Wireless Sensing and Monitoring of Physiological Movements and Volume Changes

James C. Lin, Ph.D., Professor
University of Illinois at Chicago (M/C 154)
851 South Morgan Street, 1020 SEO
Chicago, Illinois 60607-7053 USA

Summary

There has been growing interest in the use of low-power wireless technology for contact and remote detection and monitoring of physiological movements and volume changes. Some of the leading applications will be discussed. Remote or non-contact sensing of body movements associated with the expansion and contraction of the circulatory and respiratory systems in particular provides a non-invasive technique for measuring such vital physiological signatures as blood vessel pulse, respiratory rate, and heart rate. Wireless techniques provide a simple approach for detecting physiological and pathological movements and volume changes without compromising the integrity of the physiological substrates. A beam of radio frequency energy is directed to the target organ or tissue, and the reflected signal is processed to yield information on the organ or tissue of interest. Non-invasive measurements have provided sensing and monitoring for apex cardiograms, respiration rate and apnea detection, peripheral blood pulse waves, pressure pulse characteristics, arterial wall movement, and life sign (heart rate and respiration rate) detection. RF wireless techniques are providing a capability for detection and monitoring of physiological movement and volume change with unprecedented opportunities. Indeed, the large variety of potential uses of non-invasive measurement with microwaves, whether with direct contact or remote sensing, is just beginning to be seriously explored.

978-1-4244-6051-9/11/$26.00 ©2011 IEEE