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Homework 6 (1)

1. Insert the following data in the hash table using linear probing:

26 42 5 44 92 59 40 36 12

Then perform the following operations:

Delete (38) and Delete (12); search (44) and search (50); Insert (29);

Hash table size: m =11;

Hash function t= x%m;

Linear probing function: (t+i) % m

When inserting 26, the 1st probing location is 4.

When inserting 42, the 1st probing location is 9.

When inserting 5, the 1st probing location is 5.

When inserting 44, the 1st probing location is 0.

When inserting 92, the 1st probing location is 4, the 2nd probing location is 5,the 3rd probing location is 6.

When inserting 59, the 1st probing location is 4, the 2nd probing location is 5,the 3rd probing location is 6,the 4th probing location is 7.

When inserting 40, the 1st probing location is 7, the 2nd probing location is 8.

When inserting 36, the 1st probing location is 3.

When inserting 12, the 1st probing location is 1.

When deleting 38, the 1st probing location is 5, the 2nd probing location is 6, the 3rd probing location is 7, the 4th probing location is 8,the 5th probing location 9,the 6th probing location 10. Can’t delete.

When deleting 12, the 1st probing location is 1.

When searching for 44, the 1st probing location is 0. -> return true.

When searching for 50, the 1st probing location is 6, the 2nd probing location is 7, the 3rd probing location is 8, the 4th probing location is 9, the 5th probing location is 10. ->false.

When inserting 29, the 1st probing location is 7,the 2nd probing location is 8, the 3rd probing location is 9, the 4th probing location is 10.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 44 | ~~12~~ |  | 36 | 26 | 5 | 92 | 59 | 40 | 42 | 29 |
| 1 | ~~1~~ 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Perform the same operation using quadratic probing :

Quadratic probing function: (t+i\*i) % m;

When inserting 26, the 1st probing location is 4.

When inserting 42, the 1st probing location is 9.

When inserting 5, the 1st probing location is 5.

When inserting 44, the 1st probing location is 0.

When inserting 92, the 1st probing location is 4, the 2nd probing location is 5, the 3rd probing location 8.

When inserting 59, the 1st probing location is 4, the 2nd probing location is 5, the 3rd probing location is 8, the 4th probing location is 2.

When inserting 40, the 1st probing location is 7.

When inserting 36, the 1st probing location is 3.

When inserting 12, the 1st probing location is 1.

When deleting 38, the 1st probing location is 5, the 2nd probing location is 6. Can’t delete.

When deleting 12, the 1st probing location is 1.

When searching 44, the 1st probing location is 0. -> true

When searching 50, the 1st probing location is 6. ->false

When inserting 29, the 1st probing location is 7, the 2nd probing location is 8, the 3rd probing location is 9, the 4th probing location is 10.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 44 | ~~12~~ | 59 | 36 | 26 | 5 |  | 40 | 92 | 42 | 29 |
| 1 | ~~1~~ 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |

Perform the same operations using double hashing:

Fist hash function: t =% m

Second hash function: p= x%9 +1.

Double hashing probing function: (t+i\*p) % m.

26 42 5 44 92 59 40 36 12

When inserting 26, the 1st probing location is 4.

When inserting 42, the 1st probing location is 9.

When inserting 5, the 1st probing location is 5.

When inserting 44, the 1st probing location is 0.

When inserting 92, the 1st probing location is 4.

P=92%9+1 =3;

The 2nd probing location is: (4+ 1\*3)%11 = 7.

When inserting 59, the 1st probing location is 4.

P= 59 % 9 +1 = 6;

The 2nd probing location is : (4 +1\*6) %11 = 10.

When inserting 40, the 1st probing location is 7.

P= 40 % 9 +1 = 5;

The 2nd probing location is : (7 + 1\* 5)% 11 =1.

When inserting 36, the 1st probing location is 3.

When inserting 12, the 1st probing location is 1.

P =12 % 9+1 =4.

The 2nd probing location is (1 + 1\*4)%11 = 5.

The 3rd probing location is (1 + 2\*4)%11 = 9.

The 4th probing location is (1+ 3\* 4)%11 = 2

When deleting 38, 1st probing location is 5.

P= 38%9+1 = 3.

The 2nd probing location is (5 + 1\*3)%11= 8.

When deleting 12, 1st probing location is 1.

P= 12% 9+1 = 4.

The 2nd probing location is (1 + 1\*4)%11 = 5.

The 3rd probing location is (1+2\*4)% 11 =9.

The 4th probing location is (1+3\*4)%11 = 2.

When searching 44, 1st probing location is 0. -> true.

When searching 50, 1st probing location is 6. ->false.

When inserting 29, 1st probing location is 7,

P= 29% 9 +1 = 3,

the 2nd probing location is (7+1\*3)%11 = 10.

The 3rd probing location is (7+2\*3)%11 = 2.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 44 | 40 | ~~12~~  29 | 36 | 26 | 5 |  | 92 |  | 42 | 59 |
| 1 | 1 | ~~1 2~~  1 | 1 | 1 | 1 |  | 1 |  | 1 | 1 |

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