Wireless Incontinence Monitoring System for Improved Heath

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A low-cost wireless monitoring system designed to improve health care associated with incontinence is presented. The goal of this system is to address health complications such as urinary tract infections, pressure injuries, and dehydration for an aging population in nursing homes with a reliance on incontinence care. The system uses three sensors to provide data to manage care giver resources and ensure quality of care for fully dependent patients.

A small wireless module is attached onto the waistband of a disposable brief that uses Bluetooth Low Energy (LE) to communicate to a Raspberry Pi module located in the room. A moisture sensor using conductive thread is embedded into the disposable brief. The skin temperature sensor uses a metal contact on the module and body position sensor uses a 3-axis MEMS accelerometer. Sensor data is transmitted using Bluetooth LE advertisement packets thus eliminating the need for pairing. Packets are received using a Raspberry Pi (RP) single board computer and relayed via a TCP socket connection via WiFi to a server. The server collects the packets using a memory based Redis data structure. The data is written to a hard drive and used to create a status monitor display and create care giver threshold based alerts that are sent via pagers, messaging, or cloud based services. The module's wireless range is 20m indoors and battery life is 1 year using a coin cell. Dozens of modules can be supported by one RP although many RP devices would typically be used to provide complete area coverage. Historical data presiding in the database can be queried to show trends in sensor data or care.

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