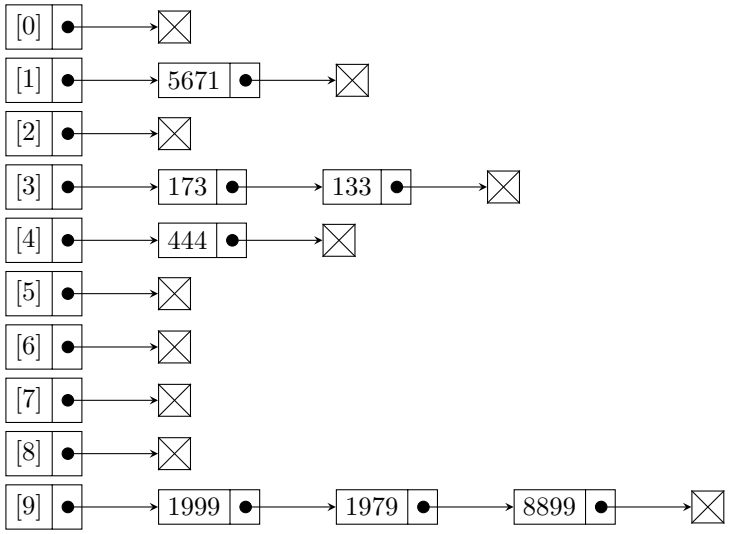
Shanghai Jiao Tong University
CS241
Fall 2019

Assignment 7

Ziqi Zhao October 30, 2019

7.1. **Collision Resolution.**

(a) Hash table using separate chaining.



(b) Hash table using linear probing.

1979	5671	1999	133	173	444				8899
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]

(c) Hash table using quadratic probing.

1979	5671		133	173	444			1999	8899
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]

(d) Hash table using double hashing, with the second hash function as $g(x) = (7 - x)\%7$.

	5671	1999	133	444	173		1979		8899
[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]

7.2. **Hash Table Size.**

Define the load factor as L, the expected number of comparisons in an unsuccessful search as $U(L)$, and the expected number of comparisons in a successful search as $S(L)$.
Then in linear probing, we have:

$$U(L) = \frac{1}{2}\left[1 + \left(\frac{1}{1-L}\right)^2\right]$$
$$S(L) = \frac{1}{2}\left[1 + \frac{1}{1-L}\right]$$

According to the requirements:

$$\begin{cases} U(L) \leq 13 \\ S(L) \leq 10 \end{cases}$$

We have:

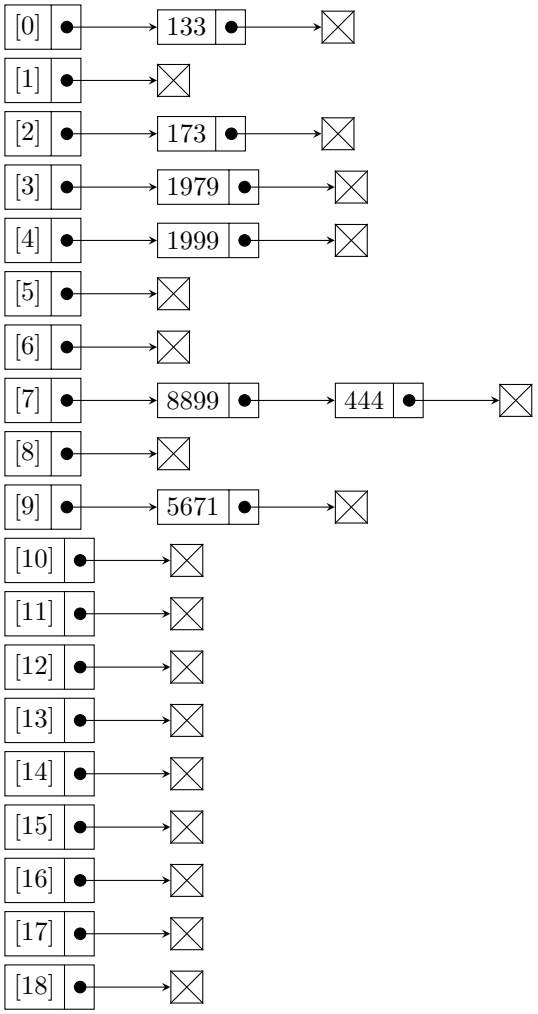
$$L = \frac{1000}{n} \leq \frac{4}{5}$$

Pick n as a prime number, then we obtain the minimum of table size n:

$$n_{min} = 1259$$

7.3. **Rehashing.**

(a) Hash table using separate chaining.



(b) Hash table using linear probing.

133		173	1979	1999			444	8899	5671
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[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]

(c) Hash table using quadratic probing.

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(d) Hash table using double hashing, with the second hash function as $g(x) = (7 - x)\%7$.

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