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SPECIAL ISSUE ON MATHEMATICAL MODELS OF BIOMEDICAL SYSTEMS AND ORGANIZATIONS

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This Specia1 Issue contains a selection of papers presented at the *First International Conference on Innovative Computing, Information and Control* (ICICIC2006) held in Beijing, China, Aug 30-Sep 1, 2006. It aims at bringing together the most recent advances in the areas of mathematical modeling of biomedical systems including organs or population. Although the papers in the special issue cover only a few topics of the wide medical field, they show importance of the analysis on medical or biological phenomena based on mathematical models.

The paper proposed by Matsuura et al, shows three biological models as for stochastic and dissipative equations, i.e., a medical prediction of disease case in Japan, stochastic actin-myosin system or diffusional flagellar motor model, which equations belong to diffuse equations according to a kind of complex Fokker-Plank equation. These totally indicate that complex biological phenomena should be explained based on physics and chemical principles. As one of the examples of such complex phenomena, Noda et al pursued the analysis on the blood flow in vessels. By solving the Navier-Stokes equations and it shows the result that a valve of blood vessels changes affects the flow severely into vortex flow. One of the most important problems in modern medicine for the biological studies or for the progress of medical therapy is to detect mRNA, Makino et al created a primer design protocol using fuzzy deducing theory, by which 90% of their primers functioned in actual applications, while most of the traditional computer protocol succeeded less than 20%. And they showed that fuzzy deducing checking protocol made it possible to select real VEGF mRNA from gene family in which there are many similar sequences. Population is one of interesting problems in society which reflects the effects from medical deceases; Koide et al simulated future Japanese population, including a death toll of the modern Japanese three major cases of deaths, and predicts a trend of population of men and women and the distribution of population until 2060. Especially they showed high aging rate, which is related directly to politics on medical and social welfare costs. As a preliminary study for new organ preservation technology, Kin et al considered a simple system that contains only water and hydrogen molecules, then simulated a stability of clathrate hydrate crystal by using a code of molecular dynamics method, then they gave a new suggestion to suppress the change of intracellular volume under low temperature. In order to understand functions of microscopic structures of complex structure of proteins, a model based on physics is particularly important. As an example, Nakano et al take the movement of actin-myosin system as a protein motor in muscle, and proposed a new model of Double-Spring Stochastic Inclined Rods Model (DS-SIRM). It is shown that it always moves forward to one direction whenever those rods are independently vibrating. It is concluded that DS-SIRM can convert the thermal noise to the one directional motion by using stochastic resonance and inclined rods in open fields.

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Guest editor
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Masahiro NAKANO received the MS and Ph.D. degrees in theory of Physics on nuclei and elementary particles from Kyushu University, in 1973 and 1979, respectively. He is currently the president of Biomedical Fuzzy System Association (BMFSA). His research interests cover physics, nanoscience, bioinformatics and statistics, including mathematical modeling of biomedical systems, molecular structure, and dynamics of molecular, nanomagnet and drug delivery systems, classification of Bacteria and Archae, analysis of medical data.