Prof. Guanrong Ron Chen, ***City University of Hong Kong, Hong Kong***

Guanrong Chen received the M.Sc. Degree in Computer Science from the Sun Yat-sen, China and the Ph.D. Degree in Applied Mathematics from Texas A&M University, USA. He is an IEEE Fellow (1996) and currently is a Chair Professor and the Founding Director of the *Centre for Chaos and Complex Networks* at the City University of Hong Kong.

Prof. Chen served and is serving as Chief Editor, Deputy Chief Editor, Advisory Editor and Associate Editor for several international journals including the IEEE Circuits and Systems Magazine, IEEE Transactions on Circuits and Systems (I and II), IEEE Transactions on Automatic Control and the International Journal of Bifurcation and Chaos. He received the 1998 Harden-Simons Prize for the Outstanding Journal Paper Award from the American Society of Engineering Education, the 2001 M. Barry Carlton Best Annual Transactions Paper Award from the IEEE Aerospace and Electronic Systems Society, the 2002 Best Paper Award from the Institute of Information Theory and Automation, Academy of Science of the Czech Republic and the 2005 IEEE Guillemin-Cauer Best Transaction Annual Paper Award from the Circuits and Systems Society. He is an honorary professor at different ranks in more than twenty universities in Argentina, Australia, China and USA.

Keynote: On the Synchronizability of Complex Dynamical Networks

Some concerned issued on synchronization and synchronizability of complex networks are addressed, regarding synchronized regions, synchronization conditions and the relationships between the topology and the synchronizability. The presentation will first be motivated by showing two simple examples of regular symmetrical graphs, which have identical structural parameters (average distance, degree distribution and node betweenness centrality) but have very different synchronizabilities. These simple examples demonstrate the intrinsic complexity of the network synchronizability problem. I will then show that for a complex network with identical node dynamics in any topology, two key factors influencing the network synchronizability are the structure of the network inner-linking matrix and the eigenvalues of the network outer-linking matrix. Some more examples will then be provided to show that an addition of new edges to a network can either increase or decrease the network synchronizability, depending on the underlying network topology and where the edges are added. Therefore, to search for some conditions under which the network synchronizability may be increased through adding edges, research found that graph theory is very helpful. It will be demonstrated that for networks with disconnected complementary graphs, adding edges never decreases their synchronizabilities. This implies that better understanding and careful manipulation of the complementary graphs are important and useful for enhancing the network synchronizability. Moreover, it will be shown that an unbounded synchronized region is always easier to analyze than a bounded synchronized region for any complex network. Consequently, to effectively enhance the network synchronizability for the case where the synchronous state is an equilibrium point of the network, a new design method will be presented for determining a rank-1 inner-linking matrix, which means only one state variable is used for coupling therefore very cost-effective, such that the resulting network has an unbounded synchronized region. Throughout this presentation, both theoretical analysis and computer simulations will be presented with comparisons, revealing the essence of graph theory for studying complex network synchronization.

Prof. Chen has been nominated lately for the ”2008 National Natural Science Award of China”. As the date of final interview conincides with the workshop, he will not be able to attend and give his interesting talk. We wish Professor Chen all the best for the competition and strongly hope that he is going to win the award.