Analisis y Diseño de Algoritmos

Juan Gutiérrez

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Ordenación en tiempo lineal

Algoritmos basados en comparaciones

- Mergesort
- Heapsort
- Quicksort

Algoritmos basados en comparaciones

Todos son $\Omega(n \lg n)$. ¿Se podrá hacer mejor que eso?

Límites inferiores para algoritmos basados en comparaciones

Árbol de decisión

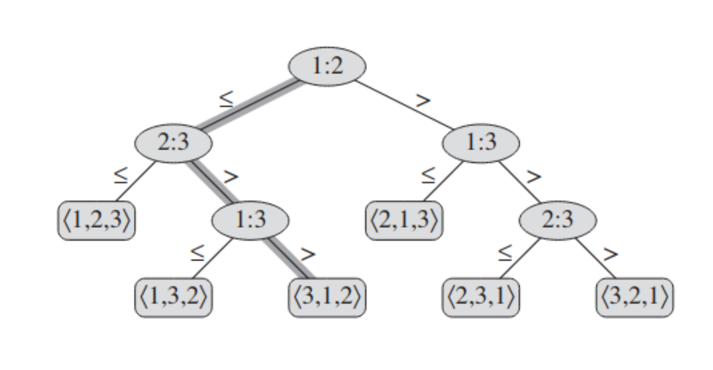
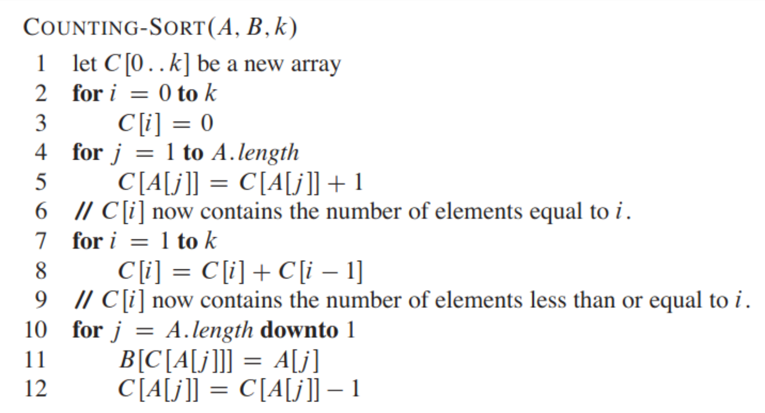


Figure 1: Tomada del libro Cormen, Introduction to Algorithms

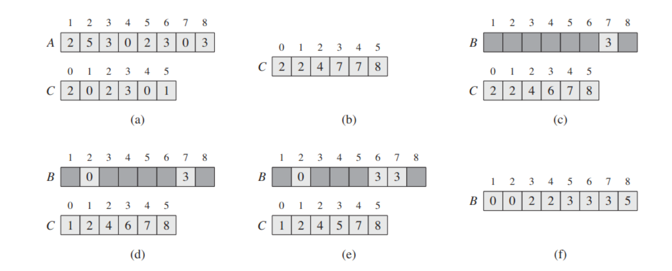
Counting sort



```
COUNTING-SORT$(A, B, k)$
let $C[0..k]$ be a new array
for $i = 0$ to $k$
    $C[i] = 0$
for $j = 1$ to $A.length$
    $C[A[j]] = C[A[j]] + 1$
// $C[i]$ now contains the number of elements equal to $i$.
for $i = 1$ to $k$
    $C[i] = C[i] + C[i-1]$
// $C[i]$ now contains the number of elements less than or equal to $i$.
for $j = A.length$ downto 1
    $B[C[A[j]]] = A[j]$
    $C[A[j]] = C[A[j]] - 1$
```

Figure 2: Tomada del libro Cormen, Introduction to Algorithms

Counting sort



	1	2	3	4	5	6	7	8
A	2	5	3	0	2	3	0	3

	0	1	2	3	4	5
C	2	0	2	3	0	1

(a)

	0	1	2	3	4	5
C	2	2	4	7	7	8

(b)

	1	2	3	4	5	6	7	8
B							3	

	0	1	2	3	4	5
C	2	2	4	6	7	8

(c)

	1	2	3	4	5	6	7	8
B		0					3	

	0	1	2	3	4	5
C	1	2	4	6	7	8

(d)

