2018-11-27 Bucket Sorts

Tuesday, November 27, 2018   3:42 PM

- The idea behind each of a bucket sort is to place items into categorical buckets
- Sometimes, as we will see, the items are then placed in additional buckets. But not always.
  - Sort students by class standing
  - You could sort this using a standard sorting algorithm, NLogN
  - OR, you could do a bucket sort:
    - Unorderd_map<string, vector> data;
    - For student in students:
      - Data[student.class_standing].push_back(student)

Radix Sort
- To Adam's knowledge the most in-depth / complex bucket sort
- Declare 10 buckets with values 0,1,2,...9
- Begin by considering each number's 10^0's digit (0s place), put in appropriate bucket
- Next, examine 10^1's digit (10s place), do the same thing
- Keep going until all items are in the 0 bucket

Example
- Use Radix Sort to sort {9, 89, 101, 243, 900, 878, 444, 332, 383, 123, 671, 290, 199}

Bucket	0s	10s	100s	1000s
0	900, 290	900, 101, 9	9, 89	9, 89, 101, 123, 199, 243, 290, 332, 383, 444, 671, 878, 900
1	101, 671		101, 123, 199	
2	332	123	243, 290	
3	243, 383, 123	332	332, 383	
4	444	243, 444	444	
5				
6			671	
7		671, 878		
8	878	383, 89	878	
9	9, 89, 199	290, 199	900	

- Efficiency: O(M*N), M = # of digits, N = # of items
- Radix sort works well when numbers don't have many digits
- Whether or not radix sort is faster than an NlogN sort depends on whether Log2(N) is larger or M is bigger.