Project Proposal: Interactive kd-tree Implementation

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Abstract

A kd-tree is a popular binary-tree datastructure used in many applications such as range-search and nearest-neighbor search. The algorithm to build a kd-tree partitions *k* dimension input space based on the median points in the spacial frame. This type of data-structure makes searching for points in space an average $O(logn)$ algorithm.

1 Project Idea

We propose to implement an interactive 2D kd-tree application. The user will be able to click a set of points in a 2D input space, after which the application will visualize the kd-tree partitions and the tree itself. The user will also be able to draw a bounding box on the screen to capture points in the plane. Performance time will be a metric

We will also implement methods to generate a large, uniformly distributed set of points for input to the kd-tree implementation. On top of that, we will analyze and build a plot for analyzing the performance of the kd-tree range search vs the brute force approach. We will report on the N values that show a significant improvement in performance over the brute-force approach.

2 Software

We plan for this to be a Java applet so that the kd-tree construction could be visualized by the user. For the large-N analysis plot, we may use Python.

References

[1] H. M. Kakde. Range searching using kd tree. pp. 1-12, 2005Range searching using kd tree. pp. 1-12, 2005