

===Lab Info===

\* 100 points

\* Due 11:59pm on Sunday 11/15 for Monday lab and on Tuesday 11/17 for Wednesday lab.

==Assignment==

In this lab, you will implement and measure the time performance on two priority queue methods. In the first stage, you should implement min leftist heap and a min skew heap. Be sure that your implementations are correct, and then run the timing test.

For each value of  $n$ , randomly generate a total of  $n$  values between 1 and  $4n$ . There will be duplicate values, but that's OK. Use the following values of  $n$ : 50,000, 100,000, 200,000, and 400,000. For each  $n$ , start the timer, produce the data, build the priority queue, stop the timer, and record the time (in that order).

Apply five different seeds and calculate the average run time. **Mention the run time for the five different seeds in your report, and draw a graph for the average time for the two heap structures. Your plot should be of time versus  $n$ .** To ensure that the timing tests are "fair", you must use the same seed for the random number generator for each structure. For the third stage, you need to run the timing test for deletemin and insert, with the number of deletions and insertions being approximately 10% of the size of the heap.

Generate a random number  $x$  such that  $0 \leq x < 1$ .

If  $0 \leq x < 0.5$ , perform a deletemin operation.

If  $0.5 \leq x < 1$ , generate a random integer  $y$  such that  $1 \leq y \leq 4n$  and insert  $y$ .

Repeat this process for five different seeds (i.e., the seeds that you used for building the heap). **Mention the time for five different seeds in your report, and draw a graph for the average time (time versus number of insertion and deletion) for the two heap structures.**

Submit a report which discusses:

- (1) The overall organization of your experiment,
- (2) Data generation,
- (3) Summary of results (CPU timing)
- (4) Observations and conclusion.

**Important: Your Lab8 folder should consist of 4 items**

**1- Leftist Heap folder**

**2- Skew Heap folder**

### 3- Timing folder

#### 4- report (in pdf format)

In the Leftist Heap (Skew Heap) folder, you should include your Leftist Heap (Skew Heap) code and its makefile and data.txt. The structure should be like that of the previous labs, i.e., the heap will be made using data.txt. Then a simple user interface should be created like below:

Please choose one the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

===Output===

Leftist Heap:

data.txt elements : 4 3 7 9 2 6 1 5 8 10 11

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

> 5

level order:

1

2 5

3 6 8 10

4 7 11

9

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

> 2

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

> 5

level order:

2

3 5

4 7 8 6

9 10

11

.....

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4-inorder

5-levelorder

6-end

>2

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

>3

preorder: 3 5 6 10 11 7 9 8 4

.....

Please choose one of the following commands:

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3-preorder

4-inorder

5-levelorder

6-end

>5

level order:

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level order:

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level order:

6

7 10

9 8 11

.....

Please choose one of the following commands:

1-insert

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3-preorder

4-inorder

5-levelorder

6-end

>6

.....

.....

Skew Heap:

data.txt elements : 4 3 7 9 2 6 1 5 8 10 11

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

> 5

level order:

1

2 5

6 3 10

11 7 4

8 9

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder



4-inorder

5-levelorder

6-end

> 2

.....

Please choose one of the following commands:

1-insert

2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

> 5

level order:

2

3 6

4 7 11

5 9 8

10

.....

Please choose one of the following commands:

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2-deletemin

3-preorder

4-inorder

5-levelorder

6-end

>2

.....

Please choose one of the following commands:

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2-deletemin

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5-levelorder

6-end

>3

preorder: 3 6 7 8 11 4 5 10 9

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level order:

3

6 4

7 11 5 9

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.....

Please choose one of the following commands:

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5-levelorder

6-end

>5

level order:

4

6 5

9 7 10

11 8

.....

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level order:

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5-levelorder

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>6

===Files===

\* Files to include in folder:

\*\* all source files (Leftist Heap folder - Skew Heap folder - Timing folder)

\*\* a functioning makefile

\*\* data.txt

\*\* report.pdf

\* Folder name: Lastname\_Lab9

\* Compressed file name: Lastname\_Lab9.zip (or rar or tar.gz)

\* Executable name: lab9