



HW7

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HW7

HW7 (Due on 11/10)

Maintain a keyword heap.

- A keyword is a triple [String name, Integer count, Double weight]
- Heap Order: $n.count \geq n.parent.count$
- Use `java.util.PriorityQueue`
 - <http://download.oracle.com/javase/1.5.0/docs/api/java/util/PriorityQueue.html>
<https://docs.oracle.com/javase/8/docs/api/java/util/PriorityQueue.html>
<https://docs.oracle.com/javase/8/docs/api/java/util/Comparator.html>
- Here's an example of a priority queue sorting by string length
- Reuse your code in HW4

Requirements

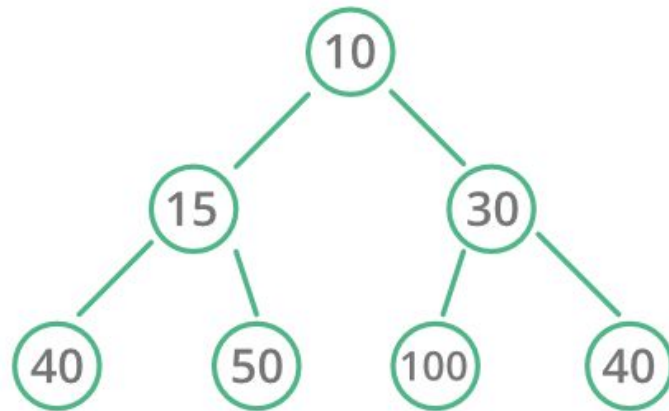
- Maintain a keyword heap
- Heap order

$n.count \geq n.parent.count$ (MIN-HEAP)

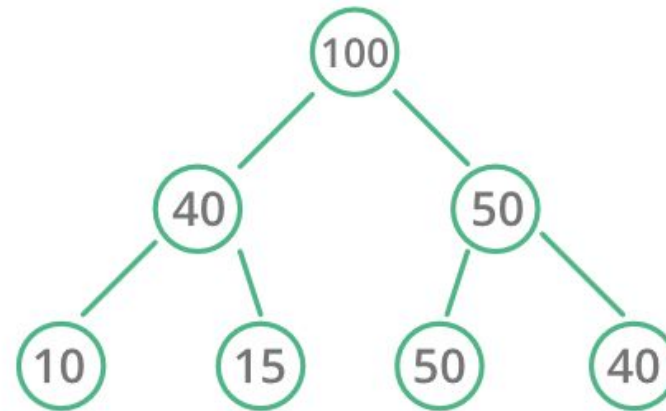
- For the heap structure, you can
 - Use `java.util.ArrayList`
 - `java.util.PriorityQueue`
 - Or develop it by yourself

Heap

Heap Data Structure



Min Heap



Max Heap



Operations

operations	description
<code>add(Keyword k)</code>	Insert a keyword <code>k</code> to the heap (use <code>offer()</code>)
<code>peek()</code>	Output the keyword with the minimal count (use <code>peek()</code>)
<code>removeMin()</code>	Return and remove the keyword of the root (the one with the minimal count) (use <code>poll()</code>)
<code>output()</code>	Output all keywords in order

Keyword

- A keyword is a tuple of [*String name, Integer count, Double weight*]
 - For example:

```
{  
    name: "Fang",  
    count: 3,  
    weight: 5.5  
}
```
- A keyword should output in format **[name, count, weight]** :
 - [Fang,3,5.5]

I/O Example: add

- To do: Insert a keyword $[k, c, w]$ to the heap in order
- Input:
 - Token1 : a constant “add”
 - Token2 : keyword name **k**
 - Token3 : keyword count **c**
 - Token4 : keyword weight **w**
 - EX: **add Fang 3 0.5**

I/O Example: peek

- To do: Output the keyword with the minimal count
- Input:
 - Token1 : a constant “peek”
 - EX: **peek**
- Output:
 - If heap is empty, then output “InvalidOperation”:
InvalidOperation
 - If it is legal to peek:
[NCCU,4,9.9]

I/O Example: removeMin

- To do: Output and Remove the keyword of the root
- Input:
 - Token1 : a constant “removeMin”
 - EX: **removeMin**
- Output:
 - If heap is empty, then output “InvalidOperation”:
InvalidOperation
 - If it is legal to remove:
[NCCU,4,9.9]

I/O Example: output

- To do: Output and Remove all the keywords in order (ascending)
- Input:
 - Token1 : a constant “output”
 - EX: **output**
- Output:
 - If heap is empty, then output “InvalidOperation”:
InvalidOperation
 - If heap is not empty:
[NCCU,4,9.9] [MIS,5,6.8] [DS,6,1.6]

