In the program, 10000 seven-character-long unique words are generated and inserted into the Hash Table.

The following two **hash functions** were used:

int hashFunc(string key) {

int p = 31;

long long pow = 1;

long long hashValue = 0;

for (int i = 0; i < key.length(); i++) {

hashValue = (hashValue + (key[i] - 'a' + 1) \* pow) % tableSize;

pow = (pow \* p) % tableSize;

}

return (hashValue % tableSize + tableSize) % tableSize;

}

int hashFunc2(string key) {

int p = 44;

long long pow = 1;

long long hashValue = 0;

for (int i = 0; i < key.length(); i++) {

hashValue = (hashValue + (key[i] - 'a' + 1) \* pow) % tableSize;

pow = (pow \* p) % tableSize;

}

return (hashValue % tableSize + tableSize) % tableSize;

}

and **Auxiliary hash function**

int auxHashFunc(string key){

int hashVal = 0;

for (int i = 0; i<key.size(); i++){

hashVal += (key[i] \* 3) % tableSize;

}

return (13 - (hashVal % 13))%tableSize;

}

For custom probing, **constants** C1 = 1003 and C2 = 57 were used.

The number of collisions while inserting the data is listed in a tabular format below. Among these 10000 generated words, randomly selected 1000 words were

searched from the words already present in the hash table. The average number of probes are listed as well.

**Table 1:** Performance of various techniques for collision resolution with two different hash functions.

**For N = 10007**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Hash 1** | | **Hash 2** | |
| **Number of collisions** | **Average probes** | **Number of collisions** | **Average probes** |
| **Chaining Method** | 3702 | 1.431 | 3660 | 1.474 |
| **Double Hashing** | 145397 | 11.541 | 107693 | 10.798 |
| **Custom Probing** | 67560 | 6.293 | 67671 | 7.709 |

**For N = 20011**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Hash 1** | | **Hash 2** | |
| **Number of collisions** | **Average probes** | **Number of collisions** | **Average probes** |
| **Chaining Method** | 2127 | 1.199 | 2119 | 1.25 |
| **Double Hashing** | 4002 | 1.383 | 3933 | 1.358 |
| **Custom Probing** | 3923 | 1.322 | 3875 | 1.355 |

**For N = 100003**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Hash 1** | | **Hash 2** | |
| **Number of collisions** | **Average probes** | **Number of collisions** | **Average probes** |
| Chaining Method | 459 | 1.028 | 473 | 1.063 |
| Double Hashing | 501 | 1.033 | 509 | 1.062 |
| Custom Probing | 516 | 1.032 | 534 | 1.066 |