**CSE 208: Data Structures and Algorithms II**

**Topic: Hashing**

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*Hash Functions*

# Hash Function 1:

long long hash1(string const &s)

{

int p = 31;

long long hash\_val = 0;

int p\_pow = 1;

for (int i = 0; i < 7; i++)

{

hash\_val = (hash\_val + (s[i] - 'a') \* p\_pow)%TABLE\_SIZE;

p\_pow = (p\_pow \* p)% TABLE\_SIZE;

}

return hash\_val;

}

# Hash Function 2:

long long hash2(string const &s)

{

int p = 37;

long long hash\_val = 0;

int p\_pow = 1;

for (int i = 0; i < 7; i++)

{

hash\_val = (hash\_val + (s[i] - 'a') \* p\_pow)% TABLE\_SIZE;

p\_pow = (p\_pow \* p)% TABLE\_SIZE;

}

return hash\_val;

}

# Auxillary Hash Function:

long long auxHash(string const& s)

{

int p = 7;

long long hash\_val = 0;

int p\_pow = 1;

for (int i = 0; i < 7; i++)

{

hash\_val = (hash\_val + (s[i] - 'a') \* p\_pow)% TABLE\_SIZE;

p\_pow = (p\_pow \* p)% TABLE\_SIZE;

}

return hash\_val;

}

# Report:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Hash 1 | | Hash 2 | |
|  | Number of Collisions | Average Probes | Number of Collisions | Average Probes |
| Chaining Method | 3684 | 1.472 | 3740 | 1.498 |
| Double Hashing | 67654 | 6.712 | 71170 | 8.414 |
| Custom Probing | 61352 | 5.764 | 62273 | 6.305 |

For TABLE\_SIZE = 10007

For TABLE\_SIZE = 20011

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Hash 1 | | Hash 2 | |
|  | Number of Collisions | Average Probes | Number of Collisions | Average Probes |
| Chaining Method | 2106 | 1.222 | 2132 | 1.236 |
| Double Hashing | 3889 | 1.351 | 3872 | 1.327 |
| Custom Probing | 3793 | 1.337 | 3926 | 1.389 |

For TABLE\_SIZE = 100003

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Hash 1 | | Hash 2 | |
|  | Number of Collisions | Average Probes | Number of Collisions | Average Probes |
| Chaining Method | 459 | 1.049 | 497 | 1.034 |
| Double Hashing | 522 | 1.056 | 559 | 1.039 |
| Custom Probing | 514 | 1.051 | 557 | 1.038 |