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Data Structures

Project 2

Summary

The purpose of this project was to analyze the difference in run time for clock ticks between a map and an unordered map. This project implemented vectors, maps, unordered maps, and other degenerate data structures learned in class. The input data was a collection of employees, their salaries, and their department numbers.

Manifest

- .gitignore – file to ignore the build folder in github
- Employee.cpp - employee class file
- Employee.h - employee class header file
- records.dat – provided data file
- records2.dat - provided data file
- empdriver.cpp – file that has main function and clock implementation
- empmaps.cpp – file that reads the data, sorts the maps, and prints the map and unordered maps
- empmaps.h – header file, contains function prototypes for empmaps.cpp

Analysis

a. **What is the runtime in clock ticks when creating the ordered map and unordered map with the department as the key and why do you think there are differences between these two times?**

   With 99999 employees, the runtime in clock ticks for creating an ordered map was 94 ticks. The runtime for creating an unordered map was 63 ticks. Sorting for an algorithm that is not already sorted takes longer. This is why I believe that the map takes more ticks than the unordered map.

b. **What is the runtime in clock ticks when creating the ordered map and unordered map with the salary range as the key and why do you think there are differences between these two times?**

   With 99999 employees. the runtime in clock ticks for creating an ordered map by salary ranges was 46 ticks. The runtime for creating an unordered map by salary ranges was 31 ticks. The reason is the same as before. I have also included a printout of the executed code.

c. **Run your code using the records2.dat file. Each record from the records.dat file is duplicated in this records2.dat file. Explain the output of your code. That is, if you get the same output as when you ran your code against the records.dat file, note this and explain why the output is the same. If the output is different, explain why it is different.**

The code output was not the same as before. The runtime in clock ticks for creating an ordered map was 250 ticks for department and salary key. The runtime for creating an unordered map was 140 ticks for department and salary keys. The output is different because each map and unordered map has to work more in order to process the keys. The employee count also got larger (199998 employees).

Records.dat console output

```
Please enter the file name to process: records.dat
Number of employees: 99999
ORDERED Map creation with department as key clock ticks: 94
ORDERED Map number of departments: 8889
ORDERED Map creation with salary as key clock ticks: 46
ORDERED Map number of salary ranges: 16
ORDERED Map Salary Range 40000 contains 6308
ORDERED Map Salary Range 50000 contains 6243
ORDERED Map Salary Range 60000 contains 6334
ORDERED Map Salary Range 70000 contains 6128
ORDERED Map Salary Range 80000 contains 6392
ORDERED Map Salary Range 90000 contains 6273
ORDERED Map Salary Range 100000 contains 6222
ORDERED Map Salary Range 110000 contains 6009
ORDERED Map Salary Range 120000 contains 6217
ORDERED Map Salary Range 130000 contains 6400
ORDERED Map Salary Range 140000 contains 6263
ORDERED Map Salary Range 150000 contains 6241
ORDERED Map Salary Range 160000 contains 6212
ORDERED Map Salary Range 170000 contains 6162
ORDERED Map Salary Range 180000 contains 6334
ORDERED Map Salary Range 190000 contains 6261
ORDERED Map Salary Range with most employees: 130000 containing 6400 employees

UNORDERED Map creation with department as key clock ticks: 63
UNORDERED Map number of departments: 8889
UNORDERED Map creation with salary as key clock ticks: 31
UNORDERED Map number of salary ranges: 16
UNORDERED Map Salary Range 60000 contains 6334
UNORDERED Map Salary Range 160000 contains 6212
UNORDERED Map Salary Range 130000 contains 6400
UNORDERED Map Salary Range 100000 contains 6222
UNORDERED Map Salary Range 110000 contains 6009
UNORDERED Map Salary Range 180000 contains 6334
UNORDERED Map Salary Range 50000 contains 6243
UNORDERED Map Salary Range 190000 contains 6261
UNORDERED Map Salary Range 80000 contains 6392
UNORDERED Map Salary Range 70000 contains 6128
UNORDERED Map Salary Range 120000 contains 6217
UNORDERED Map Salary Range 150000 contains 6241
UNORDERED Map Salary Range 40000 contains 6308
UNORDERED Map Salary Range 170000 contains 6162
UNORDERED Map Salary Range 90000 contains 6273
UNORDERED Map Salary Range 140000 contains 6263
UNORDERED Map Salary Range with most employees: 130000 containing 6400 employees


Process returned 0 (0x0)   execution time : 10.026 s
Press any key to continue.
```

Record2.dat console output

```
Please enter the file name to process: records2.dat
Number of employees: 199998
ORDERED Map creation with department as key clock ticks: 156
ORDERED Map number of departments: 8889
ORDERED Map creation with salary as key clock ticks: 94
ORDERED Map number of salary ranges: 16
ORDERED Map Salary Range 40000 contains 12616
ORDERED Map Salary Range 50000 contains 12486
ORDERED Map Salary Range 60000 contains 12668
ORDERED Map Salary Range 70000 contains 12256
ORDERED Map Salary Range 80000 contains 12784
ORDERED Map Salary Range 90000 contains 12546
ORDERED Map Salary Range 100000 contains 12444
ORDERED Map Salary Range 110000 contains 12018
ORDERED Map Salary Range 120000 contains 12434
ORDERED Map Salary Range 130000 contains 12800
ORDERED Map Salary Range 140000 contains 12526
ORDERED Map Salary Range 150000 contains 12482
ORDERED Map Salary Range 160000 contains 12424
ORDERED Map Salary Range 170000 contains 12324
ORDERED Map Salary Range 180000 contains 12668
ORDERED Map Salary Range 190000 contains 12522
ORDERED Map Salary Range with most employees: 130000 containing 12800 employees

UNORDERED Map creation with department as key clock ticks: 94
UNORDERED Map number of departments: 8889
UNORDERED Map creation with salary as key clock ticks: 46
UNORDERED Map number of salary ranges: 16
UNORDERED Map Salary Range 60000 contains 12668
UNORDERED Map Salary Range 160000 contains 12424
UNORDERED Map Salary Range 130000 contains 12800
UNORDERED Map Salary Range 100000 contains 12444
UNORDERED Map Salary Range 110000 contains 12018
UNORDERED Map Salary Range 180000 contains 12668
UNORDERED Map Salary Range 50000 contains 12486
UNORDERED Map Salary Range 190000 contains 12522
UNORDERED Map Salary Range 80000 contains 12784
UNORDERED Map Salary Range 70000 contains 12256
UNORDERED Map Salary Range 120000 contains 12434
UNORDERED Map Salary Range 150000 contains 12482
UNORDERED Map Salary Range 40000 contains 12616
UNORDERED Map Salary Range 170000 contains 12324
UNORDERED Map Salary Range 90000 contains 12546
UNORDERED Map Salary Range 140000 contains 12526
UNORDERED Map Salary Range with most employees: 130000 containing 12800 employees
```