

Lab 12

Implement 3 different hash functions explained in the lecture:

1. Selecting digits
2. Folding
3. Modular Arithmetic

Write a main method to test each version of hash function with HashTable class.

- Insert random data into your table.
 - Then insert non-random data into your table. (Try to come up with data that breaks even distribution for each version of hash function.)
 - Then answer the following questions for each version of hash function.
- Does hash function scatter data evenly throughout hash table?
 - How well does hash function scatter random data?
 - How well does hash function scatter non-random data?

Hash Functions -- Selecting Digits

- **Select certain digits** and combine to create the address.
- For example, suppose 9-digit numbers
 - Define a hash function that selects the 2nd and 5th most significant digits
$$h(0\textcolor{red}{3}34\textcolor{red}{7}5678) = \textcolor{red}{37}$$
$$h(0\textcolor{red}{2}34\textcolor{red}{5}5678) = \textcolor{red}{25}$$
 - Define the table size as 100 (2 digits can take 100 different values)

Hash Functions -- Folding

- **Folding** – selecting all digits and adding them.
- For example, suppose 9-digit numbers
 - Define a hash function that selects all digits and adds them
$$h(033475678) = 0 + 3 + 3 + 4 + 7 + 5 + 6 + 7 + 8 = 43$$
$$h(023455678) = 0 + 2 + 3 + 4 + 5 + 5 + 6 + 7 + 8 = 40$$
 - Define the table size as 82 (sum of 9 digits can take 82 different values 0, 1, .. , 81)

Hash Functions -- Modular Arithmetic

- **Modular arithmetic** – provides a simple and effective hash function.

$$h(x) = x \bmod \text{tableSize}$$

- The table size should be a prime number.