Introduction to Information Technology

CSC109

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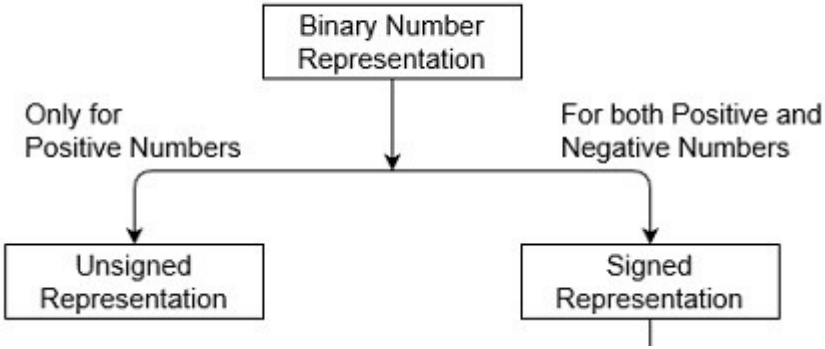
Chapter 5
Data Representation

Signed And Unsigned Numbers



MSB, a flag which represent the number is positive or negative.

MSB	Actual Number

If MSB=0; the signed binary number is positive;

MSB =1; the signed binary number is –ve;

111 7

8: 1000 Max 4 bit binary no can represent 15

Now if we need to represent number more than 16
we need 5 bit binary number

Now lets see following binary sequence

Tell me what did you notice here;

0000	1000
0001	1001
0010	1010
0011	1011
0100	1100
0101	1101
0110	1110
0111	1111

1. You can Specify a number is negative or positive with MSB also called as sign bit.

2. when you have a sign bit you can only count half. But can do so in two direction positive and negative.

3. The same exact binary can encode signed number or unsigned number

1010→ ten or negative two.

Q: 8 bit representation of +12 and -12

Complement of Binary Numbers

- In computer subtraction is performed as regular subtraction
- This is because same circuit is used both for subtraction and addition
- Complement is used to perform subtraction by addition numbers

1's Complement

1's complement of a number is obtained by inverting each bit of given number. If the number is negative it becomes positive and vice versa

2's Complement

2's complement of a number is obtained by inverting each bit of given number plus 1 to least significant bit (LSB).

Exercise; Subtraction using 1's Complement

$(110101)_2$-$(100101)_2$

$(101011)_2$-$(111001)_2$

Subtract $(11100)_2$ from $(1101)_2$

Exercise; Subtraction using 2's Complement

$(110101)_2$-$(100101)_2$

$(101011)_2$-$(111001)_2$

Number System	Base	Complement Possible
Binary	2	1’s & 2’s Complement
Octal	8	7’s & 8’s Complement
Decimal	10	9’s & 10’s Complement
Hexadecimal	16	15’s & 16’s Complement