**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 project is to demonstrate my knowledge of different sorting algorithms. I will be using two different sorting algorithms. The first sorting algorithm is using selection sort. The second sorting algorithm is using merge sort. The values that I will be sorting is a vector of objects, there will be 8 ways to sort the vector based on the different attribute values of the object.

The input of the program begins with a basic menu where the user can read a .txt file or .csv file in this case we are using a real estate database. In addition, the user can choose to print out the vector db of the real estate objects. Finally, the user can choose to sort the vector by specified attribute values. The output of the program is shown when the user decides to write the vector into a .txt or .csv file. The output should show the vector db sorted out as how the user specified the program to do it indie of the specified .txt or .csv file.

The error handling for this project was used when the user incorrectly inputs an option either on the main menu or on the sorting selection menu. The program menu repeats back to the user if they do choose an unavailable option. I have also implemented a “go back to main menu” option when the user is inside of the sort selection switch statement. This way they can decide which way they want to sort the data in case they make a mistake.

**Design:**

The design decision that I have made was to first create a RealEstateDB class that contains the vector to store the different data from each address that is read. The data structure that I used was a vector of objects that store 10 attributes each that are being used to sort the vector. The menu provides the functions that the user needs to read, write, and sort the data. The sort functions are placed in a nested switch statement inside the main menu. After I have sorted the vector, I have made sure that after the data is written into the .txt or .csv file that the vector is wiped out of information that way there Is no extra data that is stored into the vector that can be passed into the file the user wants to write into.

The algorithms that I used was selection sort and merge sort, these were used to correctly sort the vector. The reason I used these algorithms was that selection sort treats the input as two parts, a sorted part, and an unsorted part, and repeatedly selects the proper next value to move from the unsorted part to the end of the sorted part. The reasoning for the merge sort algorithm was that it divides the list of houses into two halves, recursively sorts each half, and then merges the sorted halves to produce a sorted list. The runtime for selection sort is O(N^2) and the runtime for merge sort is O(NlogN).

**Implementation:**

The implementation process for this project was to break down my code in the following five files: real\_estate.h, real\_estate.cpp, real\_estate\_db.h, real\_estate\_db.cpp, main.cpp. The sample code I used for this project was provided in the project5 files. In addition, I borrowed the sorting algorithm code from sort.cpp file in the sample code from Dr.Gauch. I extended the code by adding a readTxt(), readCsv(), writeTxt(), writeCsv(), and Print() function to the db class. I used the code from the main function which had the read and write file and moved it into the real\_estate\_db class function.

To demonstrate out the sorting algorithms I have split the functions into 4 selection sorts: HouseNum, ZipCode, Price, and NumBeds. The other half is using merge sort which would be sorted by NumBaths, SqFt, and LotSize. The user can choose these options to sort the vector to display it onto the file they have decided on, either a .txt or .csv. The development timeline for this program took about five days to figure out and debug.

**Testing:**

The way I tested this program was to provide a menu system where the user can select the different sorting functions and they can review if the sorting is correct by printing out the current vector with the Print() function that I made in the real\_estate\_db class.

The inputs I used for this program was first to decide which files to read in the information, then I decide on how I want to sort the vector, once that is done, I go back to the main menu where I can write the newly sorted vector onto a new .txt or .csv file. There were no special cases needed in this program because I have predetermined what I want to sort by with the switch statement in the program. The algorithms worked as expected. The Print() function helped by showing the current version the vector is storing all the real\_estate object values.

**Conclusions:**

The overall result of the assignment produced the correct output which was displayed by looking at the .txt or .csv file that the user has chosen. What I would do differently next time would be to figure out how to sort it by the house street name, this was a stump in my project progress as it is a string type and not an int. The project took around 5 days complete; this programming project was a success and will be a good reference for the future when looking back on how to do beginning algorithms.

**Sample Code:**

//------------------------------------------------------------------

// Selection sort algorithm

//------------------------------------------------------------------

void RealEstateDB::SelectionSortHouseNum()

{

int low = 0;

int high = houses.size() - 1;

// Put largest unsorted value at end of sorted list

for (int last = high; last > low; last--)

{

// Find index of largest value in unsorted array

int largest = low;

for (int index = low + 1; index <= last; index++)

if (houses[index].getHouseNum() > houses[largest].getHouseNum())

largest = index;

// Swap with last element in unsorted array

RealEstate temp = houses[last];

houses[last] = houses[largest];

houses[largest] = temp;

}

}

//-----------------------------------------------------------

void RealEstateDB::writeCsv()

{

// write to a .csv file

// Open output file

string fileName;

ofstream dout;

cout << "Which .csv file would you like to write to?" << endl;

cin >> fileName;

dout.open(fileName);

if (dout.fail())

cout << "Error!, input not recognized" << endl;

// Loop writing houses

for (int i = 0; i < houses.size(); i++)

houses[i].write\_csv(dout);

dout.close();

}

**Sample Output:**

edgaralcocer@edgars-mbp CSCE 2014 Project 5 % g++ -Wall \*.cpp -o main.exe; ./main.exe

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 11

Error!, please select an option between 1-7

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 1

Which .txt file would you like to read?

houses\_small.txt

Successfully read .txt data and transfered to vector!

