Hash Report.

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1 Task

In this task we will read a file in CSV format that contains zip codes in an ordered format, and then look for specific entries using different methods.

- Start with writing a linear lookup method and a binary lookup and write a small benchmark that searches for "111 15" and "994 99" and explain the results. Then change the node class so that it holds an integer as code and re-run the benchmark. Explain why the execution time has improved

- Use the zip codes as keys and store them in an array, using the keys as indexes in the array. Implement a lookup method and compare its execution time to the binary search method in the previous class.

- Take all keys and convert them to a hash and store them in a array. This can be done by taking the key modulo m for some value m. Count the number of collisions for each type and see which m seems to give the least number of collisions. To be able to handle the collisions first implement "buckets" where the buckets are a separate array. Then implement an improved version where the bucket uses the array with hashes itself. Gather some statistics on how many elements you need to look at before you find the one you're looking for. Compare the result with the separate array bucket implementation.

2 Method & Theory

3 Result

push	Depth	add	Depth
12	2	10	6
17	3	19	6
17	4	16	6
12	3	10	3
14	4	17	6
20	3	10	3
11	4	14	6
15	3	11	6
15	4	20	6
13	4	19	6
12	5	15	6
13	4	11	6
20	5	15	6
13	4	17	6
17	2	10	6
17	5	16	6
14	4	11	6
17	5	19	5
17	5	11	6
17	5	11	4

Table 1: Benchmark for how deep the push and add method needed to go in the tree

4 Discussion

Code

All the code can be found here:

Code Overview 1: $\mathcal{O}(n)$ `add(Integer item)` method

Code Overview 2: $\mathcal{O}(n)$ `remove()` method

Code Overview 3: $\mathcal{O}(1)$ `remove()` method

Code Overview 4: $\mathcal{O}(n)$ `add(Integer item)` method

Code Overview 5: $\mathcal{O}(log(n))$ `add(int priority, T item)` method

Code Overview 6: $\mathcal{O}(log(n))$ `remove()` method

Code Overview 7: The `push(int increment)` method

Code Overview 8: Array Heap `add(int item)` method

Code Overview 9: Array Heap `remove()` method