

Informatica 1

Corso di Laurea Triennale in Matematica

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1: Rappresentazione dell'Informazione

Da binario a esadecimale

Dato $(b_7b_6b_5b_4b_3b_2b_1b_0)_2$

$$\begin{aligned} & (b_72^7 + b_62^6 + b_52^5 + b_42^4) + (b_32^3 + b_22^2 + b_12^1 + b_02^0) \\ & \quad \Downarrow \\ & 2^4 \left(\underbrace{b_72^3 + b_62^2 + b_52^1 + b_42^0}_{0 \rightsquigarrow F} \right) + \left(\underbrace{b_32^3 + b_22^2 + b_12^1 + b_02^0}_{0 \rightsquigarrow F} \right) \\ & \quad \Downarrow \\ & h(b_7b_6b_5b_4) \cdot 16^1 + h(b_3b_2b_1b_0) \cdot 16^0 \end{aligned}$$

Dove $h(b_7b_6b_5b_4)$ rappresenta la cifra esadecimale che corrisponde a $b_7b_6b_5b_4$.

Da binario a esadecimale: Esempio

1	0	1	1	0	1	0	1	0	0
2		D				4			

Quindi

$$(10\ 1101\ 0100)_2$$

equivale a

$$(2D4)_{16}$$

Da esadecimale a binario

Dato $(h_2 h_1 h_0)_{16}$ con $h_i = (b_3^i b_2^i b_1^i b_0^i)_2$ ha valore

$$h_2 \cdot 16^2 + h_1 \cdot 16^1 + h_0 \cdot 16^0$$

$$h_0 \cdot 16^0 = (b_3^0 b_2^0 b_1^0 b_0^0)_2$$

$$h_1 \cdot 16^1 = h_1 \cdot 2^4 = (b_3^1 b_2^1 b_1^1 b_0^1 0 0 0 0)_2$$

$$h_2 \cdot 16^2 = h_2 \cdot 2^8 = (b_3^2 b_2^2 b_1^2 b_0^2 0 0 0 0 0 0 0 0)_2$$

Sommando

$$(b_3^2 b_2^2 b_1^2 b_0^2 \quad b_3^1 b_2^1 b_1^1 b_0^1 \quad b_3^0 b_2^0 b_1^0 b_0^0)_2$$

Da esadecimale a binario: Esempio

Convertiamo $(C\ 1\ A\ 0)_{16}$ in binario

C	\rightsquigarrow	1 1 0 0
1	\rightsquigarrow	0 0 0 1
A	\rightsquigarrow	1 0 1 0
0	\rightsquigarrow	0 0 0 0

Quindi

$$(C\ 1\ A\ 0)_{16} = (1\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0\ 0\ 0)_2$$

Bit di segno

$$(b_{n-1} \ b_{n-2} \ \dots \ b_1 \ b_0)_{2s} = \begin{cases} \sum_{i=0}^{n-2} b_i \cdot 2^i & \text{se } b_{n-1} = 0 \\ -\sum_{i=0}^{n-2} b_i \cdot 2^i & \text{se } b_{n-1} = 1 \end{cases}$$

Se $n = 8$ allora

$$(0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1)_{2s} = (77)_{10}$$

$$(1 \ 0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0)_{2s} = (-36)_{10}$$

Virgola fissa

c_{M-1}	\dots	c_1	c_0	$.$	c_{-1}	c_{-2}	\dots	c_{-N}
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$$\sum_{i=-N}^M c_i b^i$$

Esempio $N = 4$, $M = 4$:

$$\begin{aligned}(1011.0011)_2 &= 2^3 + 2^1 + 2^0 + 2^{-3} + 2^{-4} \\ &= 8 + 2 + 1 + 1/8 + 1/16 \\ &= 11.1875\end{aligned}$$

Virgola mobile: Standard IEEE 754

Notazione scientifica $\text{mantissa} \times 2^{\text{esponente}}$

31	30	...	23	22	21	...	0
<i>s</i>	<i>esponente</i>			<i>mantissa</i>			

- *s*: bit di segno (0 positivi; 1 negativi);
- *esponente*: esponente di 2;
- *mantissa*: nella forma 1.*m*. Si rappresenta solo *m*.

Operatori logici

x	y	x and y
0	0	0
0	1	0
1	0	0
1	1	1

x	y	x or y
0	0	0
0	1	1
1	0	1
1	1	1

x	not x
0	1
1	0

x	y	x xor y
0	0	0
0	1	1
1	0	1
1	1	0

$$x \text{ xor } y = (x \text{ or } y) \text{ and not } (x \text{ and } y)$$

Caratteri e stringhe

Caratteri

<i>a b ... z A B ... Z</i>	lettere
<i>0 1 ... 9</i>	cifre
<i>. , ; :</i>	punteggiatura
<i>\n \t ...</i>	controllo
<i>() + - < > ...</i>	altro

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

Source: www.LookUpTables.com

Se c_i sono codici di caratteri

$$s = \begin{array}{|c|c|c|c|} \hline c_0 & c_1 & \dots & c_{n-1} \\ \hline \end{array} \quad \backslash 0$$

$$s = \emptyset \quad (\text{NULL})$$