Al Mustaqbal University
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Computer Science

Lecture 3
Computer Number System

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What is Number System

- A number system is a system representing numbers. It is also called the system of numeration and it defines a set of values to represent a quantity. These numbers are used as digits and the most common ones are 0 and 1, that are used to represent binary numbers. Digits from 0 to 9 are used to represent other types of number systems.

Types of Number Systems

- There are different types of number systems in which the four main types are:

Binary number system

(Base - 2) like that $(110101)_2$

Octal number system

(Base - 8) like that $(826)_8$

Hexadecimal number system

(Base - 16) like that $(27FBE)_{16}$

Decimal number system

(Base - 10) like that $(102345)_{10}$

Binary Number System

- The binary number system uses only two digits: 0 and 1. The numbers in this system have a base of 2. The binary system is applied internally by almost all latest computers and computer-based devices because of its direct implementation in electronic circuits using logic gates. Every digit is referred to as a bit. binary number, the rightmost digit is called least significant bit (LSB) and leftmost digit is called most significant bit (MSB). The binary number are represent like $(110101)_2$

1	1	0	0	1	1
MSB					LSB

Decimal Number System

- Decimal number system is a **base 10** number system having 10 digits from 0 to 9. This means that any numerical quantity can be represented using these 10 digits. Decimal number system is also a **positional value system**. This means that the value of digits will depend on its position. Let us take an example to understand this.

$$1234_{10} = 1\times10^3 + 2\times10^2 + 3\times10^1 + 4\times10^0$$

$$= 1000 + 200 + 30 + 4$$

$$= 1234_{10}$$

Binary Number System

- Binary number system conversion into decimal And decimal equivalent of this number is sum of product of each digit with its positional value.
- Binary to Decimal conversation

$$110010_2 = 1\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0$$

$$= 32+16 + 0 + 0 + 2 + 0$$

$$= 50_{10}$$

Decimal to Binary Conversion

- To convert Decimal to binary numbers, the following steps should be followed:-
- 1. Take any decimal number and divide it by “2". After dividing, you will get some results along with the remainder.
- 2. If the decimal number chosen by you is even, then the result will be in a whole number and it will give the remainder 0.
- 3. If the decimal number chosen by you is odd, then the number will not be divided fully and you will get the remainder “1”.
- 4. Continue dividing the number till you get the quotient 0
- 5. Now place all the remainders in the series of Least Significant Bit (LSB) at the top and the Most Significant bit (MSB) at the bottom.

Decimal to Binary Conversion Example

- **Let us Convert the Decimal Number 75 into a Binary Number.**
- **1 0 0 1 0 1 1**

Division of Decimal Number by 2	Quotient	Remainder	Binary
75/2	37	1	(LSB) 1
37/2	18	1	1
18/2	9	0	0
9/2	4	1	1
4/2	2	0	0
2/2	1	0	0
1/2	0	1	(MSB) 1

- **128 64 32 16 8 4 2 1**
- Target --> 102
- 01100110

THANK YOU ☺