

Elementos de Sistemas

Dados Digitais

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*A força motriz da invenção matemática não é o raciocínio, mas a imaginação.
The moving power of mathematical invention is not reasoning but imagination.*

Augustus De Morgan (1806 - 1871) matemático britânico

Objetivos

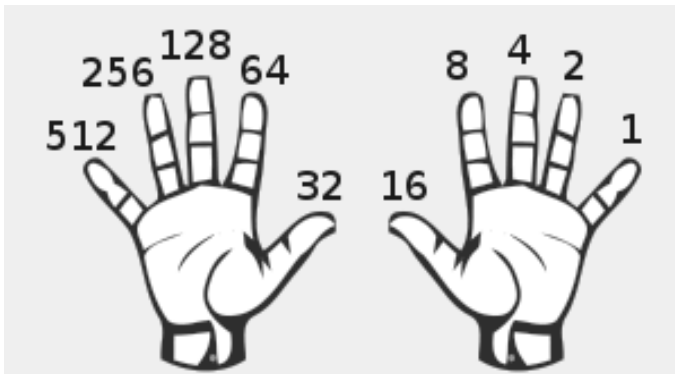
- Codificar dados em bits
- Converter bases numéricas

Números binários

- Até quanto podemos contar usando apenas os dedos das mãos?

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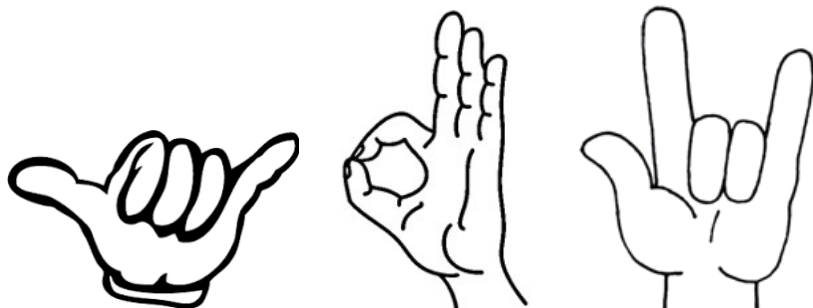


Considerando que os dedos podem ficar em duas posições, podemos contar entre 0-1023.

¹<https://www.quora.com/How-high-could-you-count-in-binary-if-you-used-all-10-of-your-fingers-as-bits>

Exemplo

- Descubra o Número em Decimal:



¹<http://www.clipartbest.com/cliparts/pi5/dj9/pi5dj9XiB.png>
http://38.media.tumblr.com/f52d7ef4320bd0e20973c6f57ef36eba/tumblr_inline_n1vgmrISUQ1rdemoh.png
<http://www.aperfectworld.org/clipart/gestures/rockhard11.png>

Exemplo

- Converta entre as bases:
 - A 0b100100 para a base 10;
 - B 0b1101001 para a base 10;
 - C 0d22 para a base 2;
 - D 0d75 para a base 2;
 - E 0o777 para a base 10;
 - F 0xDE para a base 10;
 - G 0d510 para a base 8;
 - H 0d2500 para a base 16;

Sem usar calculadora!

Outras codificações

- BCD

Decimal	Binary	BCD	Hexadecimal
0	0	0000	0
1	1	0001	1
2	10	0010	2
3	11	0011	3
4	100	0100	4
5	101	0101	5
6	110	0110	6
7	111	0111	7
8	1000	1000	8
9	1001	1001	9
10	1010	0001 0000	A
11	1011	0001 0001	B
12	1100	0001 0010	C
13	1101	0001 0011	D
14	1110	0001 0100	E
15	1111	0001 0101	F
16	1 0000	0001 0110	10
17	1 0001	0001 0111	11
18	1 0010	0001 1000	12
19	1 0011	0001 1001	13
20	1 0100	0010 0000	14
126	111 1110	0001 0010 0110	7E
127	111 1111	0001 0010 0111	7F
128	1000 0000	0001 0010 1000	80
510	1 1111 1110	0101 0001 0000	1FE
511	1 1111 1111	0101 0001 0001	1FF
512	10 0000 0000	0101 0001 0010	200

¹<https://www.theengineeringknowledge.com/what-is-binary-coded-decimal-bcd-system/>

