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Don Bit  $\rightarrow$  Creó Bitopolis

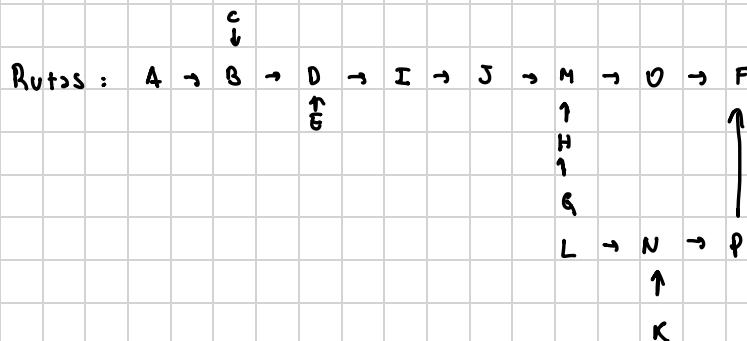
Bitopolis  $\rightarrow$  Ciudad digital en la que los autos no necesitan GPS ni semáforo.

Recorrer Bitopolis  $\rightarrow$  Cada automóvil ingresa un dígito de 4 bits en su tablero. (Entrada)

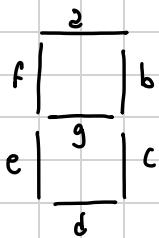
Sistema  $\rightarrow$  Recorre una red de sectores predefinidos en un grafo donde los nodos son sectores de la ciudad ( $A \rightarrow P$ )

- \* Cada entrada (código 4 bits) está asociada a un nodo inicial específico del grafo.
- \* Se sigue una ruta única y predeterminada hacia el nodo F. (F siempre es el nodo final)

Misión  $\rightarrow$  Diseñar un sistema combinacional y secuencial libre de memorias ROM que a partir del código de entrada recorra el grafo mostrando cada nodo en un display 7-seg.



Display



Código 4 bit	Letras	Código 7 seg						
		a	b	c	d	e	f	g
0 0 0 0	A	1	1	1	0	1	1	1
0 0 0 1	B	0	0	1	1	1	1	1
0 0 1 0	C	1	0	0	1	1	1	0
0 0 1 1	D	0	1	1	1	1	0	1
0 1 0 0	E	1	0	0	1	1	1	1
0 1 0 1	F	1	0	0	0	1	1	1
0 1 1 0	G	1	0	1	1	1	1	0
0 1 1 1	H	0	1	1	0	1	1	1
1 0 0 0	I	0	1	1	0	0	0	0
1 0 0 1	J	0	1	1	1	1	0	0
1 0 1 0	K	1	0	1	0	1	1	1
1 0 1 1	L	0	0	0	1	1	1	0
1 1 0 0	M	1	0	1	0	1	0	1
1 1 0 1	N	1	0	1	0	1	0	0
1 1 1 0	O	1	1	1	1	1	1	0
1 1 1 1	P	1	1	0	0	1	1	1

Bit a:

Cod: 10 4 bits

A	B	C	D	$\delta$
0	0	0	0	1
0	0	0	1	0
0	0	1	0	1
0	0	1	1	0
0	1	0	0	1
0	1	0	1	1
0	1	1	0	1
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	1
1	0	1	1	0
1	1	0	0	1
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

Mapa de Karnaugh

		CD			
		00	01	11	10
AB	00	1	0	0	1
	01	1	1	0	1
11	1	1	1	1	1
10	0	0	0	1	

$$\delta = A\bar{B} + AB + \bar{C}\bar{A}B + \bar{C}\bar{D}\bar{A}$$

Bit b:

codigo	b
0 0 0 0	1
0 0 0 1	0
0 0 1 0	0
0 0 1 1	1
0 1 0 0	0
0 1 0 1	0
0 1 1 0	0
0 1 1 1	1
1 0 0 0	1
1 0 0 1	1
1 0 1 0	0
1 0 1 1	0
1 1 0 0	0
1 1 0 1	0
1 1 1 0	1
1 1 1 1	1

Mapa de Karnaugh

AB\CD	00	01	11	10
00	1	0	1	0
01	0	0	1	0
11	0	0	1	1
10	1	1	0	0

$A \bar{B} \bar{C}$

$$\bar{B} \bar{C} \bar{D} + A \bar{B} C + \bar{A} C D + A B C$$

Bit C:

Código

4 bit

0 0 0 0

C

1

0 0 0 1

1

0 0 1 0

0

0 0 1 1

1

0 1 0 0

0

0 1 0 1

0

0 1 1 0

1

0 1 1 1

1

1 0 0 0

1

1 0 0 1

1

1 0 1 0

1

1 0 1 1

0

1 1 0 0

1

1 1 0 1

1

1 1 1 0

1

1 1 1 1

0

A <sub>B</sub>	00	01	11	10
00	1	1	1	0
01	0	0	1	1
11	1	1	0	1
10	1	1	0	1

$$\bar{A}\bar{B}\bar{C} + \bar{A}CD + \bar{A}BC + A\bar{C} + AC\bar{D}$$

## Bit d

Código 4 bit	Código 7 seg
0 0 0 0	d
0 0 0 1	0
0 0 1 0	1
0 0 1 1	1
0 1 0 0	1
0 1 0 1	0
0 1 1 0	1
0 1 1 1	0
1 0 0 0	0
1 0 0 1	1
1 0 1 0	0
1 0 1 1	1
1 1 0 0	0
1 1 0 1	0
1 1 1 0	1
1 1 1 1	0

A <sub>3</sub> A <sub>2</sub>	00	01	11	10
00	0	1	1	1
01	1	0	0	1
11	0	0	0	1
10	0	1	1	0

$$\bar{A}C\bar{D} + BC\bar{D} + \bar{A}B\bar{D} + \bar{B}D$$

Bit E.

