**Summary: Plotter Simulator Project**

GitHub [repository](https://github.com/yaofuzhou/plotter_simulation).

[Project Structure](https://github.com/yaofuzhou/plotter_simulation/tree/main?tab=readme-ov-file#project-structure).

Algorithms implemented:

* + Brute Force
  + Greedy Algorithm with Grid Search (good for large N)
  + KD Tree Nearest Neighbor (mentioned briefly during the interview)
  + R Tree Nearest Neighbor (mentioned briefly during the interview)

See [algorithm.py](https://github.com/yaofuzhou/plotter_simulation/blob/main/algorithms.py) for implementations.

Simulator modes:

* + Direct – Pen moves in an arbitrary direction with a set speed.
  + Independent – X & Y arms move independently, each with an identical speed limit. For motion in non-45-degree directions, one arm needs to slow down to accommodate the overall direction.

Scenarios simulated:

* + Random segments
  + Random segments with end points near the edges of the canvas
  + A smiley face

Simulation animations uploaded to my [Dropbox](https://www.dropbox.com/scl/fo/ughse2yu44cwxw94uz3pl/AKn9OAs4sIPL_fcmNy-Cm70?rlkey=v0hdzp3je3p6fobokerhlrk4j&st=s7p14ptt&dl=0) for easier viewing, also available on [GitHub](https://github.com/yaofuzhou/plotter_simulation/tree/main/output/animations/combined_for_comparison).

* The filenames denote the scenario simulated and the simulator mode.
* Helped me identify a significant bug in implementing the nearest neighbor search.

Visualizations of plotter instructions from algorithms uploaded to [GitHub](https://github.com/yaofuzhou/plotter_simulation/blob/main/output/KD%20Tree%20Nearest%20Neighbor_visualization.png). Navigate to [plotter\_simulation/output/](https://github.com/yaofuzhou/plotter_simulation/blob/main/output/) for more.

Performance comparisons (see next page):

* Based on the “random segments” scenario.
* Efficiency becomes higher when endpoints are only near the margins.

[A graph of different lines

AI-generated content may be incorrect.](https://github.com/yaofuzhou/plotter_simulation/blob/main/output/algorithm_path_comparison.png)

[A graph of different colored bars

AI-generated content may be incorrect.](https://github.com/yaofuzhou/plotter_simulation/blob/main/output/algorithm_comparison.png)