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WT Exp 1

Types of sensors used in wireless communication

1. Bluetooth

Description:
Bluetooth is a short-range wireless communication technology used for exchanging data over short distances between devices. It operates in the 2.4 GHz ISM band and is widely used in consumer electronics like headphones, keyboards, and smartphones.

Applications:

- Wireless headphones and speakers
- File sharing between devices
  Smart home devices (e.g., smart locks)
- Wearable devices (e.g., fitness trackers)
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2. WiFi

Description:
WiFi is a wireless networking technology that allows devices to connect to the internet or a local area network (LAN) using radio waves. It typically operates in the 2.4 GHz and 5 GHz bands, and newer standards like WiFi 6 also support 6 GHz.

Applications:

- Home and office internet connectivity
  Video streaming and gaming
- IoT devices in smart homes
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- Wireless printing

3. Zigbee

Description:
Zigbee is a low-power, low-data-rate wireless communication protocol designed for IoT and machine-to-machine (M2M) networks. It uses the 2.4 GHz frequency and is known for its mesh networking capabilities.

Applications:

- Smart home automation (e.g., light bulbs, thermostats)
- Industrial automation
- Remote monitoring systems

4. LoRa (Long Range)

Description:
LoRa is a long-range, low-power wireless technology designed for IoT applications. It operates in unlicensed frequency bands and supports long-distance communication with low data rates.

Applications:

- Smart agriculture (e.g., soil moisture sensors)
- Smart cities (e.g., parking sensors, water meters)
- Environmental monitoring
- Asset tracking

5. 5G

Description:
5G is the fifth-generation cellular network technology that provides high-speed internet and low latency. It supports massive IoT connectivity, ultra-reliable low-latency communication (URLLC), and enhanced mobile broadband.

Applications:

- Real-time video streaming and gaming
- Autonomous vehicles
- Smart cities and IoT ecosystems
- Telemedicine and remote surgeries

6. NFC (Near Field Communication)

Description:
NFC is a very short-range communication technology that allows devices to exchange data when brought within a few centimeters of each other. It is commonly used in contactless payment systems and access control.

Applications:

- Mobile payments (e.g., Google Pay, Apple Pay)
- Contactless ticketing and access control
- Data transfer between devices (e.g., Android Beam)
- Electronic identification

7. Infrared

Description:
Infrared communication uses infrared light to transmit data wirelessly. It requires a clear line of sight between devices, as the signals cannot pass through walls or obstacles.

Applications:

- Remote controls for TVs and other appliances
- Data transfer in older mobile devices
- Night vision and thermal imaging
- Wireless keyboards and mice

8. Satellite Communication

Description:
Satellite communication relies on satellites in orbit to provide global coverage for data transmission and telecommunication. It is often used in areas where terrestrial networks are unavailable.

Applications:

- Global Positioning System (GPS)
- Satellite internet (e.g., Starlink)
- Broadcast TV and radio
- Military and disaster communication

9. Cellular Communication (GSM, CDMA, 3G, 4G)

Description:
Cellular communication is a wireless communication system that uses a network of base stations to provide mobile connectivity. Different generations (GSM, CDMA, 3G, 4G, and 5G) offer varying speeds and capabilities.

Applications:

- Voice and video calls
- Mobile internet browsing
- Messaging services (SMS/MMS)
- IoT applications (e.g., connected cars, smart devices)

Wireless Technology	Range	Cost	Propagation Delay	Power Consumption	Throughput	Fanout (Connections)
Bluetooth	~10m to 100m	Low	Very Low (~few ms)	Low	~1-3 Mbps	Limited (~7 devices)
WiFi	~50m (indoor), ~200m (outdoor)	Moderate	Low (~ms)	Moderate	~100 Mbps-1 Gbps	Moderate (20-50 devices)
Zigbee	~10m to 100m	Low	Low	Very Low	~250 Kbps	High (~65,000 devices in mesh)
LoRa	~10-15 km (urban), ~40 km (rural)	Low	Moderate (~few seconds)	Very Low	~0.3-50 Kbps	High (many devices in a network)
5G	~100m to 1 km	High	Very Low (~ms)	High	~1-10 Gbps	High (massive IoT support)
NFC	~10 cm	Low	Very Low (~instantaneous)	Very Low	~424 Kbps	Very Limited (point-to-point)
Infrared	~1-5m (line of sight)	Low	Very Low (~ns to µs)	Very Low	~1 Mbps	Limited (1-to-1 communication)
Satellite Communication	Global (~10,000s of km)	Very High	High (~600 ms+)	High	~1-100 Mbps	High

Cellular (GSM/CDMA/3G/4G)	~1-10 km (depends on tech)	Moderate to High	Moderate (~ms to ~100ms)	Moderate to High	~1 Mbps (GSM) to ~1 Gbps (4G)	Moderate

Conclusion :-

The types of wireless sensors, their characteristics and their suitability to different needs was studied and understood.