Código 4 bit	Código 7 seg
0 0 0 0	1
0 0 0 1	1
0 0 1 0	1
0 0 1 1	1
0 1 0 0	1
0 1 0 1	1
0 1 1 0	1
0 1 1 1	1
1 0 0 0	0
1 0 0 1	1
1 0 1 0	1
1 0 1 1	1
1 1 0 0	1
1 1 0 1	1
1 1 1 0	1
1 1 1 1	1

AB	00	01	11	10
00	1	1	1	1
01	1	1	1	1
11	1	1	1	1
10	0	1	1	1

$$AD + AC + AB + \bar{A}$$

Bit F:

Código 4 bit	Código + e4
0 0 0 0	1
0 0 0 1	1
0 0 1 0	1
0 0 1 1	0
0 1 0 0	1
0 1 0 1	1
0 1 1 0	1
0 1 1 1	1
1 0 0 0	0
1 0 0 1	0
1 0 1 0	1
1 0 1 1	1
1 1 0 0	0
1 1 0 1	0
1 1 1 0	1
1 1 1 1	1

00	00	01	11	10
00	11	0	1	1
01	11	1	1	1
11	0	0	1	1
10	0	0	1	1

$$\bar{A}\bar{C} + \bar{A}B + \bar{C}\bar{D} + AC$$

## Bit 9.

Código	9
4 bit	9
0 0 0 0	1
0 0 0 1	1
0 0 1 0	0
0 0 1 1	1
0 1 0 0	1
0 1 0 1	1
0 1 1 0	0
0 1 1 1	1
1 0 0 0	0
1 0 0 1	0
1 0 1 0	1
1 0 1 1	0
1 1 0 0	1
1 1 0 1	0
1 1 1 0	0
1 1 1 1	1

## Código 7 seg

A <sub>0</sub>	00	01	11	10
00	1	1	1	0
01	1	1	1	0
11	1	0	0	0
10	0	0	0	1

$$\bar{A}\bar{C} + \bar{A}D + B\bar{C}\bar{D} + BC\bar{D} + A\bar{B}C\bar{D}$$

tabla:

	A			
0 0 0 0	0			
0 0 0 1	0			
0 0 1 1	1			
1 0 0 0	1			
1 0 0 1	1			
1 1 0 0	1			
1 1 1 0	0			
0 0 1 0	0			
0 1 0 0	0			
0 1 1 1	1			
0 1 1 0	0			
1 0 1 0	1			
1 1 0 1	1			
1 0 1 1	1			
0 1 0 1	0			
1 1 1 1	0			

<del>CD</del>	00	01	11	10
<del>AB</del>	00	00	10	10
	01	00	10	00
	11	11	00	00
	10	11	11	11

$$A\bar{B} + AB\bar{C} + \bar{A}CD$$

table:

0	0	0	0	0
0	0	0	1	0
0	0	1	1	0
1	0	0	0	0
1	0	0	1	1
1	1	0	0	1
1	1	1	0	1
0	0	1	0	0
0	1	0	0	0
0	1	1	1	1
0	1	1	0	1
1	0	1	0	1
1	1	0	1	1
1	0	1	1	1
0	1	0	1	1
1	1	1	1	1

B

$\cancel{CD}$				
$AB$	00	01	11	10
	00	00	00	00
	01	01	11	11
	11	11	11	11
	10	01	11	11

$$AB + BD + BC + AD + AC$$

tab1:

C

0	0	0	0	0
0	0	0	1	1
0	0	1	1	0
1	0	0	0	0
1	0	0	1	0
1	1	0	0	1
1	1	1	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
0	1	1	0	1
1	0	1	0	0
1	1	0	1	1
1	0	1	1	0
0	1	0	1	0
1	1	1	1	0

<del>CD</del>	00	01	11	10
AB	00	01	10	00
00	0	1	0	0
01	1	0	0	1
11	1	1	0	0
10	0	0	0	0

$$AB\bar{C} + \bar{A}\bar{B}CD + \bar{A}\bar{B}C\bar{D} + B\bar{C}\bar{D}$$

Q

tabla:

D

0	0	0	0	1
0	0	0	1	1
0	0	1	1	0
1	0	0	0	1
1	0	0	1	0
1	1	0	0	0
1	1	1	0	1
0	0	1	0	1
-	0	1	0	0
0	1	1	1	0
0	1	1	0	1
1	0	1	0	1
1	1	0	1	1
1	0	1	1	1
0	1	0	1	1
1	1	1	1	1

$\cancel{CD}$	00	01	11	10
$\cancel{AB}$	00	11	01	10
00	11	10	01	11
01	11	10	01	11
11	01	11	11	11
10	10	01	11	11

$$\bar{A}\bar{C} + B\bar{C}D + C\bar{D} + ACD + \bar{A}\bar{B}\bar{D}$$

