

# CS2700 : Programming and Data Structures

## Hashing : collision resolution

- Chaining
- Open Addressing
  - Linear Probing
  - Quadratic Probing
  - Double Hashing

# OPEN ADDRESSING : DOUBLE HASHING.

Use another hash function say  $h_2(\text{key})$

$$[h(\text{key})]$$
$$[h(\text{key}) + 1 \times h_2(\text{key})] \% m$$

$$[h(\text{key}) + 2 \times h_2(\text{key})] \% m$$

$$[h(\text{key}) + 3 \times h_2(\text{key})] \% m$$

primary  
hash function

secondary hash function

# OPEN ADDRESSING : DOUBLE HASHING.

Example:

$$h_1(\text{key}) = \text{key} \% 7$$

$$h_2(\text{key}) = \text{key} \% 5$$

Insert 14, 18, 21, 4

0	14
1	21
2	
3	
4	18
5	4
6	

# OPEN ADDRESSING : DOUBLE HASHING.

Example:

$$h_1(\text{key}) = \text{key} \% 7$$

$$h_2(\text{key}) = \text{key} \% 5$$

Insert 14, 18, 21, 4, 35

0	14
1	21
2	
3	
4	18
5	4
6	

# OPEN ADDRESSING : DOUBLE HASHING.

Example:

$$h(\text{key}) = \text{key} \% 7$$

$$h_2(\text{key}) = \text{key} \% 5$$

Insert 14, 18, 21, 4, 35

0	14
1	21
2	
3	
4	18
5	4
6	

$h(35) = 0 \rightarrow$  this is okay!

$h_2(35) = 0 \rightarrow$  this is not okay!

$\hookrightarrow$  why?

Modify  $h_2$

to be s.t

$h_2(\text{key}) \neq 0$