**COP 5536 Fall 2019**

Programming Project

Classes:

RisingCity.java

Building.java

BuildingProperties.java

MinHeap.java

RedBlackTree.java

Initialized variables ‘days’, maxBuildings , outputFile and ‘minHeap’. ‘days’ is number of ‘days’ which acts as globarTimer, maxBuildings is static and set to 2000 as mentioned in the problem statement, outputFile is also set to given name of the output file and our main minHeap with all null nodes while initializing.

1. In main, first args is checked to see if any value is passed for inputFile. If nothing is passed, an error message is printed and code exits.
2. Now the filename is read and if the file is found in the path, all the valid commands are read one after the other and stored into a list called ‘commandList’.
3. Once all the commands are stored in the list it is traversed to read one command after the other to execute in a for loop till all the commands are read and executed.
4. In the for loop we read two commands simultaneously. We call first command as currentCommand and the second command as nextCommand. This is done to know the time that the first and next commands are passed so the construction can be run for those many days without interruption till we get next command to be executed. In case we reach end of the list and there are no more commands left we make nextCommandTime as max value of integer so that we have a limit till when our construction should continue.
5. Next we start running from currentCommandTime till we reach nextCommandTime. During this, we first execute the command that has been asked.
6. If the command is ‘Insert’, insert operation is performed. First a check is made if there is already a buildingNumber present. If there is no building with the same buildingNumber, then it is added to a list called buildingList which acts as a queue. This is done so, new building does not disturb the ongoing construction in case it is inserted before the 5 days of construction of the building with least execution time. In case no builing is ongoing construction, then the building in the buildingList is inserted. (the list will have a maximum of 4 buildings as every 5 days a check is made if there are any new buildings in the queue and they are inserted and the list is emptied)
7. If it is ‘PrintBuilding’ we perform the print operation based on number of parameters in the printBuilding command. If the command contains ‘,’ method that prints between a range of buildingNumbers is called. If the command does not contain ‘,’ it means command is to print details of only a particular buildingNumber.
8. Before proceeding to construct the building, we first check if we have any completed building. If there is any, it is printed and deleted the same from red black tree.
9. Now the main construct operation is called. At the same time, it is checked if the construct method returns the number of a building. If it returns -1 it means the building on which construct was being performed did not complete(execution time did not reach total time). If it returns any number other than -1, the building number if printed along with the current day number only when there is no further command or when the next command is not ‘PrintBuilding’.

**Construct:**

1. The parameters passed in construct method are nextCommand, the buildingList which contains list of buildings that are yet to insert into heap, building Object that is the top node of minHeap on which the construction need to be performed and redblacktree object.
2. Execution time of the building object is incremented for 5 days or total time whichever is lesser.
3. Along with this, the progress of 5-day construction is also incremented.
4. If the execution time reaches total time of the building, building is deleted from minHeap which heapifies the heap. If the next command is null or it is not print, building is deleted from redblacktree as well. This check is made so as to have this building printed in the next command since PrintBuilding is given preference over delete after completion.
5. At this point, buildingList is checked. If any buildings present in the queue are added since construction of the top node of the heap is completed and next building can be taken.
6. If execution time did not reach total time but the 5 days construction is completed, the progress is set back to 0. Heapify operation is performed on minHeap to get next building with least execution time. At this point, if there are any buildings that were added during the 5 days period, gets inserted into minHeap.
7. If any building completes construction, buildingNumber is returned.