# Editorial
# Note on Biomedical and Health Informatics

THE Editor-in-Chief must express the deepest gratitude to all the distinguished Guest Editors, Associate Editors, and Reviewers (their names are listed in the last issue of 2010 [1]) for their enormous contributions and support to the IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE (T-ITB) in the past three years. With their striving efforts in completing the review of manuscript submitted to T-ITB, we have substantially improved the turnaround time of our publication where the average time from authors' first submission to final acceptance of a manuscript has now been reduced by 30% to around 6–7 months.

In the beginning of the second term of service to T-ITB, several important changes and action plans in T-ITB should be noted by our readers, potential authors, and reviewers.

1) Starting from 2011 onward, a number of new members have been invited to join the Editorial Board (EB). Our EB is now composed of members from different geographic regions, with different backgrounds, such as engineering, computer science, and medicine, and with affiliations from academia and research institutions, government, and industries. The complete list of board members can be found in the inner front cover of each issue and on the official website of T-ITB (http://bme.ee.cuhk.edu.hk/TITB/contact.html). With the synergy of the new EB, T-ITB will continue to select and publish high-quality papers that reflect global advancements in the wide spectrum of bio, medical, and health informatics.
2) The health informatics research community is expanding in recent years and so does the total annual submissions to T-ITB. In fact, a 15% annual increase in the total submissions has been observed in T-ITB, since 2006 (see Fig. 1). In order to cope with the limited printed pages available to T-ITB, the acceptance of papers are becoming increasingly competitive. It is, therefore, decided that each submission to T-ITB will only be recommended *major revision* for not more than *once*. In other words, a revised manuscript will either be accepted (possibly with a minor revision) or rejected. This ensures T-ITB to strive for publishing quality papers timely at the forefront of technology.
3) To better categorize the various topics in the area of bio, medical, and health informatics, major topics of current interest to T-ITB have been grouped into seven categories as shown in Table I. The first four being the *acquisition, transmission, processing*, and *management* (including storage and retrieval) of bio, medical, and health information. These areas have already been discussed in the earlier editorials [2], [3].

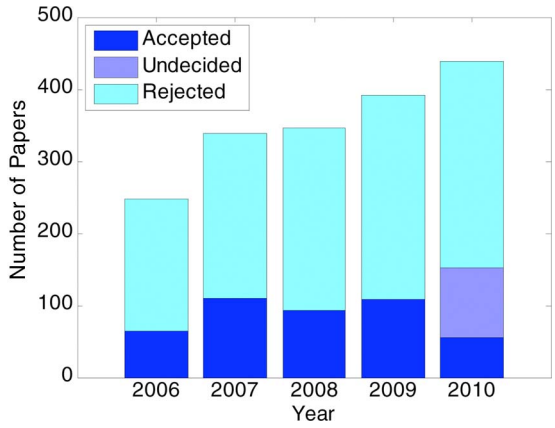


Fig. 1. Total number of papers submitted to and accepted/rejected by the IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE during 2006–2010 (as of early February 2011).

The fifth area encompassed studies on bio, medical, and health informatics at the system level. Due to the interdisciplinary nature of the type of research of interest to T-ITB, both technological advancements as well as clinical studies on the novel application of health/medical information systems will be considered for publication in T-ITB.

The remaining two areas are viewed as emerging topics with great potential. One of them targets for innovative information theories and technologies arising from biological systems and physiological principles. For example, low-power design has become one of the most critical challenges in developing wearable medical devices for long-term acquisition of physiological signals. Although various low-power technologies for designing integrated circuits at the system, block, and device levels have been proposed with great effectiveness, some recent methods that were inspired by biological systems are proven to carry unique features. A typical example is a sampling method that was designed based on the neuron's integrate-and-fire model to replace the conventional analog/digital converter (ADC) based on Nyquist sampling theorem [4], [5]. Since physiological data are only sampled during the period of interest, power consumption of the ADC as well as the back-end digital and transmission units can be reduced. It is anticipated that designs inspired by the nature will be a focus of T-ITB.

The last area deals with information acquisition, processing, transmission, and management inside the biological systems, which can be considered as some of the

Digital Object Identifier 10.1109/TITB.2011.2119410

TABLE I
MAJOR TOPICS OF INTEREST TO THE IEEE TRANSACTIONS ON INFORMATION TECHNOLOGY IN BIOMEDICINE

**I) Acquisition of Bio, Medical and Health Information**
- a. Wearable devices and technologies;
- b. Standardisation of wearable devices;
- c. Biosensors;
- d. Implantable devices and technologies;
- e. Biophotonics and biomicroelectromechanical optical systems (bio-MEMOS);
- f. Microfluidic devices;
- g. Microarray technologies and biochips;
- h. Multifunctional smart nanoparticle probe for molecular imaging;

**II) Transmission of Bio, Medical and Health Information**
- a. Body sensor networks (BSNs), body area networks (BANs), and body nets;
- b. Wireless sensor networks in healthcare and medicine;
- c. Internet and web solutions for healthcare delivery;
- d. Privacy, security, and standardisation of health nets;
- e. Technologies for mobile multimedia medicine (T4M);
- f. Regional, community, national and international health information networks;