Outras codificações

- Código Morse

International Morse Code

1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

A	• —	U	• • —
B	— • • •	V	• • — —
C	— • — •	W	• — — —
D	— • •	X	— • • —
E	•	Y	— • — —
F	• • — •	Z	— — • •
G	— — •		
H	• • • •		
I	• •		
J	• — — —		
K	— • — —	1	• — — — —
L	• — • —	2	• • — — —
M	— —	3	• • • — —
N	— •	4	• • • • —
O	— — —	5	• • • • •
P	• — — •	6	— • • • •
Q	— • — •	7	— — • • •
R	• — •	8	— — — • •
S	• • •	9	— — — — •
T	—	0	— — — — —

¹https://pt.wikipedia.org/wiki/Código_Morse

Outras codificações

• ASCII

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040	#32;	Space	64	40	100	#64;	@	96	60	140	#96;	`
1	1	001	SOH (start of heading)	33	21	041	#33;	!	65	41	101	#65;	A	97	61	141	#97;	a
2	2	002	STX (start of text)	34	22	042	#34;	"	66	42	102	#66;	B	98	62	142	#98;	b
3	3	003	ETX (end of text)	35	23	043	#35;	#	67	43	103	#67;	C	99	63	143	#99;	c
4	4	004	EOT (end of transmission)	36	24	044	#36;	\$	68	44	104	#68;	D	100	64	144	#100;	d
5	5	005	ENQ (enquiry)	37	25	045	#37;	%	69	45	105	#69;	E	101	65	145	#101;	e
6	6	006	ACK (acknowledge)	38	26	046	#38;	&	70	46	106	#70;	F	102	66	146	#102;	f
7	7	007	BEL (bell)	39	27	047	#39;	'	71	47	107	#71;	G	103	67	147	#103;	g
8	8	010	BS (backspace)	40	28	050	#40;	(	72	48	110	#72;	H	104	68	150	#104;	h
9	9	011	TAB (horizontal tab)	41	29	051	#41;	)	73	49	111	#73;	I	105	69	151	#105;	i
10	A	012	LF (NL line feed, new line)	42	2A	052	#42;	*	74	4A	112	#74;	J	106	6A	152	#106;	j
11	B	013	VT (vertical tab)	43	2B	053	#43;	+	75	4B	113	#75;	K	107	6B	153	#107;	k
12	C	014	FF (NP form feed, new page)	44	2C	054	#44;	,	76	4C	114	#76;	L	108	6C	154	#108;	l
13	D	015	CR (carriage return)	45	2D	055	#45;	-	77	4D	115	#77;	M	109	6D	155	#109;	m
14	E	016	SO (shift out)	46	2E	056	#46;	.	78	4E	116	#78;	N	110	6E	156	#110;	n
15	F	017	SI (shift in)	47	2F	057	#47;	/	79	4F	117	#79;	O	111	6F	157	#111;	o
16	10	020	DLE (data link escape)	48	30	060	#48;	0	80	50	120	#80;	P	112	70	160	#112;	p
17	11	021	DC1 (device control 1)	49	31	061	#49;	1	81	51	121	#81;	Q	113	71	161	#113;	q
18	12	022	DC2 (device control 2)	50	32	062	#50;	2	82	52	122	#82;	R	114	72	162	#114;	r
19	13	023	DC3 (device control 3)	51	33	063	#51;	3	83	53	123	#83;	S	115	73	163	#115;	s
20	14	024	DC4 (device control 4)	52	34	064	#52;	4	84	54	124	#84;	T	116	74	164	#116;	t
21	15	025	NAK (negative acknowledge)	53	35	065	#53;	5	85	55	125	#85;	U	117	75	165	#117;	u
22	16	026	SYN (synchronous idle)	54	36	066	#54;	6	86	56	126	#86;	V	118	76	166	#118;	v
23	17	027	ETB (end of trans. block)	55	37	067	#55;	7	87	57	127	#87;	W	119	77	167	#119;	w
24	18	030	CAN (cancel)	56	38	070	#56;	8	88	58	130	#88;	X	120	78	170	#120;	x
25	19	031	EM (end of medium)	57	39	071	#57;	9	89	59	131	#89;	Y	121	79	171	#121;	y
26	1A	032	SUB (substitute)	58	3A	072	#58;	:	90	5A	132	#90;	Z	122	7A	172	#122;	z
27	1B	033	ESC (escape)	59	3B	073	#59;	<	91	5B	133	#91;	[	123	7B	173	#123;	{
28	1C	034	FS (file separator)	60	3C	074	#60;	>	92	5C	134	#92;	\	124	7C	174	#124;	|
29	1D	035	GS (group separator)	61	3D	075	#61;	=	93	5D	135	#93;	]	125	7D	175	#125;	}
30	1E	036	RS (record separator)	62	3E	076	#62;	>	94	5E	136	#94;	^	126	7E	176	#126;	~
31	1F	037	US (unit separator)	63	3F	077	#63;	?	95	5F	137	#95;	_	127	7F	177	#127;	DEL

