GUEST EDITORIAL

A MILESTONE TOWARD CLINICAL LABORATORY AUTOMATION BASED ON DIELECTROPHORESIS

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The dielectrophoresis (DEP) is suitable for handling micro-/nano-particles or tubes, sometimes together with gravity and/or flow of liquids. Recently research works on applications of DEP to biochemical measurement of biological cells alive or dead. Mass-processing of clinical laboratory test will be led to Clinical Laboratory Automation. We made discussions about what should be considered for Clinical Laboratory Automation and what is the difference between biological cells and inorganic materials as well as control of the system and delivery of small volume of samples in the specially organized session in WAC2010 (ISIAC “A milestone toward Clinical Laboratory Automation employing Dielectrophoresis I and II”).

This special issue for Auto Soft will activate the researchers working in the field of DEP and its applications to biological manipulation/separation/trapping, and move them closer to Clinical Laboratory Automation.

The first paper by Masanori Eguchi, et al., proposes the methods of the particle separation by employing electrokinetic phenomena (dielectrophoresis (DEP) and traveling-wave electroosmosis (TWEO)) and the inclined gravity. The authors created the new electrodes named “Bottle neck Fork-trace electrode (BF electrode)” for collecting all particles from entire space of the chamber to the clear field and separating them by the DEP.

The second paper by Hiroko Imasato, et al. describes whether living blood cells can be separated by employing the dielectrophoresis (DEP).

The third paper by Takaharu Enjoji, et al., describes the metabolic states of heat-injured Saccharomyces cerevisiae (S. cerevisiae) in a micro-cell which were investigated using dielectrophoretic impedance measurement (DEPIM) method.

The forth paper by Satoshi Uchida, et al. presents a dielectrophoretic microdevice with three dimensional microstructures and sophisticated microchannel to trap and detect bacteria efficiently.

The fifth paper by Shogo Miyata and Yu Sugimoto describes a novel cell patterning technology for accumulating cells around collagen microbeads using DEP forces.

The sixth paper by Hiroshi Frusawa and Masaichi Inoue demonstrates non-contact manipulations unique to the scanning method of the authors. The authors also propose that the use of the frequency modulated electric field provides a novel way for one-step
assay of crossover frequency in dielectrophoresis of a single colloid, which has been validated by the scanning method.

The last paper by Tomoyuki Yasukawa, et al. reports the control of a microparticle position within fluid flow based on its size by using a repulsive force generated with negative dielectrophoresis (n-DEP).

The guest editors would hope that this special issue gets into a milestone toward Clinical Laboratory Automation.

Finally, we wish to thank to Editor-in-Chief Mo Jamshidi for giving us the opportunity of serving ISIAC as Guest Editors of this Special Issue.

Guest Editors
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H. Imasato received her Ph. D degree in Department of Brain Science and Systems Engineering Kyushu Institute of Technology, Japan in 2008. From 1982, she had been a medical technologist at University hospital of Occupational and Environmental Health, Japan. From 2008, she had been a senior researcher at Fuzzy Logic Systems Institute. Her research interests dielectrophoresis and clinical laboratory test.

T. Yamakawa is now a special-appointment professor and a Professor Emeritus of Department of Brain Science and Engineering, Graduate School of Life Science and Systems Engineering, Kyushu Institute of Technology, Wakamatsu, Japan and also the chairman of Fuzzy Logic Systems Institute (FLSI).

He received the B. Eng. degree in electronics engineering in 1969 from Kyushu Institute Technology, Tobata and the M. Eng. and Ph.D. degrees for his studies on electrochemical devices in 1971 and 1974, respectively, from Tohoku University, Japan. He developed intrinsic fuzzy logic integrated circuits in pMOS (1983) and CMOS (1985), the fuzzy logic controller hardware (1986), the fuzzy logic computer hardware (1986), the fuzzy memory device (1986), fuzzy micro processors (rule chip and defuzzifier chip) (1988), the fuzzy neuron chip in BiCMOS technology (1991) and the chaos chip in CMOS technology (1992).

His main research interest lies on hardware implementation of fuzzy systems, fuzzy neural networks, and chaotic systems, minimally invasive epileptic surgery, and application of dielectrophoresis to clinical laboratory automation. He holds more than 100 international and domestic patents. Prof. Yamakawa is a fellow of IEEE, International Fuzzy Systems Association (IFSA) and Japan Society of Fuzzy Theory and Systems (SOFT). He received IEEE 2008 Fuzzy Systems Pioneer Award. He is acting as a member of editorial board and a regional editor of 10 international professional journals. He contributed more than 80 international conferences as a member or the chairman of organizing/programming committee.