**Programming Project Report**

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**Academic Integrity Statement:** I pledge that I have neither given nor received unauthorized help on this programming assignment.

**Problem Statement:**

The goal of this programming assignment was to replicate a geographic information system (GIS). The GIS lets users view maps centered on specific addresses, with road or nearby sites of interest displayed. The GIS must answer two questions (1) what is the location (latitude and longitude) of a specific street address? (2) what addresses are within distance of a specified location? The inputs of this program will be the address you want to search in the recursive binary search function, house number and street name are what are being searched. For the iterative binary searches the location vector to find the address location for a specified distance. Error handling was implemented a lot in the binary search functions, without error handling the function would not work correctly and would be stuck in an infinite loop.

**Design:**

This project was designed in 4 separate tasks. (1) read and store GIS information, the program should be reading information form the address.txt file and fill it into a vector. The data we are obtaining is the latitude, longitude, house number, and the street name. The Address class has all the constructors, destructors, and prints necessary to read the address.txt file. (2) the project requires searching an address by using recursive binary search to search the vector. we should first check if the file that we read into is all in a structured order, if the search cannot find the target value, then the program return the closest address, in this case it would be the last location looked at. (3) using binary search to find nearby locations. This iterative function uses the location.txt to print all addresses that are within a specified distance D of location (A,B). (4) Finally, once our functions are all working, I implemented a menu system to perform the two searches, each option will allow you to input the correct parameters either a street address, or a latitude, longitude, and distance.

The data structure I used to input all the read file into was a vector instead of using a traditional array, or linked list. The reasoning for this was to make sure that the container has enough space to input the data. The project creates 2 vectors to store the address.txt and location.txt respectively.

**Implementation:**

Originally the program was reading the full address with the house number included but was not reading correctly. I then split up the function parameter to read in the address number and then the street name. The recursive binary search works by first finding the street name that we are supposed to find, once found we search again but this time only the address number between the address’ with the same name. The development of this project was split between the four tasks. There are always improvements to be don’t between the tasks, so revision was always a possibility throughout the project. For iterative binary search the user inputs latitude and longitude and the distance to be search. To do this the distance is calculated by using the dist function to find the Euclidean distance.

**Testing:**

I tested the code by using cout to check the variable changes throughout the program. I was originally hard coding my search results until I figured out how my recursive binary search works correctly. I then implemented my menu system so that it can prompt user every time they want to search for an address. When my code was not working as expected I reviewed my code and used cout statement to help me debug the code until it worked as expected.

**Sample Input/Output:**

**<><><><><><><><><><><><><><><><><><><>**

**Welcome to Google Maps!!!**

**The number of address' stored in the vector is: 33129**

**The number of locations' stored in the vector is: 33129**

**<><><><><><><><><><><><><><><><><><><>**

**1. Search for an address**

**2. Search to find nearby location**

**3. To exit the program**

**Please Select an option: 1**

**Please input an address to search: 67 Summerhouse Ln**

**The address to search for is: 67 Summerhouse Ln**

**-=-=-=-=- Found the house address! -=-=-=-=-**

**Latitude: 36.0473**

**Longitude: -94.152**

**House Number: 67**

**Street Name: Summerhouse Ln**

**<><><><><><><><><><><><><><><><><><><>**

**Welcome to Google Maps!!!**

**The number of address' stored in the vector is: 33129**

**The number of locations' stored in the vector is: 33129**

**<><><><><><><><><><><><><><><><><><><>**

**1. Search for an address**

**2. Search to find nearby location**

**3. To exit the program**

**Please Select an option: 2**

**Please input a location lat1 to search address': 36.0473**

**Please input a location lon1 to search address': -94.1611**

**Please input a location lat2 to search address': 36.05**

**Please input a location lon2 to search address': -94.1779**

**0.00270081 0.0167999**

**There was 0 within the specified distance**

**<><><><><><><><><><><><><><><><><><><>**

**Welcome to Google Maps!!!**

**The number of address' stored in the vector is: 33129**

**The number of locations' stored in the vector is: 33129**

**<><><><><><><><><><><><><><><><><><><>**

**1. Search for an address**

**2. Search to find nearby location**

**3. To exit the program**

**Please Select an option: 3**

**Thank you for using Google Maps!!!**

**ending program**

**Conclusions:**

The result of this assignment helped me develop my skills in binary search. The programming project was a success at finding search results with recursive binary search. What I would do differently would be to implement my functions into my address.cpp file and have them be called in my main. The project took around a week to complete. The implantation of this program is very useful and can be used in various programs that are related to GPS, one of the most used information systems in the world.