Input file

- You need to read the sequence of operations from a txt file
- The format is firm
- Raise an exception if the input does not match the format

```
add Fang 3 1.2
add Yu 5 1.8
add NCCU 2 0.6
add UCSB 1 1.9
peek
add MIS 4 2.2
removeMin
add Badminton 1 0.6
output
```

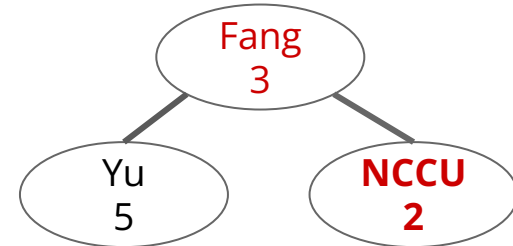
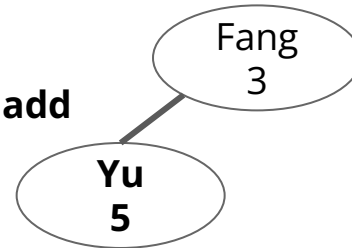
Keyword Heap

```
add Fang 3 1.2
add Yu 5 1.8
add NCCU 2 0.6
add UCSB 1 1.9
peek
add MIS 4 2.2
removeMin
add Badminton 1 0.6
output
```

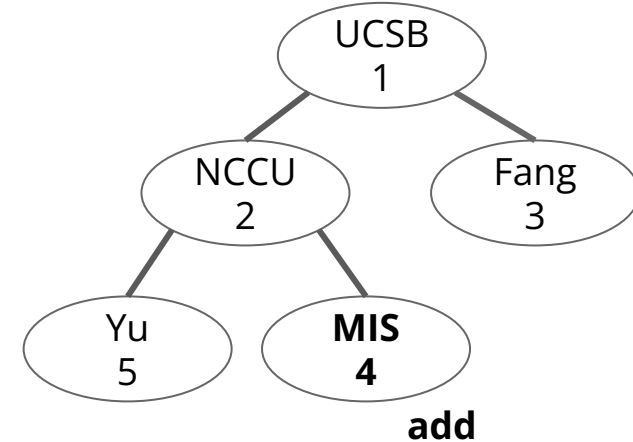
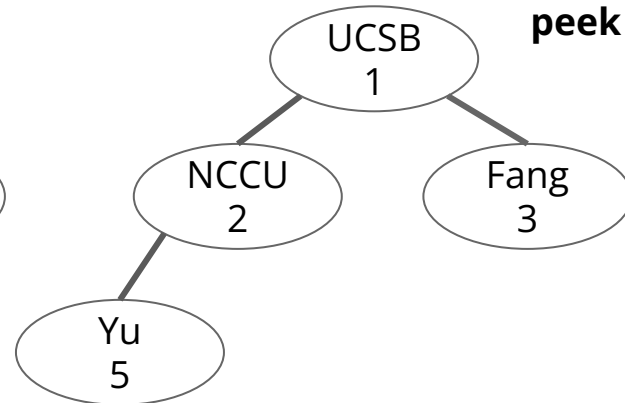
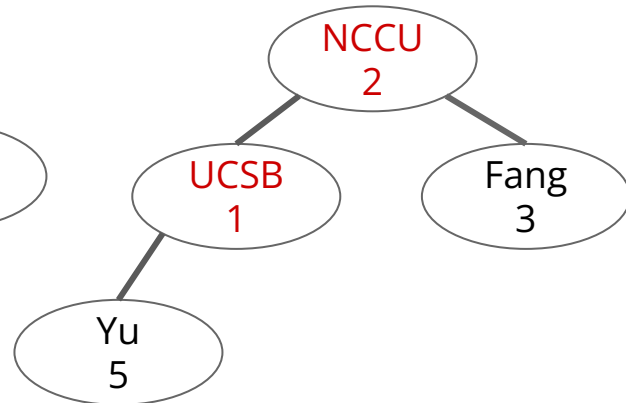
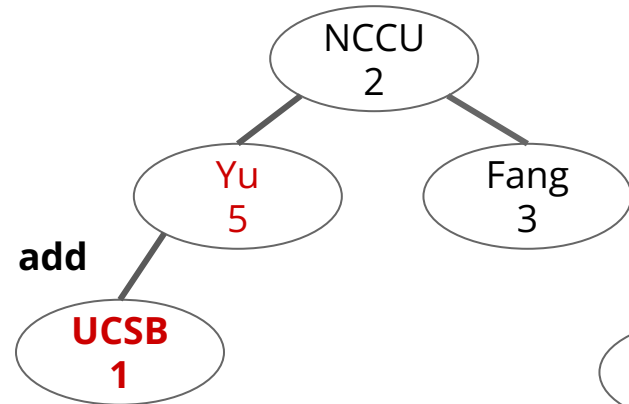
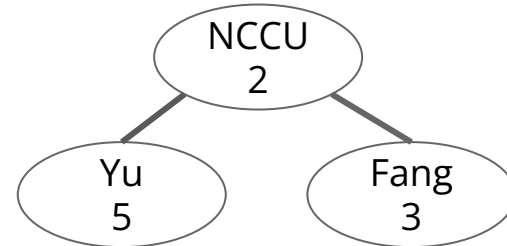
add



