COMP 4202

Computational Aspects of Geographic Information Systems

Testing the Performance of Various **Spatial Indexing Algorithms** for Geographic Information Systems

Implementing and comparing the time complexity and efficiency of different data structures for spatial indexing in Geographic Information Systems. The different data structures to be used are: R-tree, Quadtree, Geohash, and KD-tree.

4th Year Project Proposal   Carleton University, Winter 2024

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Overview

To define, a spatial index is a type of data structure that aims to improve the performance of searching and retrieving data based on spatial queries. This project will implement 4 common spatial index data structures and compare their time complexities and efficiency.

Datasets

Esri Open Data Hub
Shapefile data can be collected into the 4 data structures to be tested and analyzed

Data Structures

R-Trees
Supports points, lines, and polygons as a tree-based data structure

Quadtrees
Supports points and polygons as a tree-based data structure

Geohashes
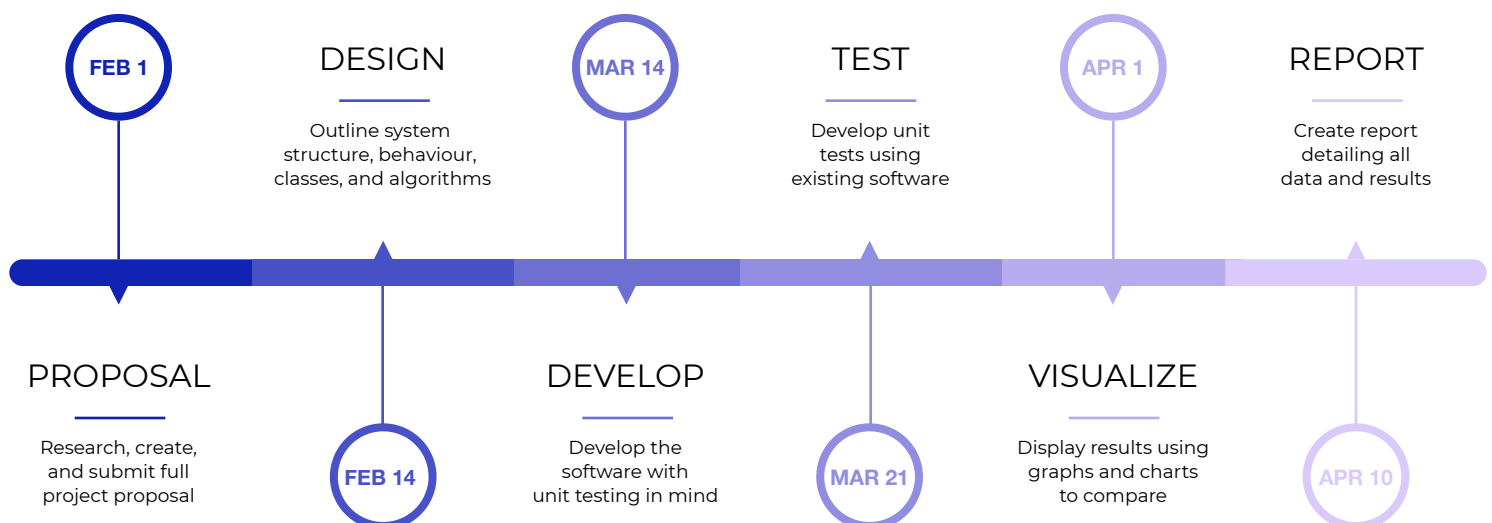Supports points as a grid-based data structure

KD-Tree
Supports points as a binary tree data structure

Resources*

mapscaping.com
naturalearthdata.com
hub.arcgis.com
postgis.net

Project Timeline

FEB 1

DESIGN
Outline system structure, behaviour, classes, and algorithms

MAR 14

TEST
Develop unit tests using existing software

APR 1

REPORT
Create report detailing all data and results

PROPOSAL
Research, create, and submit full project proposal

FEB 14

DEVELOP
Develop the software with unit testing in mind

MAR 21

VISUALIZE
Display results using graphs and charts to compare

APR 10

* Not a definitive list of finalized resources, any future resources will be included on the final report