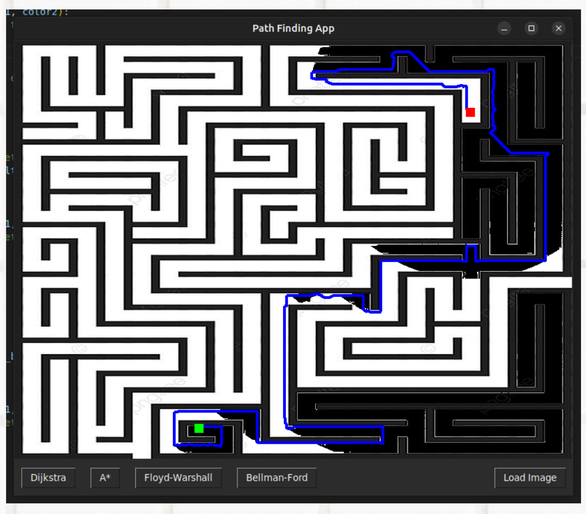
- Loading any image for pathfinding visualization.
- Selecting starting and ending points directly on the image.
- Choosing from multiple pathfinding algorithms like Dijkstra, A*, Floyd-Warschall, Bellman-Ford.
- Visualizing path found as a blue line and explored pixels as negative colors.
- Automatically calculating cost based on several distance metrics between pixels (euclidian distances, manhattan distances, chebyshev distances...)

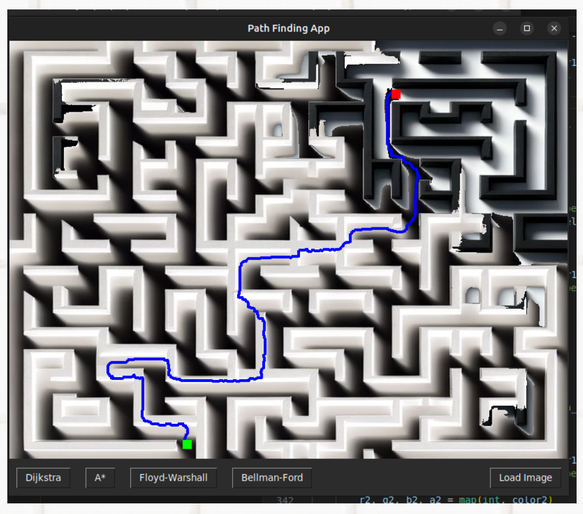
Results



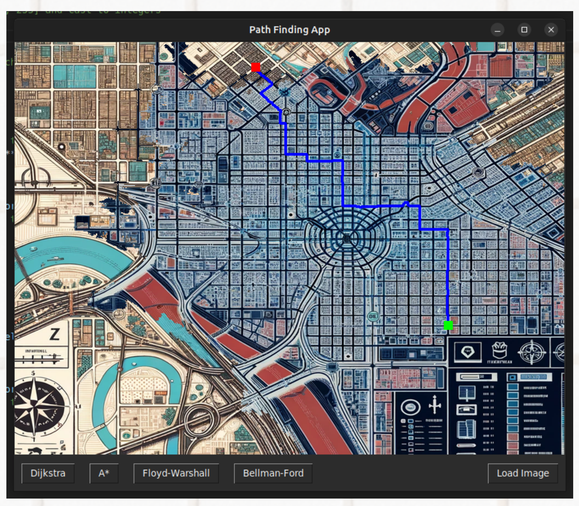


On the homework material, our pathfinding algorithm seem to be perfectly functional, except for the very thin line of colour that A* ignored (probably because of the heuristic prevailing). We can clearly see that Dijkstra (left) explored way more nodes than A* (right).

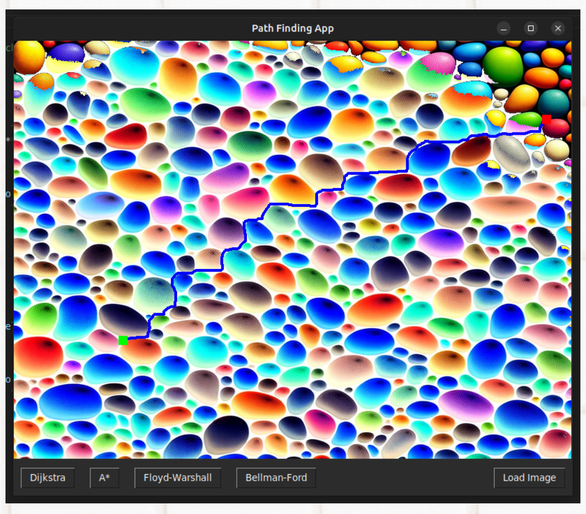


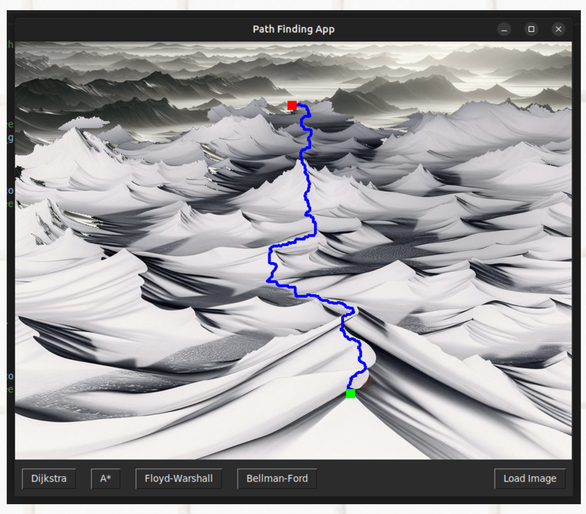


The tool is functional on mazes too, but only with well defined walls. Gradients and shadows will disturb the algorithm which will easily go through walls as the color variation is more progressive.



We then tried the algorithm on city maps generated by DALLE. We get worst results on the left because the algorithm uses the “skyline” of buildings as path. But on the top-down view on the right, we get a perfect path. We can also notice that the more complex the image is, the more expensive it gets with way more nodes explored.





Finally we experimented on pattern and landscapes generated by DALLE. Getting funny results with the algorithm going around the pebbles or following the crest of the dunes.

Conclusion

Our project has successfully demonstrated the practical application and efficacy of various pathfinding algorithms in a visually engaging manner. By loading images and visualizing paths based on color variations, the tool has provided insightful and interesting visuals, giving way to an intersection of algorithmic theory and AI-generated art.