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CS 32

HW 4 Report

2) A map of the Coord class to integers will cause an error because the Coord class does not have the comparison (==) operator defined. This operator needs to be defined, as a map needs to compare keys, and in this case, the keys are Coord objects. There is no default way to compare two Coord objects, so an error is brought up. Because Coords have no dynamically allocated members, shallow copying is allowed and no assignment operator needs to be defined.

3)

a. The time complexity of this algorithm is O(N3). There are two nested for loops, making a total of three for loops. Each loop can iterate up to a maximum of N times, thus making the worst case time complexity O(N3). The iterations within each for loop may add some constant multipliers to N3 and are therefore insignificant.

b. The time complexity of this algorithm is also O(N3) because in the worst case, the second for loop still iterates up to N times. Thus, nothing has changed in this regard.

4)

a. In running the get() function with three parameters, there are N/2 nodes visited at maximum, which essentially means N nodes are visited. In the following for loop, there will be N-1 iterations. In each iteration, the get() function with three parameters will go through N/2 nodes at maximum, again, essentially boiling down to N nodes. The insert() function will call the doInsertOrUpdate() function, which will call find(). find() goes through N nodes in the worst case scenario. Thus, insert() goes through N nodes. The insert() call outside the for loop then will visit another N nodes to insert a node at the last position. Lastly, swap() visits two nodes and has constant time complexity. All together, in the worst case scenario, the time complexity in terms of the number of nodes visited is O(N + (N-1)(N + N) + N). This is O(N2).

b. In this reassign() function, N nodes are traversed. The function starts at the head of the linked list and traverses until the last element is reached. With the last line of the function, p->m\_value = value0 the last node is visited. Thus, the time complexity is O(N). This implementation is better than the implementation in 4a because the time complexity is smaller.