SICE BPES

Systems and Information Division
Technical Committee on Biological and Physiological Engineering
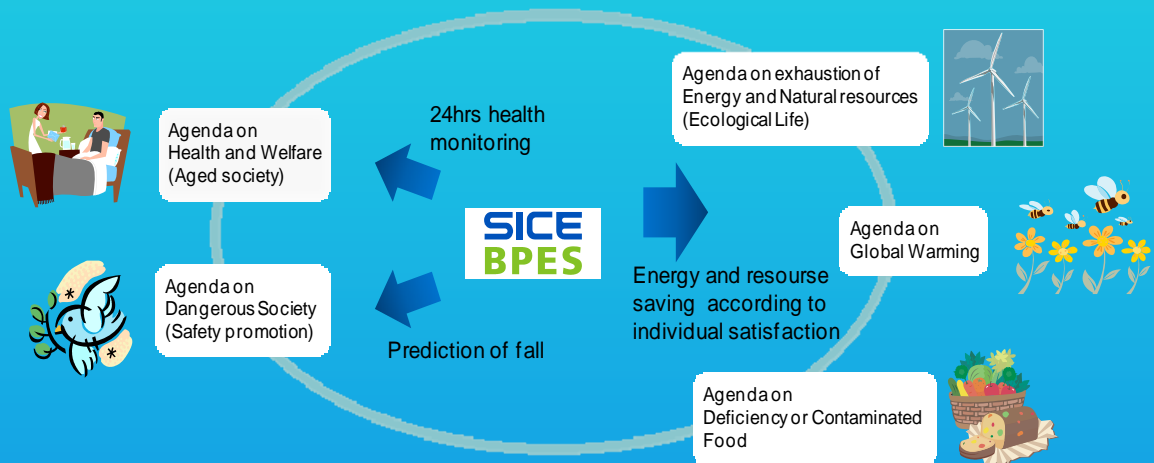
● Missions :

The living organism is a multivariable system with parallel, distributed, hierarchical, and antagonistical structure and it has highly evolved and diversified functions, i.e. adaptation, learning, self organization, reproduction, et. al. Recent remarkable developments in electronics, informatics, biotechnologies have expanded the field of biological research into enormous region, from studies of the micro cellular structure in gene and molecular level to the higher information process of the brain.

In this big paradigm shift, conventional analytical methodologies are insufficient and new synthetic research viewpoint is necessary. A new approach based on system engineering which deals the organism as a control or information system becomes very important to study the underlying mathematical principles of organic functions. Of course, organic functions are more advanced and more complex than those of systems that today's engineering theories can realize, and it is very difficult to understand dynamic functions of the organism perfectly using our engineering theories. It is necessary to create new engineering theories and the concepts through such studies.

The advantage of the technical committee on biological and physiological engineering is that this committee is interdisciplinary and many researchers of different fields can collaborate. The mission of this biological and physiological engineering committee is to prepare chances and make time to discuss about the biological and physiological systems and to contribute to develop new theories and concepts about control and regulation.

● Challenges to global scale agenda:

Agenda on Health and Welfare (Aged society)

Agenda on Dangerous Society (Safety promotion)

24hrs health monitoring

Prediction of fall

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Agenda on exhaustion of Energy and Natural resources (Ecological Life)

Agenda on Global Warming

Energy and resourse saving according to individual satisfaction

Agenda on Deficiency or Contaminated Food

● Scope & Keywords:

● Biosignal Processing; Time-frequency/scale analysis, Linear and nonlinear analysis, Nonlinear dynamic analysis, Signal pattern classification, Principal/ independent component analysis, Adaptive and parametric filtering, Applications of neural networks and support vector machines

● Medical Imaging; MR, Ultrasound, Optical and infrared imaging, Electrical source and impedance imaging, X-Ray and CT, Molecular/Neuro/cardiac imaging, Image reconstruction, Image segmentation/registration/fusion/retrieval, communication and security, Diagnostic and therapeutic Engineering

● Diagnostic and therapeutic Engineering; Implantable/in-body miniaturized devices. Wireless/telemetry/monitoring systems, Textile sensors, Wearable systems for e-health, p-health and m-health, Actuators and sensor-actuator combined systems, Micro-nano-bio systems, Microfluidics

● Computational Modeling; Computational methodologies and technologies for translational research and medicine, Computational analysis of genome, transcriptome, and interactome, Medical vocabularies and ontologies, Structural bioinformatics and computational proteomics

● Tissue Engineering; Molecular and cellular biomechanics, Cellular and tissue engineering, Biomaterials and cell-biomaterial interactions

● Medical Robotics; Surgical robotics, Computer-assisted surgery, Human-robot interactions, Biorobotics, Robotics for rehabilitation, Mechanobiology, Orthopedic and musculoskeletal biomechanics

● Artificial Organs; Internally applied therapeutic devices, Externally applied therapeutic devices, Image-guided therapies, Diagnostic devices and instrumentation, Clinical engineering

● Healthcare & Sports Engineering; Healthcare information systems, Personal health systems, Telemedicine and related applications, Decision support systems, Ambient assisted living solutions, Health systems engineering