	1	2	3	4	5	6	7	8
B		0				3	3	

	0	1	2	3	4	5
C	1	2	4	5	7	8

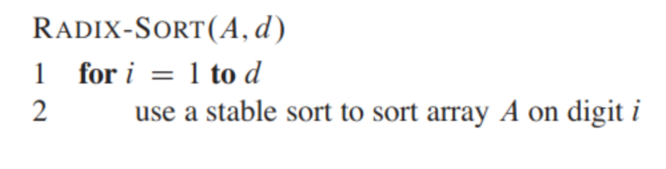
(e)

	1	2	3	4	5	6	7	8
B	0	0	2	2	3	3	3	5

(f)

Figure 3: Tomada del libro Cormen, Introduction to Algorithms

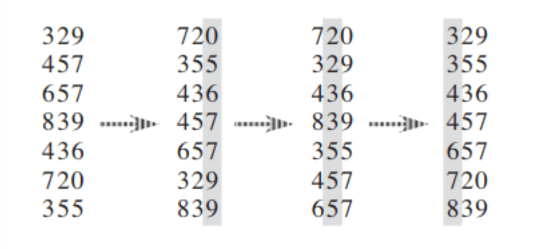
Radix sort



```
RADIX-SORT($A, d$)
for $i = 1$ to $d$
        use a stable sort to sort array $A$ on digit $i$
```

Figure 4: Tomada del libro Cormen, Introduction to Algorithms

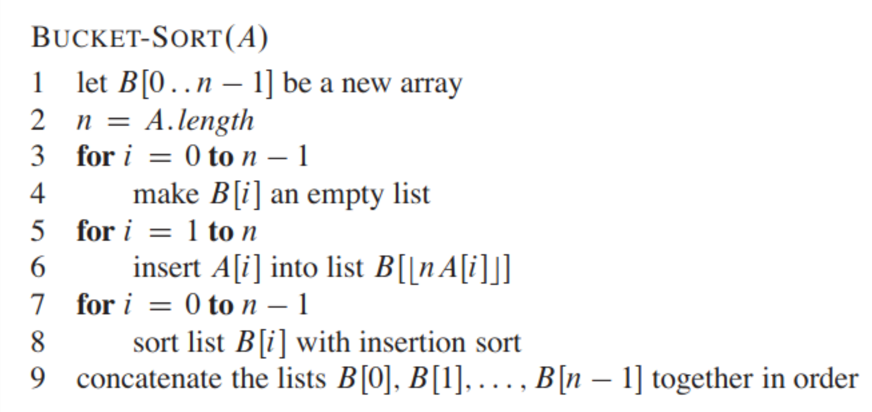
Radix sort



329	720	720	329
457	355	329	355
657	436	436	436
839	457	839	457
436	657	355	657
720	329	457	720
355	839	657	839

Figure 5: Tomada del libro Cormen, Introduction to Algorithms

Bucket sort



```
BUCKET-SORT($A$)
let $B[0..n-1]$ be a new array
$n = A.length$
for $i = 0$ to $n - 1$
    make $B[i]$ an empty list
for $i = 1$ to $n$
    insert $A[i]$ into list $B[\lfloor nA[i] \rfloor]$
for $i = 0$ to $n - 1$
    sort list $B[i]$ with insertion sort
concatenate the lists $B[0], B[1], \ldots, B[n-1]$ together in order
```

Figure 6: Tomada del libro Cormen, Introduction to Algorithms

Bucket sort

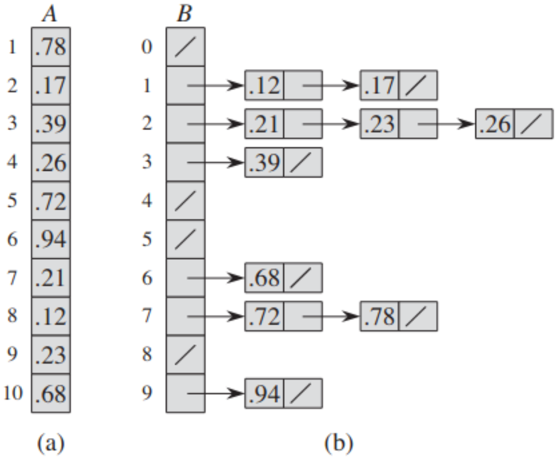


Figure 7: Tomada del libro Cormen, Introduction to Algorithms

Gracias