Recent Advances in Fixed-Time Cooperative Control of Multi-Agent Systems

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Abstract

Fixed-time cooperative control of multi-agent systems has received considerable research interest since it can provide an estimated bound of settling time, which does not depend on initial conditions. Compared with asymptotic cooperative control algorithms, fixed-time cooperative control algorithms can provide better closed-loop performance and disturbance rejection properties. Different from finite-time control, fixed-time cooperative control can produce a faster convergence rate and provide an explicit estimate of settling time independent of initial conditions, which is desirable for multi-agent systems. In this keynote talk, some fundamental concepts of fixed-time stability are introduced. Then, fixed-time cooperative control of multi-agent systems with various dynamics are elaborated in detail. An application of fixed-time consensus for distributed optimization is presented. Finally, a time base generator approach is introduced for practical fixed-time cooperative control.

Bio of Professor Qing-Long Han

Qing-Long Han received Ph.D. degree in Control Engineering and Electrical Engineering from East China University of Science and Technology, Shanghai, China, in 1997. From September 1997 to December 1998, he was a Post-doctoral Researcher Fellow with the **L**aboratoire d'**A**uomatique et d'**I**nformatique **I**ndustrielle (LAII) (currently, **L**aboratoire d'**I**nformatique et d'**A**utomatique pour les **S**ystèmes, LIAS), **É**cole **S**upérieure d'**I**ngénieurs de **P**oitiers (ESIP) (currently, **É**cole **N**ationale **S**upérieure d'**I**ngénieurs de **P**oitiers (ENSIP)), Université de Poitiers, France. From January 1999 to August 2001, he was a Research Assistant Professor with the Department of Mechanical and Industrial Engineering at Southern Illinois University at Edwardsville, USA. From September 2001 to December 2014, he was Laureate Professor, Associate Dean (Research and Innovation) with the Higher Education Division, and the Founding Director of the Centre for Intelligent and Networked Systems at Central Queensland University, Australia. From December 2014 to May 2016, he was Deputy Dean (Research), with the Griffith Sciences, and a Professor with the Griffith School of Engineering, Griffith University, Australia. In May 2016, he joined Swinburne University of Technology, Australia, where he is currently Pro Vice-Chancellor (Research Quality) and a Distinguished Professor. He is also the Director of Centre for Networked Control Systems with the School of Mechatronic Engineering and Automation, Shanghai University, China. In March 2010, he was appointed Chang Jiang (Yangtze River) Scholar Chair Professor by Ministry of Education, China.

Professor Han has been conducting research in the field of Control Theory and Control Engineering.

He has published has been conducting research in the field of networked control systems, multi-agent systems, time-delay systems and neural networks. Since 2001, he has published **two hundred and fifty-one (251)** fully-refereed high quality journal articles, of which **thirty-one (31) articles** are published in **Automatica**, and **nineteen (19)** articles are published in **IEEE Transactions on Automatic Control** (**the two best journals** in the area of automatic control) and **one hundred and twelve (112) articles** are published in the **most prestigious IEEE Transactions**. He has also published **one hundred and eighty (180)** leading conference papers, four monographs, one research-based book chapter, and edited four conference proceedings and six special issues.

As of September 7, 2019, Professor Han's research work has been cited **21834 times** with **h-index** of **80**, **i10-index** of **228** according to Google Scholar. He has ranked at **No. 5** in the arena of **Computer Science and Electronics** in Australia according to Guide2Research (http://www.guide2research.com/scientists/AU). This ranking is based on the h-index metric provided by Google Scholar and DBLP. His research work has been cited **17593 times** with **h-index** of **73** according to SCOPUS, and **14633 times** with **h-index** of **68** according to Clarivate Analytics (formerly Thomson Reuters) Web of Science Core Collection. The **Essential Science Indicator's (ESI)** Report on July 11, 2019, which covers the period from **January 2009** to **March/April 2019**, indicates that he has **50 Highly Cited Papers.** Among these Highly Cited Papers, **33 Highly Cited Papers** are in the field of **Engineering**; **16 Highly Cited Papers** are in the field of **Computer Science**; and **1 Highly Cited Paper** is in the field of **Mathematics**.

Professor Han is one of The World's Most Influential Scientific Minds: 2014-2016 and 2018. He is a Highly Cited Researcher according to Clarivate Analytics (formerly Thomson Reuters). He is **a Fellow of The Institute of Electrical and Electronic Engineers** (FIEEE) and a **Fellow of The Institution of Engineers Australia** (FIEAust). He is an Associate Editor of a number of international journals including IEEE Transactions on Industrial Electronics, IEEE Transactions on Industrial Informatics, IEEE Transactions on Cybernetics, IEEE/CAA Journal of Automatica Sinica, and Information Sciences. His research interests include networked control systems, time-delay systems, multi-agent systems, neural networks and complex dynamical systems.