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Perspective

Advancements of Wireless Sensors on Wearable Electronics

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DESCRIPTION

User comfort, convenience, security, and improved medical functionality have all been emphasized in the development of wearable electronics. Several prior research efforts turned several types of sensors into wearable devices in order to better monitor body signals and provide real-time, continuous sensing. Wireless power supply and data transmission systems must be integrated with the wearable sensors in order for these wearable sensing platforms to be realized. Electronic skin, smart contact lenses, neural interfaces, and retinal prosthesis are also highlighted as state-of-the-art research connected to the use of wearable sensor systems with wireless capabilities. Wireless sensor systems are examined, including their current difficulties and future opportunities.

Wireless power supply and data communication methods are discussed in this section, along with their properties. Their pros and disadvantages are also compared.

Wireless power supply

A method that can provide continuous power is required for wireless sensors to work in a long-term way. Battery replacement is not the desired process in certain applications, such as implanted devices, according to several studies of wireless wearable sensors. However, it is difficult to use batteries without power transfer technologies, so battery replacement is not the desired process in certain applications, such as implanted devices. As a result, wireless power supply is a critical component in the effective application of many types of wireless wearable sensors.

Wireless power transfer

Electromagnetic fields are used to transfer power between two antennas in wireless power transfer. For data transmission, several types of electromagnetic power transfer may be utilized; as a result, it has become a popular method for delivering wireless power to sensors. Inductive electromagnetic coupling of a transmitting antenna coupled to an external power source to a receiving antenna transfers Radio Frequency (RF) power. The provided electricity is utilized to charge the battery or to run thewearable electronic gadget without a battery. Without a battery, the size of the device system may be reduced, and the lack of batteries eliminates certain safety concerns, such as battery explosion or electrolyte leakage.

Wireless data transmission

Wireless data transfer is gaining popularity as a way to examine data from wearable sensors in real time with computers or cellphones, as well as to effectively transport the large amounts of data held by sensor systems to the outside world. Various approaches for wireless data transfer from sensors that detect human signals to a media capable of receiving the data are being investigated. Depending on the distance between the sensor and the signal receiver, the medium, bidirectionality, and numerous connections, the sensor system employs appropriate approaches.

Radiofrequency identification

RFID, often known as an electronic tag, is an electromagnetic frequencies method of identifying data. RFID stands for radio frequency identification, which is used to detect short-range or contactless data. A tag and a reader are required for an RFID system. Transceivers and chips are utilized in the tag, or an antenna can be used as a "chipless RFID" without chips. According to function and power availability, RFID tags can be classed as active, passive, or semi-active. This data is used to identify targets that have been tagged. The tags may be read from 15 metres or less, and the range varies depending on the frequency. Passive RFID is RFID that reads and transfers chip information using just the power of a reader.

Bluetooth

Bluetooth operates at frequencies between 2.4 GHz and 5 GHz and uses electromagnetic waves for data transmission. In addition to low power and cost, the Bluetooth has the advantage of having a wide transmission range and fast speed, with a maximum transmission distance of 100 m and a maximum transfer rate of 24 Mb/s. Furthermore, since microcontroller modules, including Bluetooth communication, are commercially available in various sizes, they can be easily integrated intoexisting sensors and thus occupy a large part of the wearable wireless sensor market.

The sensor and Bluetooth module were used to create a battery-free wireless energy collecting device that was linked to metamaterial fabrics. The Bluetooth-based sensor may wirelesslycommunicate temperature and humidity measurements to a smartphone using the device's power. Bluetooth, on the other hand, is difficult to miniaturise since it is implemented as a circuit board with a microcontroller unit.

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