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 6

1. Sort by house number

2. Sort by zipcode

3. Sort by price

4. Sort by number of beds

5. Sort by number of bathrooms

6. Sort by square footage

7. Sort by lot size

8. Go back to MAIN MENU

Selection: 3

Selection Sort by Price

Successfully Sorted the Data!

1. Sort by house number

2. Sort by zipcode

3. Sort by price

4. Sort by number of beds

5. Sort by number of bathrooms

6. Sort by square footage

7. Sort by lot size

8. Go back to MAIN MENU

Selection: 8

Going back to main menu

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 5

Printing out the current vector

HouseNum: 506

Street: W Whillock St

City: Fayetteville

State: AR

ZipCode: 72701

Price: 300000

Bed: 3

Bath: 2

SqFt: 1728

LotSize: 5.96

HouseNum: 2746

Street: N Ashbrook Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 301000

Bed: 3

Bath: 2

SqFt: 1689

LotSize: 0.18

HouseNum: 410

Street: Jay Ave

City: Fayetteville

State: AR

ZipCode: 72727

Price: 306000

Bed: 3

Bath: 2.5

SqFt: 1988

LotSize: 0.46

HouseNum: 4287

Street: W Divide Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 315000

Bed: 3

Bath: 2

SqFt: 1615

LotSize: 0.17

HouseNum: 2332

Street: N Old Wire Rd

City: Fayetteville

State: AR

ZipCode: 72703

Price: 315000

Bed: 3

Bath: 1

SqFt: 1246

LotSize: 0.33

HouseNum: 1009

Street: S Happy Hollow Rd

City: Fayetteville

State: AR

ZipCode: 72701

Price: 324900

Bed: 3

Bath: 1

SqFt: 874

LotSize: 0.31

HouseNum: 2196

Street: N Winwood Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 325000

Bed: 3

Bath: 2

SqFt: 1625

LotSize: 0.25

HouseNum: 4239

Street: W Marlowe Ln

City: Fayetteville

State: AR

ZipCode: 72704

Price: 330000

Bed: 4

Bath: 3.5

SqFt: 1756

LotSize: 0.1

HouseNum: 4415

Street: W Bell Flower Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 345000

Bed: 4

Bath: 3.5

SqFt: 2358

LotSize: 0.44

HouseNum: 6115

Street: W Limerick Way

City: Fayetteville

State: AR

ZipCode: 72704

Price: 349900

Bed: 3

Bath: 2.5

SqFt: 1825

LotSize: 0.2

HouseNum: 420

Street: N Lone Jack Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 350000

Bed: 3

Bath: 2

SqFt: 2042

LotSize: 0.21

HouseNum: 1415

Street: W Mount Comfort Rd

City: Fayetteville

State: AR

ZipCode: 72703

Price: 350000

Bed: 3

Bath: 1.5

SqFt: 1444

LotSize: 0.47

HouseNum: 541

Street: N Sabine Pass Rd

City: Fayetteville

State: AR

ZipCode: 72704

Price: 365000

Bed: 4

Bath: 2.5

SqFt: 2000

LotSize: 0.18

HouseNum: 4381

Street: W Lofty Wood Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 389000

Bed: 3

Bath: 2.5

SqFt: 2255

LotSize: 0.26

HouseNum: 833

Street: E Birwin Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 389000

Bed: 3

Bath: 2.5

SqFt: 1917

LotSize: 0.21

HouseNum: 792

Street: W Foothills Dr

City: Fayetteville

State: AR

ZipCode: 72701

Price: 389000

Bed: 5

Bath: 2.5

SqFt: 2562

LotSize: 0.29

HouseNum: 4696

Street: W Marble Ridge Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 395000

