Editorial

Sensors and Data Processing Techniques for Future Medicine

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Varieties of innovative and high precision sensors have been developed and became available for versatile application. Such sensors, when combined with data processing techniques of artificial intelligence, can make a huge impact on healthcare technologies. That is, a system can screen symptoms such as infection, cardiovascular failure, and major depressive disorders, just as experienced physicians diagnose with stethoscope and percussion.

These sensors not only substitute a portion of an experienced physician but also win advantage over physicians in some aspects. A microwave radiated from a small and low-cost microwave-Doppler sensor can penetrate clothes and comforters and monitor not only thoracic respiratory motions and heart rates of patient but also activation of his/her autonomic nerve system located in the hypothalamus of the brain stem using heart rate variability indices calculated from time series of heart rates. An approach has been already conducted to distinguish major depressive disorder patients from normal people under mental work load using a high precision photoplethysmographic sensor, a microwave-Doppler sensor, and a conventional electrocardiogram sensor. Emerging sensors and data processing techniques appear promising for not only physical disease diagnosis but also psychiatric disorder screening in future medicine.

The objective of this special issue is to publish high-quality papers and promote researches in sensors and data processing techniques. Potential topics include but are not limited to the following: psychiatric disorder screening using sensors, sensors for daily stress monitoring, sensor-

based data processing and diagnosis technique for future medicine and psychiatry, sensors designed for future medicine and psychiatry, application of conventional sensors for future medicine, sensor-based elderly monitoring in future super aging society, sensor application to robots used for elderly care at nursing care facilities and home, application of a microwave sensor for future medicine, sensor-based infection screening, emerging applications of infrared sensors in medical fields, and monitoring sensors for companion animals.

We welcomed papers not only biomedical sensing techniques but also diagnosing and therapeutic techniques based on sensor-determined vital signs.

The papers have been peer reviewed and have been selected on the basis of their quality and relevance to the topic of this special issue.

The paper “The Development of a Dual-Radar System with Automatic Hypopnea Threshold Optimization for Contact-Free Sleep Apnea-Hypopnea Syndrome Screening” deals with not only sleep apnea sensing techniques using dual radars located beneath bed mattress but also ideal screening algorithm which determines the hypopnea threshold.

The clinical application of the developed portable vital sign monitoring system was achieved in the “Vital-SCOPE: Design and Evaluation of a Smart Vital Sign Monitor for Simultaneous Measurement of Pulse Rate, Respiratory Rate, and Body Temperature for Patient Monitoring.”

The therapeutic aspects of sensor application for cancer therapy was achieved in “Thermal Sensor Circuit Using Thermography for Temperature-Controlled Laser Hyperthermia.”

Monitoring techniques for domestic animals appeared in “Detection of Stress Hormone in the Milk for Animal Welfare Using QCM Method.”

A paper which may not appear in the regular issue of this journal is also published in this special issue, the paper which utilized a game as a sensing tool for oral-facial malfunction, i.e., “An Innovative Serious Game for the Detection and Rehabilitation of Oral-Facial Malfunction in Children: A Pilot Study.”

We hope that this special issue will be useful for researchers from the academia and the industry, standard developers, policy makers, professionals, and practitioners.

Conflicts of Interest

As the guest editorial team, we declare that there are no conflicts of interest or private agreements with companies regarding our work for this special issue. We have no financial relationships through employment and consultancies, either stock ownership or honoraria, with industry.

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