Source: www.LookupTables.com

¹<https://www.asciitable.com/>

Outras codificações

- UTF-8 (parte dos caracteres)

C0 Controls and Basic Latin																
U+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
000x	[NUL]	[SOH]	[STX]	[ETX]	[EOT]	[ENQ]	[ACK]	[BEL]	[BS]	[HT]	[LF]	[VT]	[FF]	[CR]	[SO]	[SI]
001x	[DLE]	[DC1]	[DC2]	[DC3]	[DC4]	[NAK]	[SYN]	[ETB]	[CAN]	[EM]	[SUB]	[ESC]	[FS]	[GS]	[RS]	[US]
002x	[SP]	!	"	#	\$	%	&	'	()	*	+	,	-	.	/
003x	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
004x	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
005x	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
006x	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
007x	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	[DEL]

¹https://en.wikibooks.org/wiki/Unicode/Character_reference/0000-0FFF

Outras codificações

- UTF-8 (parte dos caracteres)

Cyrillic																
U+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
040x	Ё	Е	Ђ	Ѓ	Є	Ѕ	І	Ї	Ј	Љ	Њ	Ћ	Ќ	Й	Ў	Ў
041x	А	Б	В	Г	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
042x	Р	С	Т	У	Ф	Х	Ц	Ч	Ш	Щ	Ъ	Ы	Ь	Э	Ю	Я
043x	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о	п
044x	р	с	т	у	ф	х	ц	ч	ш	щ	ъ	ы	ь	э	ю	я
045x	ё	е	ђ	ѓ	є	ѕ	і	ї	ј	љ	њ	ћ	ќ	й	ў	џ
046x	Ѡ	ѡ	Ѣ	ѣ	Ѥ	ѥ	Ѧ	ѧ	Ѩ	ѩ	Ѫ	ѫ	Ѭ	ѭ	Ѯ	ѯ
047x	Ѱ	ѱ	Ѳ	ѳ	Ѵ	ѵ	Ѷ	ѷ	Ѹ	ѹ	Ѻ	ѻ	Ѽ	ѽ	Ѿ	ѿ
048x	Ҁ	ҁ	҂	҃	҄	҅	҆	҇	҈	҉	Ҋ	ҋ	Ҍ	ҍ	Ҏ	ҏ
049x	Ґ	ґ	Ғ	ғ	Ҕ	ҕ	Җ	җ	Ҙ	ҙ	Ҝ	ҝ	Ҟ	ҟ	Ҡ	қ
04Ax	Ҝ	ҝ	Ҟ	ҟ	Ҡ	қ	Ң	ң	Ҥ	ҥ	Ҧ	ҧ	Ҩ	ҩ	Ҫ	ҫ
04Bx	Ҫ	ҫ	Ҭ	ҭ	Ү	ү	Ҹ	ҹ	Һ	һ	Ҽ	ҽ	Ҿ	ҿ	Ҡ	қ
04Cx	І	Ъ	Ѡ	ѡ	Ѣ	ѣ	Ѥ	ѥ	Ѧ	ѧ	Ѩ	ѩ	Ѫ	ѫ	Ѭ	ѭ
04Dx	Ӑ	ӑ	Ӓ	ӓ	Ӕ	ӕ	Ӗ	ӗ	Ә	ӧ	Ө	ө	Ӫ	ӫ	Ӭ	ӭ
04Ex	Ӯ	ӯ	Ӱ	ӱ	Ӳ	ӳ	Ӵ	ӵ	Ӷ	ӷ	Ӹ	ӹ	Ӻ	ӻ	Ӽ	ӽ
04Fx	Ӿ	ӿ	Ӱ	ӱ	Ӳ	ӳ	Ӵ	ӵ	Ӷ	ӷ	Ӹ	ӹ	Ӻ	ӻ	Ӽ	ӽ

¹https://en.wikibooks.org/wiki/Unicode/Character_reference/0000-0FFF

Próxima aula

- Estudar: Teoria \rightarrow Aritmética binária
- Estudar: Teoria \rightarrow Álgebra booleana