

Coding (1C)

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Coding

A code is a rule for converting a piece of information (for example, a letter, word, phrase, or gesture) into another form or representation (one sign into another sign), not necessarily of the same type.

In *communications and information processing*, **encoding** is the process by which information from a source is converted into symbols to be communicated. **Decoding** is the reverse process, converting these code symbols back into information understandable by a receiver.

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	— — — — —

Character Coding

ASCII code

definitions for 128 characters:
 33 non-printing control characters
 (many now obsolete)
 95 printable characters

USASCII code chart

					0 0	0 0 1	0 1 0	0 1 1	1 0 0	1 0 1	1 1 0	1 1 1
b ₄	b ₃	b ₂	b ₁	Row	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	\$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	|
1	1	0	1	13	CR	GS	-	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

BCD (Binary Coded Decimal)

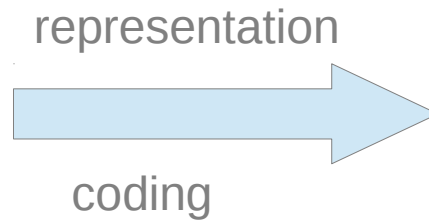
Number characters (0-9)

Decimal Digit	BCD 8 4 2 1
0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1

Representation of Numbers

Fixed Point Number

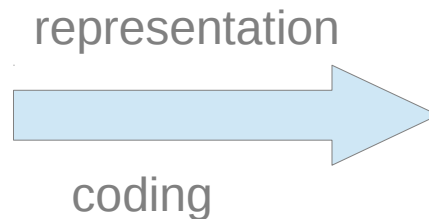
+1234
0
-582978



- 2's complement
- 1's complement
- sign-magnitude

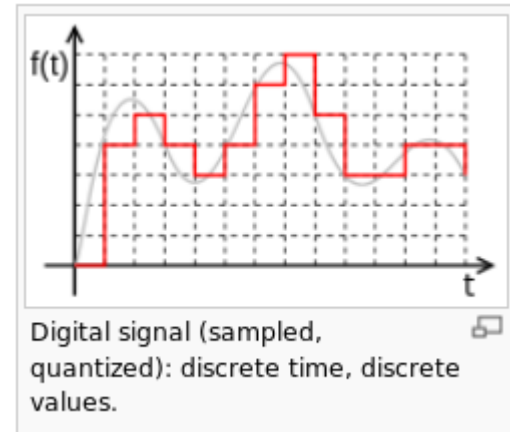
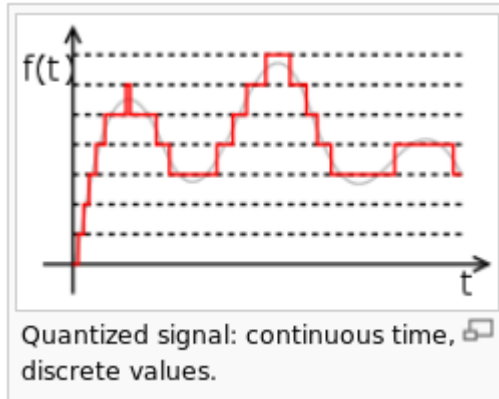
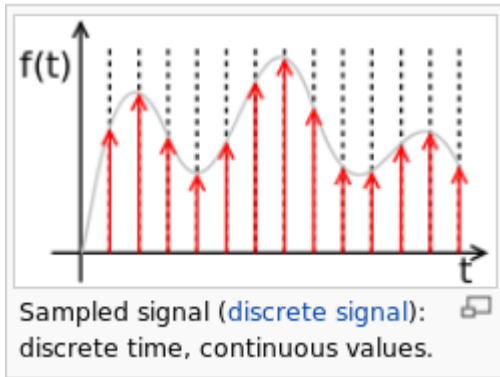
Floating Point Number

