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Collective Behaviour Coordination with Low Cost Communication and Adaptive Velocity

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Reception starts at 4:15pm

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Abstract

An important natural phenomenon is that satisfactory synchronization of self-driven particles can be achieved with a remarkably reduced communication cost, especially for high-density particle groups with low external noise. Statistical numerical evidence illustrates that a highly efficient way for succeeding this is to distribute the communication messages as evenly as possible throughout the whole dynamic process, since it minimizes the communication redundancy. More surprisingly, it is discovered that there exists an abnormal region in the state diagram where moderately decreasing the communication cost may actually improve the synchronization performance. Another significant and interesting scenario is found where low-cost communication can help the particles aggregate into synchronized clusters, which may be beneficial for explaining the forming mechanism underlying the individuals' aggregation phenomena over biological flocks and swarms.

About the Speaker

Dr. Hai-Tao Zhang was born in 1977. He graduated from the University of Science and Technology of China in 2005 with a Ph.D. degree in Control Engineering. In 2004, he was a visiting scholar in IBM China Research Lab, working on Enterprise Content Protection projects. In 2006 he was a Senior Research Assistant in the MEEM Dept, City University of Hong Kong. From Jan. 2007 till Jan. 2008, he was a Post-Doc Research Fellow at the Department of Engineering and Wolfson College, University of Cambridge, UK. From 2005 till now he is an Associate Professor of Control Engineering at the Huazhong University of Science and Technology, China. In 2004, he won the President Prize of the Chinese Academy of Science and UK/China Fellowship in the Excellence Programme. He is an Associate Editor of the *IST Transactions of Control Engineering-Theory and Applications*, and a referee of *IEEE Trans. on Automatic Control*, *IEEE Trans. on Automation Science and Engineering*, *IEEE CDC*, *IEEE ACC*, etc.