U-Wear: Software-defined ultrasonic networking for wearable devices

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Technology description

WEARABLE BIOSENSOR SYSTEM USING ULTRASONIC COMMUNICATION FOR IMPROVIED PREFORMANCE, RELIABILITY, AND SAFETY, IN MONITORING HEALTH

Background

Current wearable medical devices and biosensors are typically based on RF communications systems. These systems have several potential drawbacks and limitations, including:

• Conflicts from other existing RF communications systems

• Health concerns due to extended exposure to RF electromagnetic fields

• Lack of flexibility and adaptability for application requirements

• Subject to jamming/attacks

U-Wear is the first software-defined networking framework for wearable medical devices based on ultrasonic communications. This system overcomes limitations of current technology.Current wearable medical devices and biosensors are typically based on RF communications systems. These systems have several potential drawbacks and limitations, including:

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Application area

Medical: There are a range of medical applications, including but not limited to:

• Wearable electrocardiography (ECG) devices and blood pressure sensors for early diagnosis of cardiac arrhythmias and hypertension.

• Measurement of subcutaneous blood glucose for Diabetes

• Diagnostic for post-surgery telerehabilitation in cases of injury, stroke, or degenerative conditions.

Fitness/Sports: Motion sensors, e.g., accelerometers and gyroscopes, can collect large amounts of data, For example, wireless motion trackers can record athletes' stride length, step rate, speed, and acceleration, for performance monitoring.
Military: Biosensors for monitoring the physical condition of soldiers in the field.

Advantages

U-Wear provides the following benefits over existing RF based wearable medical device systems:
• Eliminates any potential conflict with existing RF communications systems and over-crowded RF environments
• Ultrasonic communication systems are inherently more secure with respect to eavesdropping and jamming attacks
• Ultrasound is fundamentally safe, as long as acoustic power dissipation in tissues is limited to predefined safety levels
• Use of ultrasonic transducers can enable wireless battery charging functionalities
• Can easily be interfaced with ultrasonic intra-body networks, and can work as a bridge between intra-body sensors and the external world
• Can be reconfigured to adapt to the application requirements, offering more flexibility with respect to the traditional RF-based networking
systems entirely implemented in hardware, e.g., Bluetooth or Wi-Fi.

Institution

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