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CS 32

Homework 4

2. The reason why the one-argument form of Sequence<Coord>::insert causes a compilation error is because the one-argument form of insert, searches through the linked list and adds the node where its value is less than or equal to the value at that node using the > operator. However, since there is no overloaded operator of > for Coord, it does not know how to define when a Coord class is less than or equal to another.

4b. Given only the one-parameter listAll function, the problem could not be solved because the function would not be able to access the strings of the previous files inputted into it and therefore write out the correct output.

5a. The problem is O(N^3) because the input is a 2-dimensional array of N stops. The array goes through 3 for loops of size N, all nested within each other. Therefore, there are N\*N\*N steps or N^3 steps.

5b. With the new and improved algorithm, there are still three nested for loops. The outermost one still takes in a size N. The middle one takes in a size I, which is less than N, and the innermost one takes in a size N. Therefore, the time complexity of this algorithm is still O(N^3) at the worst and assuming an average number of N/2 iterations, O(0.5N^3), which is still equal to O(N^3).

6a. There are two for loops in this function, but they are not nested. One runs through the number of items that is the minimum size between the two sequences while the other goes through the remaining values. However, within each loop, the get function is called, which calls the nodeAtPos function which also contains a for loop. Therefore, we can think of the loops in the interleave function as a for loop with a nested loop. The function has a time complexity of O(N^2) because of this.

6b. There are again two for loops in this function but each loop runs through the entirety of the sequence until it reaches the head. Because the for loops are not nested and call the function insertBefore, which does not require a loop, and run through the sequence a maximum of N times, the time complexity is O(N). This algorithm is more efficient because it the loops runs a total of 2N times, not N\*N times (at the worst) like the previous interleave.