Hashing Examples

CS 2604
Summer II 2003
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Hashing Example 1

• Classic Hashing with M = 16 slots
  – h(K) = K % 16
  – Conflict Resolution Policy:
    (home + 5i) % M                   p(K,i) = 5i
• Probe Sequence for
  – K = 35:   3,8,13,2,7,12,1,6,11,0,5,10,15,4,9,14
  – K = 87:   7,12,1,6,11,0,5,10,15,4,9,14, 3,8,13,2

Hashing Example 2

• M = 7 slots
  – h(K) = K % 7
  – Conflict Resolution Policy:
    (home + i^2) % M                   p(K,i) = i^2
• Probe Sequence for
  – K = 35:   0,1,4,2,2,4,1,0,...
  – K = 87:   3,4,0,5,2,0,4,3,...
• Undesirable because no guarantee all slots will be in sequence
Hashing Example 3

- M = 7 slots
  - h(K) = K % 7
  - Conflict Resolution Policy: (home + 3i) % 7
  - p(K,i) = 3
- Probe Sequence (assume i starts with 0) for
  - K = 35: 0,1,3,2,6,4,5
  - K = 87: 3,4,6,5,2,0,1
- Clustering does not happen
  - Look at probe sequences for other home positions

Hashing Example 4

- If p( ) uses K, not just i, secondary clustering can be avoided
- Example: h(K) = K % 11; collision resolution: home + (1+K%10) % 11
- Probe sequence for
  - K = 100: 1,2,3,4,5,6,7,…
  - K = 122: 1,4,7,10,2,5,8,…
  (same home position)

“Probe Sequence” for Bucket Hashing

- Suppose h(K) = K % 10^d and bucket size = s
- Absolute positions in hash table:
  \[ 0,1,2,\ldots,10^s-1,10^s,10^s+1,\ldots \]
  (overflow space)
- If s = 5, and d = 1,
- “Probe sequence” for K = 135:
  25,26,27,28,29,50,51,52,53, …

What you need to know

Given the hash function, collision resolution policy, and a key
- Compute for the home position of the key
- Determine its probe sequence
- Determine slot where element will land, given state of the hash table

Other considerations:
- Consequences on time complexity
- Distribution of elements in input and hash table