Note Title 2/4/2009

Non-positional codes — BCD code is an example

Error-detecting codes } read Section 1.5 of your text

Error-correcting codes

Gray code

0	0000	only one bit changes
1	0001	only one bit changes
2	0011	only one bit changes
3	0010	

Gray codes can be built by "mirroring."

Q5

(1) $8_{10} = (\qquad\qquad)_2$

(2) Find the 2's complement of this, i.e., represent

-8_{10} in the 2's complement number system

This example is on p. 20 of the textbook.

(1) 00001000 = a (do by repeated division)

(2) a^* = 11111000 (flip bits to the left of the rightmost 1)

(3) b = 00010011 (do by repeated division)

(4)

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  00010011 +
  11111000
 ----------
 100001011
```

⟹ b − a = 00001011

(discard carry bit)

Boolean algebra (Chs 2+3) (Combinational circuits)

~~Who was George Boole?~~
What did he write? — Please find out the exact title of his circa ~~1868~~ 1847 book.

We study Boolean algebra for its use in digital logic design, and especially for the design of combinational circuits.

Boolean variables may take two values, which we represent as 0 and 1 (other representations are: T and F, t and f, true and false, yes and no, y and n, Y and N).

Boolean variables are usually represented by upper case Roman letters ($A, B, \ldots, X, Y, \ldots$).

You indicate that a Boolean variable has value 1, by writing it lower case

You indicate that a B. var. has value 0, by writing it with a prime

Ex.: $A=1$ is written a

$A=0$ is written a' ($\bar{a}$, $\sim a$, $\neg a$)

book common

A pair of a Boolean variable and its value is called a literal.

So, a and a' are literals.

The basic operations of Boolean algebra are AND, OR, and complement.

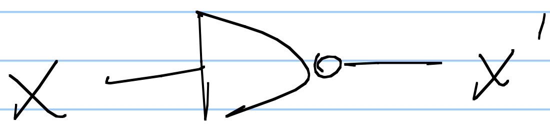
Complement (complementation) is indicated by $'$.

So, $0' = 1$ $\quad$ $1' = 0$

$X' = 1$ if X is 0

$X' = 0$ if X is 1

This defines a new Boolean expression from another one, namely the complement of a Boolean expression



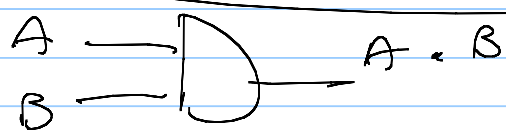
↑ negation circuit element (complementation)

You "feed" X to the negation circuit element ("negator" or <u>inverter</u>) and you get its complement, X'!

AND operation

$A \cdot B = A \text{ AND } B = A \wedge B = A \& B = AB$

most common and used in our text



OR operation

used by our text

$A + B = A \text{ OR } B = A \vee B$