Bed: 3

Bath: 2

SqFt: 2144

LotSize: 0.2

HouseNum: 18431

Street: Phelps Cir

City: Fayetteville

State: AR

ZipCode: 72704

Price: 399000

Bed: 5

Bath: 2

SqFt: 2359

LotSize: 0.53

HouseNum: 3089

Street: N Dorchester Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 399900

Bed: 4

Bath: 3.5

SqFt: 2291

LotSize: 0.62

HouseNum: 14214

Street: Round Mtn Community Rd

City: Fayetteville

State: AR

ZipCode: 72701

Price: 415000

Bed: 4

Bath: 2.5

SqFt: 2143

LotSize: 1.53

HouseNum: 20

Street: E Willoughby Rd

City: Fayetteville

State: AR

ZipCode: 72701

Price: 439000

Bed: 3

Bath: 2

SqFt: 2527

LotSize: 2.63

HouseNum: 939

Street: E Oaks Manor Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 445000

Bed: 3

Bath: 2

SqFt: 2299

LotSize: 0.35

HouseNum: 95

Street: S Duncan Ave

City: Fayetteville

State: AR

ZipCode: 72701

Price: 450000

Bed: 3

Bath: 1.5

SqFt: 1853

LotSize: 0.25

HouseNum: 3708

Street: N Lalique Ln

City: Fayetteville

State: AR

ZipCode: 72704

Price: 455000

Bed: 4

Bath: 2.5

SqFt: 2652

LotSize: 0.26

HouseNum: 4770

Street: N Brandywine Dr

City: Fayetteville

State: AR

ZipCode: 72764

Price: 474900

Bed: 3

Bath: 2.5

SqFt: 2873

LotSize: 0.41

HouseNum: 3248

Street: E Charing Cross

City: Fayetteville

State: AR

ZipCode: 72703

Price: 475000

Bed: 3

Bath: 2

SqFt: 2629

LotSize: 0.19

HouseNum: 614

Street: N Rockcliff Rd

City: Fayetteville

State: AR

ZipCode: 72701

Price: 499900

Bed: 4

Bath: 3

SqFt: 3254

LotSize: 0.54

HouseNum: 3768

Street: N Belfast Pl

City: Fayetteville

State: AR

ZipCode: 72704

Price: 510000

Bed: 4

Bath: 3

SqFt: 2921

LotSize: 0.43

HouseNum: 3744

Street: W Dahlia Way

City: Fayetteville

State: AR

ZipCode: 72704

Price: 534750

Bed: 5

Bath: 3

SqFt: 2838

LotSize: 0.29

HouseNum: 2443

Street: N Hosta Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 534900

Bed: 5

Bath: 3.5

SqFt: 2920

LotSize: 0.24

HouseNum: 2573

Street: N Glenmoor Dr

City: Fayetteville

State: AR

ZipCode: 72704

Price: 549000

Bed: 4

Bath: 3.5

SqFt: 3474

LotSize: 0.23

HouseNum: 2348

Street: Riverfront Ln

City: Fayetteville

State: AR

ZipCode: 72703

Price: 580000

Bed: 4

Bath: 3.5

SqFt: 3086

LotSize: 1

HouseNum: 5327

Street: W Jess Anderson Rd

City: Fayetteville

State: AR

ZipCode: 72704

Price: 585225

Bed: 4

Bath: 2.5

SqFt: 2601

LotSize: 1.32

HouseNum: 1827

Street: N Candleshoe Dr

City: Fayetteville

State: AR

ZipCode: 72701

Price: 589000

Bed: 4

Bath: 3.5

SqFt: 3641

LotSize: 0.22

HouseNum: 3312

Street: E Zion Rd

City: Fayetteville

State: AR

ZipCode: 72764

Price: 599900

Bed: 4

Bath: 3.5

SqFt: 2450

LotSize: 3.73

HouseNum: 3433

Street: E Township St

City: Fayetteville

State: AR

ZipCode: 72703

Price: 625000

Bed: 4

Bath: 3

SqFt: 3550

LotSize: 0.28

HouseNum: 1588

Street: N Desoto Pl

City: Fayetteville

State: AR

ZipCode: 72703

Price: 642500

Bed: 3

Bath: 2.5

SqFt: 2186

LotSize: 0.21

HouseNum: 1867

Street: Chukker Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 699000

Bed: 4

Bath: 3.5

SqFt: 3481

LotSize: 1.66

HouseNum: 2927

Street: E Pebblestone Dr

City: Fayetteville

State: AR

ZipCode: 72701

Price: 740000

Bed: 5

Bath: 4

SqFt: 3808

LotSize: 0.38

HouseNum: 2587

Street: N Firewood Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 775000

Bed: 4

Bath: 3.5

SqFt: 3944

LotSize: 0.6

HouseNum: 658

Street: Winding Spring Dr

City: Fayetteville

State: AR

ZipCode: 72703

Price: 795000

Bed: 4

Bath: 4.5

SqFt: 4600

LotSize: 2.01

HouseNum: 2174

Street: Riverfront Ln

City: Fayetteville

State: AR

ZipCode: 72703

Price: 815000

Bed: 4

Bath: 3

SqFt: 4285

LotSize: 1

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 4

Which .csv file would you like to write to?

houses\_small.csv

Successfully written vector data to .csv file!

Welcome to Projet 5

<><><><><><><><><><><><><><><><><><><>

1. Read a .txt file

2. Read a .csv file

3. Write to a .txt file

4. Write to a .csv file

5. Print out vector db of houses

6. Sort the vector list

7. Exit the Program

Selection: 7

Thank you for using Project 5