

A ZIGBEE-WIRELESS BIOMEDICAL SENSOR NETWORK AS A PREDECESSOR TO AN IN-SUIT COLLECTION OF LOW-POWER HEALTH SENSORS

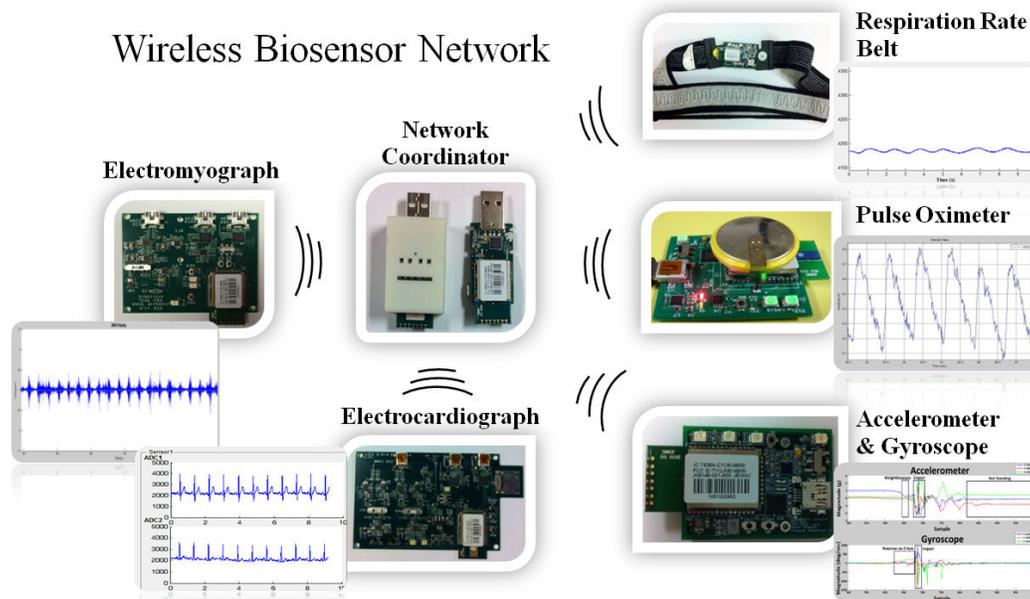
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Biomedical sensors embedded in spacesuits will help to monitor astronaut health during extra-vehicular activities (EVAs). Wireless, textile-based, low-power designs that rely on energy harvesting techniques are an important goal, as they would promote sensor-placement flexibility and address the need for power conservation in extreme reduced-gravity environments. However, the physical design of a pressurized suit that offers limited mobility and is constructed of multiple layers of radio-opaque material drives the need to test the operation of both commercial and custom tools (i.e., sensors, transmitters/receivers, and power delivery subsystems) intended for wireless health monitoring purposes. To that end, this work represents a network of ZigBee wireless sensors developed at Kansas State University that will offer a performance baseline for follow-on designs that incorporate FPGA-based low-power sensors, textile-based devices/antennas, custom low-power wireless links, and energy harvesting methods. The figure below depicts the elements of the biomedical sensor network: an electromyograph, a two-channel electrocardiograph, a respiration-rate belt [1], a pulse oximeter [2], and an accelerometer/gyroscope [3]. Illustrative data for each device are shown in the respective insets. These devices upload their data to a ZigBee network coordinator that has the form of a pluggable USB connector. When possible, sensors are operated in filter-free mode (e.g., electrocardiograph, pulse oximeter) so that these data include all signal elements, such as those resulting from motion, respiration, and environmental noise. Data are currently visualized using MATLAB and LabVIEW.



REFERENCES

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