**III) Processing of Bio, Medical and Health Information**
- a. Multi-scale modelling;
- b. Personalised modelling;
- c. Decision support systems;
- d. Data mining and data warehousing;
- e. Techniques for fusing bio, medical and health information;

**IV) Management of Bio, Medical and Health Information**
- a. Electronic patient records and electronic healthcare records;
- b. Interoperability and connectivity;
- c. Context-aware retrieval;
- d. Participative management technologies;
- e. Internet health information searching;

**V) Technologies and Clinical Studies on Health/Medical Information Systems**
- a. p-health, m-health, e-health
- b. Personal healthcare systems;
- c. Ambient assisted living, smart homes and community healthcare systems;
- d. Pervasive and ubiquitous healthcare;
- e. Hospital information systems and clinical information systems;
- f. Close-loop drug delivery systems;
- g. Targeted therapeutic systems;

**VI) Biologically Inspired Informatics**
- a. Advanced bioimaging and medical visualisation;
- b. Virtual and augmented reality;
- c. Computer-assisted surgery and image-guided surgery;
- d. Computer–brain interfacing and human–computer interfacing;
- e. Minimally invasive surgical technologies;
- f. Bio-inspired robotics and biomimics;
- g. Biorobotics, medical robotics, and healthcare robotics;

**VII) Informatics in Biological Systems**
- a. Neuroinformatics
- b. Protein-protein interaction networks;
- c. Bioinformation transmission, coding, integration at molecular and cellular levels;
- d. System biology including organ level modeling and visualisation;

**VIII) Other Emerging Topics in Bioinformatics, Medical Informatics and Health Informatics**

most complex and sophisticated information systems in the world. Billions of sensory cells are found in each human body to acquire information from the environment as well as to indicate the physiological status of the body. Information are processed and managed at molecular, cellular, tissue, organ, and system levels. Different interaction mechanisms allow the information to be transmitted from one location to another and across different levels. Many of these information technologies found in the biological systems are not clearly known at the moment and thus hindering our understanding of the causes and development of many diseases.

Each of the aforementioned topics has its own technical challenges remained to be solved. By this editorial, we look forward for more original contributions to T-ITB in all these topics.

4) In addition to the seven major areas listed in Table I, T-ITB will also call for papers on specific topics. For 2011, the topics include: 1) Emerging technologies for patient-specific healthcare and 2) cardiovascular health informatics. Both these issues are intended to help shaping the future p-Health model—the 6-P's paradigm [2]. While the scope of the first issue is unspecific in terms of the targeted health issue, the second issue intends to focus on one specific type of health problem—cardiovascular disease, which is the major cause of premature death and disability worldwide. Risk prediction models have been built to predict the mortality due to cardiovascular events and Framingham risk score being the most classical model in this area [6]. The Framingham model uses traditional risk factors, such as age, sex, systolic blood pressure, and smoking habits, to give promising prediction in a long

run (5 or 10 years). Recent studies attempt to integrate biomarkers [7] and image results [8] with these traditional factors, but the outcomes are controversial. Nevertheless, the derivation of a more personalized approach to assess the risk of atherosclerotic cardiovascular disease is a clear trend. The *bioimage study* [9] is a recent project launched with this purpose.

In an editorial of T-ITB published in 2009, the management of cardiovascular disease has been used as an example to illustrate the need of building multimodal e-records, namely, Cardiovascular Health Informatics and Multimodal E-record (CHIME) [10]. Since then, a number of interesting papers that marked the advancements in the development of CHIME can be found in T-ITB. In respect of imaging techniques, a review on noninvasive ultrasound image processing methods in the analysis of carotid plaque morphology for the assessment of stroke risk was reported [11]. Regarding information processing, Karaolis *et al.* [12] proposed a data mining system for the assessment of heart-event-related risk factors targeting in the reduction of coronary heart disease events by identifying high- and low-risk subgroups of subjects. Kampouraki *et al.* [13] proposed the use of support vector machines to classify heartbeat time series and tested it on subjects suffering from coronary artery disease. Moreover, a number of studies on ECG monitoring by wearable and mobile system have also been reported [14], [15]. Such systems are anticipated to play major roles in real-time or near-term assessment of cardiovascular risk in future.

The call for papers on cardiovascular health informatics intends to attract papers from projects, which dedicated efforts to a MISSIoN, i.e., the Myocardial Infarction and Stroke Screening and Intervention within Nations. By collecting works that contribute to the advancement of identifying new risk factors, techniques for integrating, and fusing the different risk factors as well as long-term monitoring results, it is anticipated that a better solution to the control of CVD can be laid out. In addition, it will be of interest to receive papers that reports clinical results of the outcome of applying recent technological advancements in different subject groups. For more information about T-ITB and the on-going special issues, please visit the website ofT-ITB (http://bme.ee.cuhk.edu.hk/TITB/calls4paper.html).

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