+23.84380
-1.388E+08

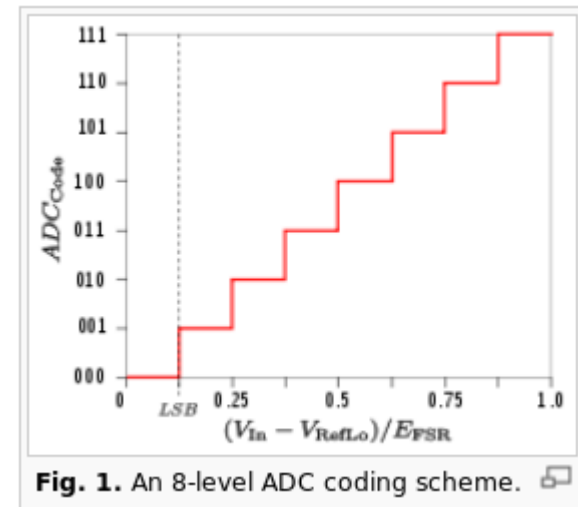


- IEEE 754

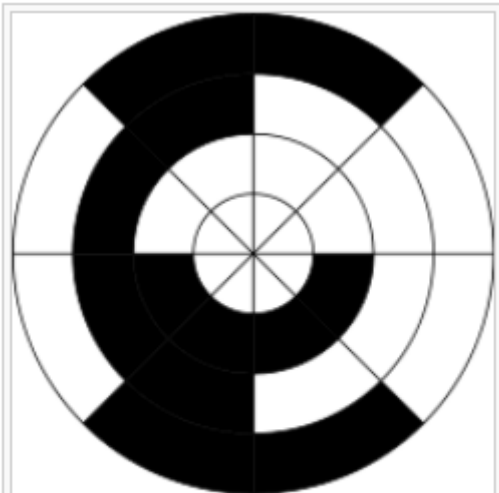
Representation of Signals



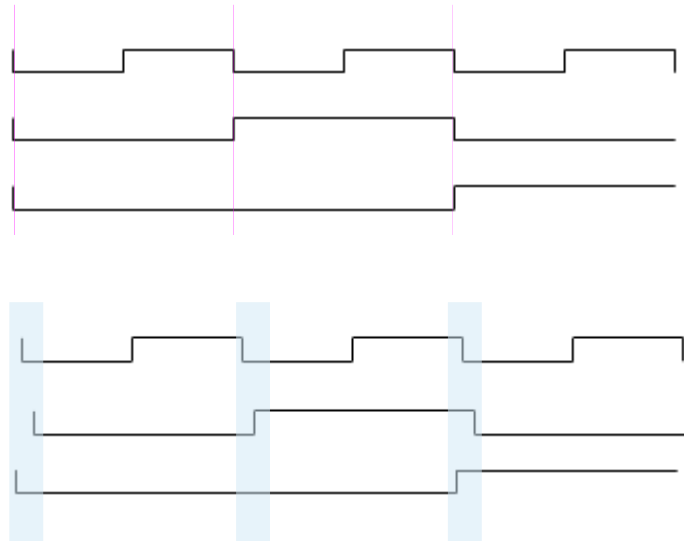
Analog to Digital Converter



Angular Position Sensors



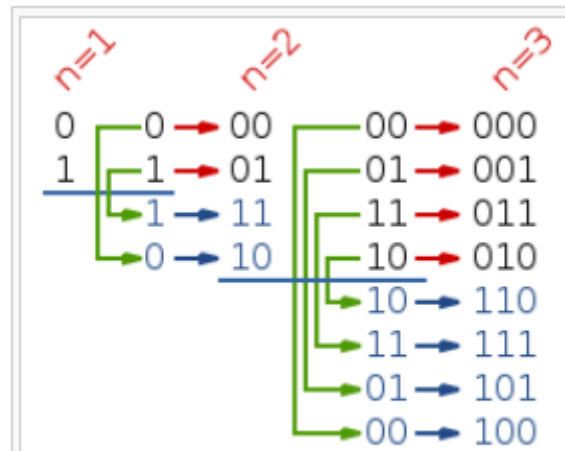
Rotary encoder for angle-measuring devices marked in 3-bit binary-reflected Gray code (BRGC)



Dec	Gray	Binary
0	000	000
1	001	001
2	011	010
3	010	011
4	110	100
5	111	101
6	101	110
7	100	111

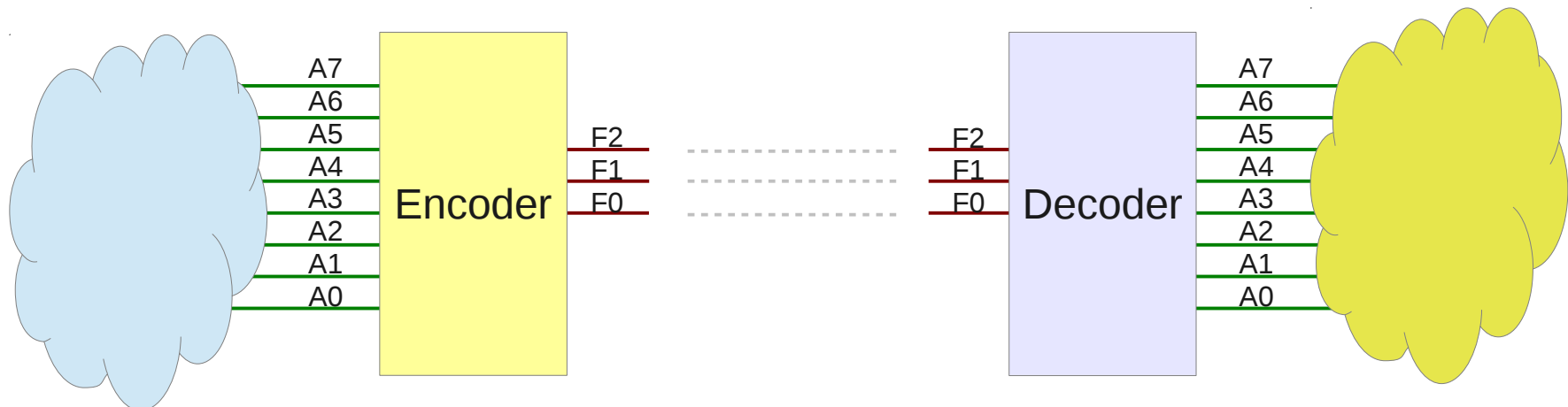
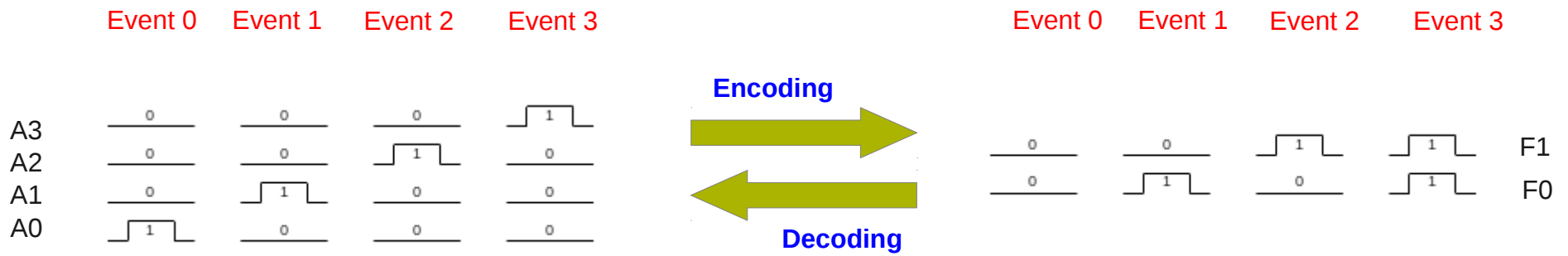
Gray code by bit width

