Editorial

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Biographical notes: Hoon Heo graduated from Korea University with BE in Mechnical Engineering. He worked as an Engineer in LG Electronics and as a Senior Researcher in Agency for Defence Development in Korea. He received his MSc in Aerospace Engineering and his PhD in Mechanical Engineering from the University of Texas at Austin and Texas Tech University in USA, respectively. He has been a Professor in the Department of Control and Instrumentation Engineering in Korea Unversity since 1989. Stochastic dynamics and control involving noise and mechtronics are parts of his current research interest.

Jooyoung Park received his BS in Electrical Engineering from Seoul National University in 1983 and his PhD in Electrical and Computer Engineering from the University of Texas at Austin in 1992. He joined Korea University in 1993, where he is currently a Professor in the Department of Control and Instrumentation Engineering. His recent research interests are in the area of reinforcement learning, control and kernel methods. Also, he is applying those theories to random noise reduction.

In Lee received his BS in Aeronautical Engineering from Seoul National University in 1972 and his PhD in Aerospace Engineering from Stanford University in 1986. He has been a Professor in Korea Advanced Institute of Science and Technology (KAIST) since 1987. He received a medal (The Order of Science and Technology) from the Korean President in 2008. He was the President of Korean Society for Composite Materials and was also the President of Korean Society for Aeronautical and Space Sciences. He was given the position of Honorary Professor at Nanjing University of Aeronautics and Astronautics in 2008.

Moon K. Kwak received his BS and MS from Seoul National University in 1981 and 1983, respectively. He received his PhD from Virginia Tech, USA in 1989. He has been an Assistant Professor in the University of New Mexico and Virginia Polytechnic Institute and State University, USA. Also, he worked as a Project Engineer in Dynacs Engineering Co. Inc. His research interest is in smart structure and its control. He also conducted research in structure control supported by USA FOSR. He has published more than 70 papers in international and domestic journals.

Any systems working in society, science and engineering field or even in natural world are normally involved with various irregularities. As far as the performance of the system is concerned, these influences on system operation have been underestimated or even ignored.

However as the requirements of system performance increase and the demands of users are even higher, these indeterministic effects must be taken into account. Very often they play an important role, and reveal a random pattern in terms of time and space. The random nature is inherent in the system, but also arises externally from the environment and sometimes occurs interactively with the environment while the system is operating.

There are many reasons for randomness, some of which are due to non-linearity in the operating system. The basic characteristics of randomness of a system operating in the time domain can be classified as stationary or non-stationary, according to the time dependency of the random characteristics.

A random process with no memory is called a Markovian process and a random process with memory is regarded as a non-Markovian process.

Most random processes are known to have a Gaussian probability distribution function, and others have a non-Gaussian probability distribution function.

Also, the random nature of the system response variation can be divided into white noise and non-white noise, depending on the characteristics in the frequency domain.

Randomness in the modelling of a system is normally treated as either a space-dependent random process or a time-dependent random process.

In addition to the well-known Fokker-Planck-Kolmogorov equation approach based on white noise assumption, various analytical methods can be used to manage the stochastic problem, and some techniques to cover the uncertainty problem in system operation have been widely introduced.

The papers in this special issue give a useful summary for what is currently going on in this area of research. Ten papers have been selected to reflect the stochastic aspects of the area. Two additional papers were selected based on the quality point of view. The editorial comments regarding the 12 papers are briefly explained below.

Paper 1 Using proportional and different controller to control chaos in non-autonomous mechanical system

Chaotic motion in a non-autonomous mechanical system is controlled via a non-linear feedback proportional and differential control scheme. The result shows that the method effectively controls the hyperchaotic behaviour of a system of two positive Lyapunov exponents along with one zero and one negative Lyapunov exponent.

Paper 2 Approach of context-aware computing with uncertainty for ubiquitous active service

Context-aware computing with uncertainty is treated in the paper. Due to dynamic and randomly changing characteristics of multi-source evidence context-aware information, an improved version of D-S evidence theory is efficiently applied and its validity demonstrated.

Paper 3 Adaptive sliding mode observer for non-linear stochastic systems with uncertainties

A novel adaptive sliding mode observer for reconstructing the states of non-linear stochastic systems with structure uncertainties, parameter perturbations and external disturbances is introduced. Simulation for reconstructing the states of Lorentz chaotic attractor disturbed with uncertainties and polluted with noises is conducted to verify the effectiveness of the proposed observation strategy to a reasonable degree.

Paper 4 Guaranteed cost control with accommodation of position and rate limits in the second-order actuators

A novel approach to design a robustly guaranteed cost controller via linear matrix inequality (LMI) is introduced and applied to a class of continuous time linear system, with norm bonded time-varying uncertainties, in conjunction with the second-order actuator's position and rate limit. The feasibility of the proposed approach is proven via simulation.

Paper 5 A brief summary on the control recovery of time-varying K-G systems

A control technique suitable for a distributed system which is modelled by Klein-Gordon PDE is reported. The author shows that it is possible to control, if and only if, some distributed parameter system is exactly controllable. Normally the way to control a distributed system is seldom known.

Paper 6 Two-class M/G/1 queue under workload control

A queuing system under the *D*-policy with two classes of customers is considered. Laplace-Stieltjes transform of the waiting time of each class of customers and mean waiting time are derived sequentially and consecutively. Simulation is conducted to compare the analytical results with estimates.

Paper 7 The CVaR constrained stochastic programming ALM model for defined benefit pension funds

The CVaR risk measure is implemented to analyse the optimal investment strategy for the improved model of Kouwenberg and Bogentoft's dynamic stochastic programming ALM model. The newly constructed ALM model is applied to defined benefit enterprise pension funds to reveal some useful results.

Paper 8 Study on anti-synchronisation between spatiotemporal chaos system and temporal chaos system

A controller based on Lyapunov stability theory is designed to realise anti-synchronisation between a spatiotemporal chaos system and a temporal chaos system. Simulation is conducted to realise anti-synchronisation between a Gray-Scott spatiotemporal chaos system and a Duffing system, which shows that it can be applied to any spatiotemporal and temporal chaos system.

Paper 9 Disturbance detection using an improved hit-or-miss transform

A novel algorithm, improved hit-or-miss transform (IHIM), for the detection of power disturbances is presented. In the simulation applied to power systems, IHMT shows its detecting capabilities of location and duration of disturbances and various aspects as well.

Paper 10 Stochastic system identification of unknown flexible cantilever beam under turbulent flow

A new concept of system ID technique defined in a stochastic domain is proposed and demonstrated via a simulation and two experiments. The preliminary results are verified by its usefulness in both a quantitative and a qualitative way.

Paper 11 The modelling and road simulation test of a hydraulic engine mount

A parameter identification method is introduced in terms of system characterisation for HEM, which is very important for vibration isolation of a vehicle. Simulation and experiment are conducted successfully.

Paper 12 Simulation research on braking performance of hydrodynamic torque converter and retarder based on automatic shifting rules

An automatic shifting rule is applied to the braking performance of hydra-dynamic torque converter and retarder, which was studied via simulation. This research reveals reasonable and promising results.

We think that the papers selected reflect a wide range in this significant research field, and their contents supply a clear indication of the current state in the area. It is concluded that there are exciting opportunities for future research and investigations in the years ahead.