add

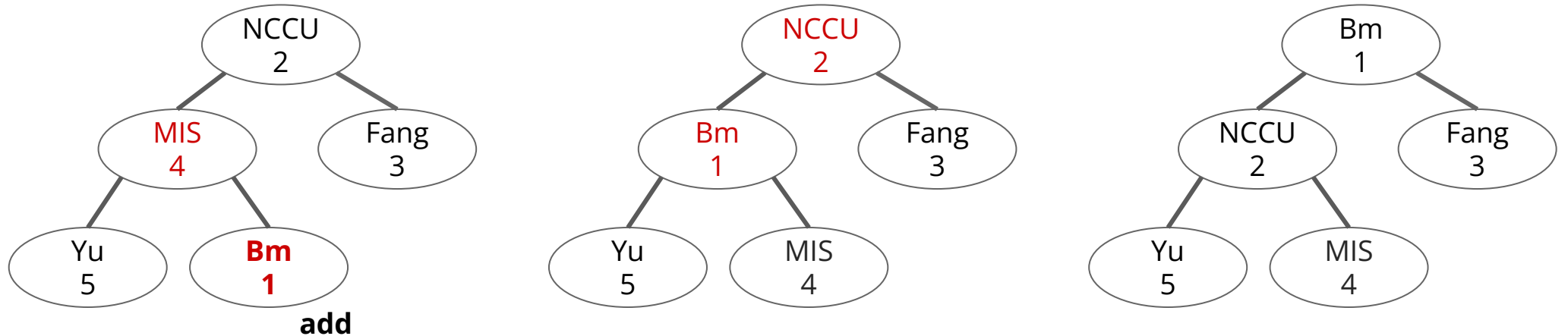
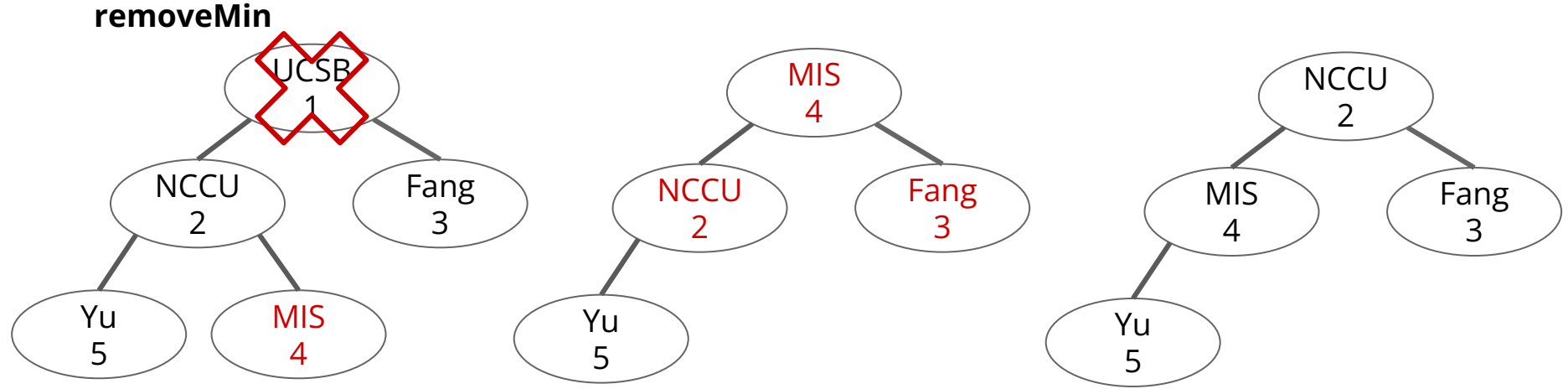


add



Keyword Heap

```
add Fang 3 1.2
add Yu 5 1.8
add NCCU 2 0.6
add UCSB 1 1.9
peek
add MIS 4 2.2
removeMin
add Badminton 1 0.6
output
```



Output

```
[UCSB,1,1.9]  
[UCSB,1,1.9]  
[Badminton,1,0.6] [NCCU,2,0.6] [Fang,3,1.2] [MIS,4,2.2] [Yu,5,1.8]
```