

Book Review

Wearable Sensors: Fundamentals, Implementation and Applications, 2nd ed.

**Edited by Edward Sazonov,
Academic Press, 2020,
ISBN: 978-0-128-19246-7,
xvi + 644 pages, \$150**

■ **THIS TEXT IS** a well-referenced fairly comprehensive overview of the current state of the art involving wearable sensors and relevant applications in (mainly) human health monitoring in applications from medicine to sports. The text is organized into six sections containing a total of 22 chapters contributed by some 78(!) researchers from 13 countries. It is aimed at “Practicing engineers in the area of medical and wearable devices, academic researchers, undergraduate and graduate students.” A review of the text, by sections, follows.

Section 1 (three chapters) of the text is titled “Taxonomy and concepts of wearable sensors.” It overviews what currently exists in wearable sensors, and the current challenges and possible features of the technology that might be developed in the future. Implantable sensors are next overviewed, with applications in musculoskeletal injuries and stroke rehabilitation as examples. Lastly, the use and history of external and internal sensing devices for disease detection, from Holter monitors to current devices used in cardiovascular, neurological, and gastrointestinal diseases are reviewed.

Section 2 (five chapters) is titled “Sensors, actuators, and low-power electronics” and covers sensors for, for example, sweat, tears, and wound exudate, UHF and low power epidural sensors and circuits and applications. Wearable haptic devices and potential uses are also covered. Section 3 (two chapters) overviews the values of

knitted versus woven electronic textiles, design challenges regarding the use of the devices in males versus females and gives examples of designs such as a urination detection system of value in nursing care. Section 4 (two chapters) reviews power and data communications issues for sensor systems, and touches on RF energy harvesting as a design option.

Section 5 (five chapters) reviews “Data analytics, signal processing, and machine learning” as applied to wearable sensor systems. There are many examples of use here including glucose monitoring, exercise rehabilitation, sleep monitoring, Parkinson’s measurements, epilepsy tracking, and “egocentric” lifestyle monitoring (use of photography to track activities of daily living). Briefly discussed here also are minimization of data transfer from the subject to reporting devices, and methods to accommodate swaps of sensors in computational algorithms.

Section 6 (six chapters) is simply titled “Applications” and as such gives tremendous substance to this text. The chapters include: “Wearables for life in space,” “Applications for optical cardiovascular monitoring,” “... bioimpedance systems for home-care monitoring ...,” “... detection and monitoring of food intake ...,” “fatigue monitoring ...,” and “... assistive technologies.” This section, because of its coverage, might best be read first by a user of this text, rather than last, as it gives an excellent overview of the “state of the art” in applied wearable sensors.

OVERALL, THIS REVIEWER recommends this text as a comprehensive introduction to the quite broad field of the use of wearable sensors in monitoring of the human condition. It is well written and has excellent coverage of useful applications in a multitude of human endeavors. ■

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In an absolutely related matter: “The 17th IEEE International Conference on Wearable and Implantable Body Sensor Networks (BSN2021) is sponsored by IEEE-EMBS to address the challenges in the emerging sensor medical/health care systems and networks. BSN2021 will be colocated with the BHI2021 (IEEE International Conference on Biomedical and Health

Informatics). The joint program (BHI-BSN) will have world-renowned speakers from academic and research institutes, government agencies, and industry.” (July 27–30, 2021) Selected papers will be invited to submit to a special series that will be published in the IEEE OPEN JOURNAL OF ENGINEERING IN MEDICINE AND BIOLOGY (<https://www.embs.org/ojemb/>).