CSCE 221 Assignment 5 Cover Page

First Name Anders Last Name Wallace UIN 925000221

User Name awallace2 E-mail address awallace2@tamu.edu

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Type of sources				
People				
Web pages (provide URL)	www.stackoverflow.com			
Printed material				
Other Sources				

I certify that I have listed all the sources that I used to develop the solutions/codes to the submitted work.
On my honor as an Aggie, I have neither given nor received any unauthorized help on this academic work.

Your Name Anders Wallace Date 11/20/17

1 Description

1.1 Assignment Objective

The purpose of this assignment was to take data as an input from a file which contained various jobs with varying IDs, lengths, and priorities, and then insert them into a minimum priority queue by highest priority. After inserting all jobs, we had to run them for the specified length and output the info about the job as well as how long its running to a seperate file. In order to run the program, simply type the command:

```
g++ -std=c++14 *.cpp
```

and then type:

```
./a.out
```

2 CPU Simulator Description

2.1 Data Structures Implementation and Running Time

This assignment called for us to use a Minimum Priority Queue, and to implement this priority queue we used a binary heap class with the operations remove_min(), is_empty(), and insert(). Then for the priority queue we used the same functions, as well as some extras in order to imlement various actions. We also implemented a comparator class and an item class to compare the items we were inserting by element (the priority) to know which ones to insert first. The binary heap and comparator class were templated to allow us to in theory insert items of different types, but for this assignment we were only dealing with integers.

The running time for these functions is as follows:
Priority Queue
insert(): $O(log(n))$
is_empty() : $O(1)$
remove_min(): $O(log(n))$

Binary Heap:
insert(): $O(log(n))$
is_empty() : $O(1)$
remove_min(): $O(log(n))$

3 Data Processing and Output

3.1 CPU Process

After reading in the data from a specified file, we then had to insert into the priority queue, assuring that they were in the correct order (highest priority first). In order to do this, we had a comparator class so we could compare the items being inserted. However, we also had the additional task of checking whether two jobs had the same priority, and if so, insert the job with the smaller ID. After all the jobs were correctly inserted, they were run by executing the current highest priority task and running it for its specified length. This was output to a seperate file, and after the job was finished, it was removed from the queue, and after this removal the queue would reorder itself, and then the next task was run. This continue until the queue was empty, then the program output "no more jobs waiting". Below are screenshots of the data before and after being read in and executed, as well as the actual starting of the program.

Before being run:

job ID	length	priority
41	4	13
8	9	15
99	8	5
59	6	-6
86	3	19
78	6	8
9	3	7
82	8	11
69	9	-7
65	8	-13
35	2	6
92	7	-12
62	10	1
17	5	10
52	4	3
66	3	11

After being run:

Job 11 with length 1 and priority -20
Job 57 with length 3 and priority -20
Job 57 with length 2 and priority -20
Job 57 with length 1 and priority -20
Job 88 with length 3 and priority -20
Job 88 with length 2 and priority -20
Job 88 with length 1 and priority -20
Job 6 with length 3 and priority -19
Job 6 with length 2 and priority -19
Job 6 with length 1 and priority -19
Job 56 with length 7 and priority -19
Job 56 with length 6 and priority -19
Job 56 with length 5 and priority -19
Job 56 with length 4 and priority -19
Job 56 with length 3 and priority -19
Job 56 with length 2 and priority -19
Job 56 with length 1 and priority -19
Job 12 with length 7 and priority -18
Job 12 with length 6 and priority -18
Job 12 with length 5 and priority -18
Job 12 with length 4 and priority -18

Running of the program:

```
[awallace2]@build ~/CSCE_221/Wallace-Anders-A5> (20:14:23 11/21/17)
:: ./a.out
Please enter the name of the file for reading in: DataSetSize10.csv

Jobs have been executed
```