Explain the characteristics and attributes you should consider when selecting and dealing with connecting smart objects.

1. Compatibility
2. Interoperability
3. Security
4. Data Privacy
5. Scalability
6. Power efficiency
7. Cost
8. Update and maintenance

SENSORS

1. Active-ultrasonic sensor or passive- light or infrared sensor
2. Invasive- Temperature or BP sensor and non-invasive- pacemaker, retina implant
3. Analog- speed sensor or accelarometer and digital - digital acceleratometer
4. Contact- oral thermometer and no-contact- infrared thermometer
5. Absolute- absolute pressure sensor or relative - relative pressure sensor refers to the ambient atmospheric pressure
6. Area of application - chemical, biological

ACTUATORS

1. Hydraulic - welding, clamping, raising vehicles
2. Pneumatic - robot fingers
3. Electrical - solenoid based electrical bell
4. Thermal - Shape memory alloys, piezo motor using sma
5. Mechanical - crankshaft

Components of smart object

* Sensors
* Actuators
* Communictaion devices
* Low cost tiny computer
* Power supply

| **Aspect** | **Wi-Fi (Wireless Fidelity)** | **Li-Fi (Light Fidelity)** |
| --- | --- | --- |
| Technology | Uses radio waves to transmit data wirelessly. | Utilizes visible light from LED bulbs for data transfer. |
| Transmission Medium | Radio frequency (RF) waves. | Visible light spectrum, typically using LEDs. |
| Speed | Typically provides data rates ranging from Mbps to Gbps, depending on the Wi-Fi standard (e.g., 802.11ac, 802.11ax). | Has the potential for extremely high data rates, even reaching tens of Gbps in lab environments. |
| Range | Offers relatively longer range, covering indoor and outdoor areas, with signals capable of passing through walls and obstacles. | Offers a shorter range since it relies on visible light, making it ideal for indoor environments but not suitable for long-range outdoor applications. |
| Interference | Susceptible to interference from other Wi-Fi networks, electronic devices, and physical obstacles. | Generally less susceptible to interference from other Li-Fi networks, but light signal transmission can be blocked by physical obstacles. |
| Security | Provides encryption and security features, including WPA3 for network protection. | Offers inherent security benefits as light signals do not pass through walls, making it difficult for outsiders to intercept data. |
| Health Concerns | Generally considered safe, with radio waves used in many everyday devices. | Safe for human exposure, but strong or flickering light may cause discomfort or headaches. |
| Deployment | Commonly deployed in various environments, including homes, offices, public spaces, and outdoor locations. | Suitable for specific use cases in controlled environments, such as hospitals, manufacturing, and secure data communication areas. |
| Energy Efficiency | Relatively less energy-efficient compared to Li-Fi. | More energy-efficient as it uses LED lighting, which is energy-efficient and eco-friendly. |
| Line-of-Sight | Not strictly line-of-sight, as signals can penetrate some obstacles. | Typically requires a direct line-of-sight between the transmitter (LED bulb) and receiver (Li-Fi device). |
| Illumination | Does not provide illumination; Wi-Fi and lighting are separate systems. | Provides illumination along with data transmission, offering potential energy savings in smart lighting applications. |
| Standardization | Governed by IEEE standards, such as 802.11n, 802.11ac, and 802.11ax. | Li-Fi technology is still evolving, and there is no universal standard yet, but organizations are working on Li-Fi standards. |

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