For every key $K$, probe sequence $\langle h(K0), h(K1), \ldots, h(Km-1) \rangle$. $n : 0 \times 0, 1, \ldots, m-1 \rightarrow 0, 1, \ldots, m-1$

load factor $\alpha$ can never exceed 1

- systematically examine table slots for searching an element.
- all elements stored in the hash table itself.

- Open Addressing
- Open Addressing

Recitation 7 Notes 6.006 October 7 2009
- Prefer chaining when keys are to be deleted.
- no longer dependent on a
  mark the deleted set as deleted instead of NIL

DELETION

return NIL
  i = i + 1

return

if T[i] == NIL
  return

if T[i] == k
  return

if T[i] == NIL
  i = h(i)
m possible distinct prime sequences

Secondary clustering: \( h(K + 0) = h(K + 0) < h(K + 2) \) but \( c(3 + 2) \) is constrained

\( n(K + 0) = h(K + 0 + c(3 + 2)) \mod m \)

Quadratic Probing

Primary Clustering Problem: Clustering alone

\[ n = \frac{1}{m} \cdot \text{probability} (\text{hit}) \]

Linear Probing

m possible values
determines the entire sequence

\[ n(K + 1) = h(K + 1) \mod m \]

\[ n(K + i) = (h(K) + i) \mod m \]

\[ n(K + i) \leq m - 1 \]
Double Hashing

\[ h(k,i) = \left( h_1(k) + i h_2(k) \right) \mod m \]

\( h_2(k) \) relatively prime to \( m \)
- \( m = 2^p \), \( h_2 \to \text{odd number} \)
- \( m \to \text{prime}, \ h_2 \to < m \)

\( \Theta(m^2) \) probe sequences \( (h_1(k), h_2(k)) \Rightarrow \text{distinct probe sequence} \)
\[ f = \frac{2}{\sqrt{m \cdot \frac{2}{1}}}, \quad g = \frac{1}{\sqrt{m \cdot \frac{1}{1}}} \]

\[ R_{1} = \frac{K_{2}}{R_{3}}(\text{horizontal to } K_{2}) = 1 \text{ m} \]

Suppose \( K_{2} \) is dotted. What is the probability that searching for \( K_{3} \) starts exactly one problem?

What is the probability that searching for \( K_{1} \) starts exactly no problem?

Initially empty. Key \( K_{1} \) is inserted into the tree first, followed by \( K_{2} \).

An open addressing table that satisfies conditions using linear probing. \( 0 \)