复杂系统与网络科学研究中心

Research Center for Complex Systems and Network Sciences

第五十三届复杂系统与网络科学研究中心论坛

The Fifty-third Workshop of Research Center for Complex Systems and Network Sciences

2021 年 11 月 22 日（16:00-19:00）

程

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论坛资助：国家自然科学基金委
东南大学数学与人工智能交叉引智平台

主办：东南大学复杂系统与网络科学研究中心
江苏省网络群体智能重点实验室
复杂工程系统测量与控制教育部重点实验室
紫金山实验室数理基础研究中心

Inquiry: Simone Baldi (103009004@seu.edu.cn)

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时间：2021 年 11 月 22 日，周一（Beijing Time: 16:00-19:00）
Time: November 22nd, 2021, Monday
(UK time: 8:00-11:00)
(Amsterdam time: 9:00-12:00)
会议方式（Meeting Method）：Tencent Meeting
会议号（Meeting ID）：633 701 004
会议密码（Meeting password）：1122
会议链接：https://meeting.tencent.com/dm/hVS2Ms0hqHGl

Mean-Field Game for Collective Decision-Making in Honeybees via Switched Systems

Dario Bauso, University of Groningen

Beijing Time: 16:00-17:00

(UK time: 8:00-9:00, Amsterdam time: 9:00-10:00)

Online Optimisation Approach to Composite Adaptive Control

Namhoon Cho, Cranfield University

Beijing Time: 17:00-18:00

(UK time: 9:00-10:00, Amsterdam time: 10:00-11:00)

A Unified Framework for Distributed Optimization and Non-cooperative Games

Maojiao Ye, Nanjing University of Science and Technology

Beijing Time: 18:00-19:00

(UK time: 10:00-11:00, Amsterdam time: 11:00-12:00)

Inquiry: Simone Baldi (103009004@seu.edu.cn)

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Mean-Field Game for Collective Decision-Makingin Honeybees via Switched Systems

Dario Bauso（University of Groningen）

Abstract

In this talk, we discuss the optimal control problem arising from the mean-field game formulation of the collective decision-making in honeybee swarms. A population of homogeneous players (the honeybees) has to reach consensus on one of two options. We consider three states: the first two represent the available options (or strategies), and the third one represents the uncommitted state. We formulate the continuous-time discrete-state mean-field game model. The contributions of this talk are the following: i) we propose an optimal control model where players have to control their transition rates to minimize a running cost and a terminal cost, in the presence of an adversarial disturbance; ii) we develop a formulation of the micro-macro model in the form of an initial-terminal value problem (ITVP) with switched dynamics; iii) we study the existence of stationary solutions and the mean-field Nash equilibrium for the resulting switched system; iv) we show that under certain assumptions on the parameters, the game does not admit Nash equilibrium solutions but only periodic solutions; and v) we analyze the resulting microscopic dynamics in a structured environment where a finite number of players interact through a network topology.

About the Speaker

Dario Bauso received the Laurea degree in Aeronautical Engineering in 2000 and the Ph.D. degree in Automatic Control and System Theory in 2004 from the University of Palermo, Italy. Since 2018 he has been with the Jan C. Willems Center for Systems and Control, ENTEG, Faculty of Science and Engineering, University of Groningen (The Netherlands), where he is currently Full Professor and Chair of Operations Research for Engineering Systems. Since 2005 he has also been with the Dipartimento di Ingegneria, University of Palermo (Italy). From 2015 to 2018 he was with the Department of Automatic Control and Systems Engineering, The University of Sheffield (UK), where he was Reader in Control and Systems Engineering. From 2012 to 2014 he was also Research Fellow at the Department of Mathematics, University of Trento (Italy).

He has been academic visitor in several universities. From October 2001 to June 2002, he was a Visiting Scholar at the Mechanical and Aerospace Engineering Department, University of California, Los Angeles (USA). In 2010 he was short-term visiting scholar at the Department of Automatic Control of Lund University (Sweden) and at the Laboratory of Information and Decision Systems of the Massachusetts Institute of Technology (USA). In 2013 he was visiting lecturer at the Department of Engineering Science, University of Oxford (UK) and at the Department of Electrical and Electronic Engineering of Imperial College London (UK). Since 2018-2019 he has been guest professor at Keio University, Japan.

