Lecture 1: Introduction to Digital Systems

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Introduction to Digital Systems

- How does your phone work?

- You take a picture with your phone.

- The picture is converted into digital signals (0 and 1).

- The signals are transmitted over the network.

- Your friend receives and views the picture, unchanged.

- - How are these data transformed and transmitted?

Why Study Digital Systems?

- Foundation of technology: Every electronic device relies on digital systems.

- Communication:

-   Internet, smartphones

- Industry:

- Robotics, automated control

- Entertainment:

- Video games, streaming platforms

- What devices do you use daily that rely on digital systems?

Historical Background

Evolution of Digital Systems:

- 1854: George Boole established Boolean algebra.

- 1937: Claude Shannon applied Boolean algebra to electrical circuits.

- 1946: The first digital computer (ENIAC).

- 1960s: The invention of integrated circuits.

- What do you think the first computers looked like?

The Binary System

- What is it? A system based on two digits: 0 and 1.

- Represents two states: ON or OFF.

- Why use it?

- Simple and stable.

- Resistant to noise.

Example:

- The decimal number 5 in binary = 101.

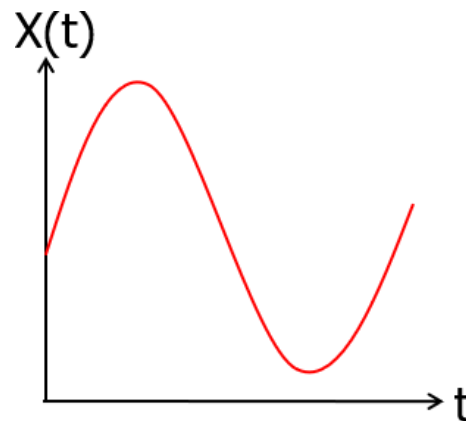- Why do we use the binary system instead of the decimal system?

Introduction to Digital Systems
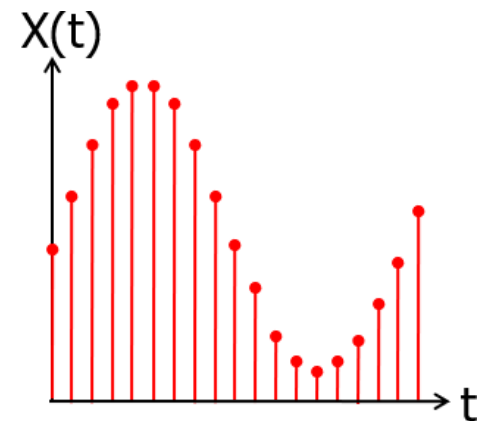
Analog system

- The physical quantities or signals may vary continuously over a specified range.

Digital system

- The physical quantities or signals can assume only discrete values.
- Greater accuracy

Analog signal

Digital signal

Introduction to Digital Systems

1. **Analog Signal:** Represents continuous data, such as sound or light waves.

- Example: A sine wave from a microphone.

2. **Digital Conversion:** Sampling: Taking signal values at regular intervals.

- Quantization: Converting sampled values into binary (0s and 1s).

3. **Digital Signal:** Represents data using two levels (0 and 1).

- Resistant to noise, easy to store and process.

Importance:

- Enables storage, processing, and transmission of data in digital systems.

- Used in MP3 audio, digital video, and modern communication systems.

Homework

- Choose a digital device you use daily.

- Research and explain in simple terms how it works.

- How does a smartphone process and display images?

- How does a remote control communicate with a TV?

ASCII

Symbol	Dec	Binary	Hex
`	96	1100000	60
a	97	1100001	61
b	98	1100010	62
c	99	1100011	63
d	100	1100100	64
e	101	1100101	65
f	102	1100110	66
g	103	1100111	67
h	104	1101000	68
i	105	1101001	69
j	106	1101010	6A
k	107	1101011	6B
l	108	1101100	6C
m	109	1101101	6D
n	110	1101110	6E
o	111	1101111	6F

Symbol	Dec	Binary	Hex
p	112	1110000	70
q	113	1110001	71
r	114	1110010	72
s	115	1110011	73
t	116	1110100	74
u	117	1110101	75
v	118	1110110	76
w	119	1110111	77
x	120	1111000	78
y	121	1111001	79
z	122	1111010	7A
{	123	1111011	7B
		124	1111100	7C
}	125	1111101	7D
~	126	1111110	7E
Del	127	1111111	7F