2-bit	4-bit
00	0000
01	0001
11	0011
10	0010
	0110
	0111
3-bit	0101
000	0100
001	1100
011	1101
010	1111
110	1110
111	1010
101	1011
100	1001
	1000

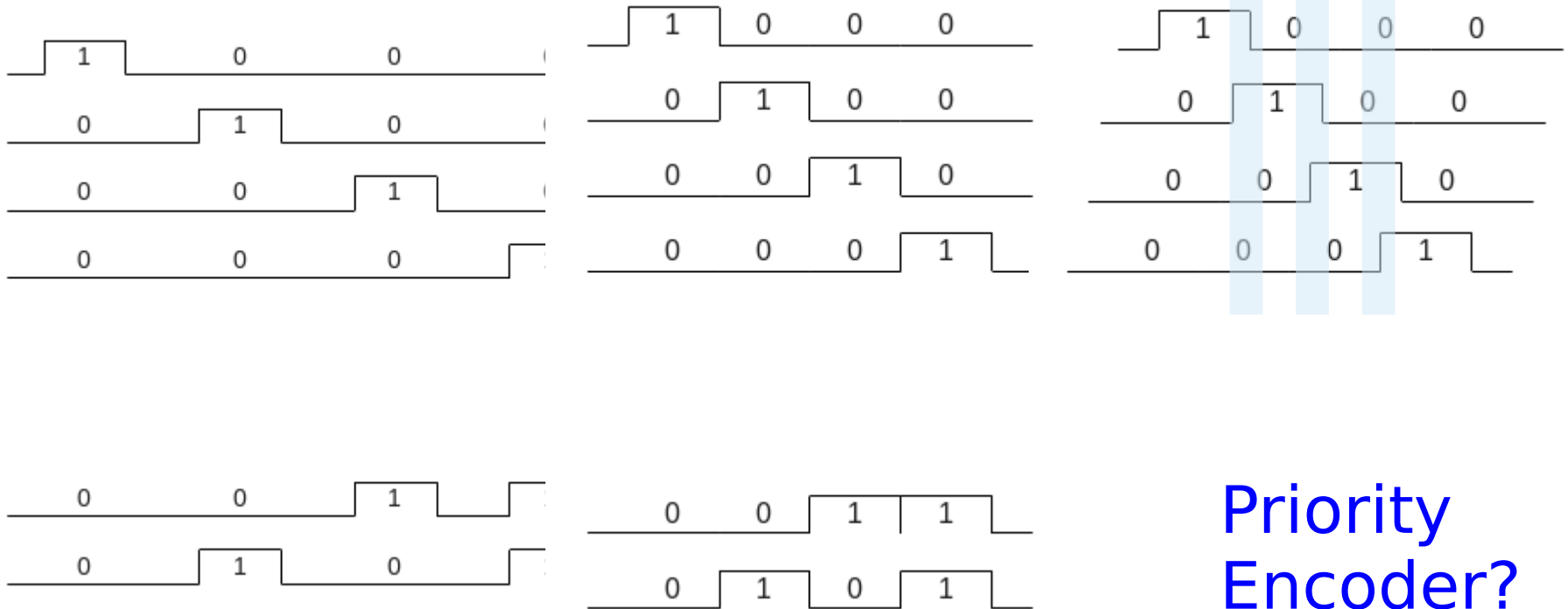


The first few steps of the reflect-and-prefix method.

Encoder and Decoder



Priority Encoder



Priority
Encoder?

Laplace Equation

References

- [1] <http://en.wikipedia.org/>
- [2] <http://planetmath.org/>
- [3] M.L. Boas, "Mathematical Methods in the Physical Sciences"