His research interests are in the field of Optimization, Optimal and Distributed Control, and Game Theory. Since 2010 he is member of the Conference Editorial Board of the IEEE Control Systems Society. He was Associate Editor of IEEE Transactions on Automatic Control from 2011 to 2016. He is Associate Editor of IFAC Automatica, IEEE Control Systems Letters and Dynamic Games and Applications. He is the author of the monograph Game Theory with Engineering Applications, SIAM's Advances in Design and Control series, Philadelphia, PA, USA, 2016. He has also been general chair of the 6th Spain, Italy, and Netherlands Meeting on Game Theory (SING 6).

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Online Optimisation Approach to Composite Adaptive Control

Namhoon Cho（Cranfield University）

Abstract

Recent interests in the data-driven paradigm enabled by modern machine learning techniques have led the research attention to the area lying between control and machine learning. The interplay between the two domains has been the most significant in self-learning autonomous systems that should perform model learning and control at the same time. Many different algorithms have been developed individually in both control and machine learning societies, however, an overarching perspective encompassing previous knowledge is still not widely known. With this background, we will discuss high-level representations for the composite adaptive control systems in the contexts of both control-inspired learning and model learning for control. The discussion will be constructed upon the point of view that online convex optimisation provides a common language for machine learning and control. In the first part of this talk, we will see how the control designer's perspective can be useful in the development of gradient-descent-based optimisation methods for supervised learning. Then, in the next part, we will discuss how composite adaptive control algorithms can be generated naturally by solving the associated optimisation problems with different formulations.

About the Speaker

Namhoon Cho is a research fellow in the Centre for Autonomous and Cyber-Physical Systems, School of Aerospace, Transport and Manufacturing, Cranfield University, United Kingdom, since January 2021, where he has been awarded a Cranfield 75th Anniversary Fellowship. He received his BSc and PhD degrees in Mechanical and Aerospace Engineering from Seoul National University, South Korea, in August 2012 and February 2017, respectively. Previously, he was a senior researcher in the 1st R&D Institute, Agency for Defense Development, South Korea, from March 2019 to December 2020, where he was involved in research and development of guidance and control systems for missiles and developed design tools based on optimisation techniques. He was a research fellow in the Department of Mechanical and Aerospace Engineering, Seoul National University, South Korea, from March 2017 to February 2019. He develops methodologies for the design and analysis of control and estimation systems, with a particular emphasis on autonomous aerospace vehicles. His research interests include robust adaptive control methods based on online model learning, applications of machine learning algorithms to problems in control and estimation, unified frameworks for automated design of optimal guidance and control systems, and online trajectory optimisation. More info at https://nhcho91.github.io.

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A Unified Framework for Distributed Optimization and Non-cooperative Games

Maojiao Ye（Nanjing University of Science and Technology）

Abstract

Non-cooperative games and distributed optimization problems are hot research topics in recent years. Non-cooperative games capture the competitive behavior among self-interested players while distributed optimization relies on the cooperation among the agents. However, situations involving both cooperative and competitive behaviors are beyond their scopes. To deal with this issue, a unified framework for distributed optimization and noncooperative games is developed. In addition, methods that can solve the formulated model will be provided.

About the Speaker

Maojiao Ye received the B.Eng. degree in Automation from the University of Electronic Science and Technology of China, Sichuan, China, in 2012 and the Ph.D. degree from Nanyang Technological University, Singapore, in 2016. She is currently a Professor with the School of Automaton, Nanjing University of Science and Technology. Prior to her current position, she was a Research Fellow in the School of Electrical and Electronic Engineering at Nanyang Technological University from 2016-2017.

Dr. Ye was a recipient of Guan Zhao-Zhi Award in the 36th Chinese Control Conference 2017 (first author) and a recipient of the Best Paper Award in the 15th IEEE International Conference on Control and Automation 2019 (sole author). Her research interests include distributed optimization, games and their applications.