

# ZHAOZHAN YAO

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Google Scholar Profile

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## EDUCATION

with the School of Automation, Guangdong University of Technology

M.Sc.in Control Science and Engineering

B.Eng. in Automation, GPA: 4.0/5.0 (rank 1st in the school)

supervised by Prof. Yong Xu

Sept 2020 to present

Sept 2016 to Jun 2020

## RESEARCH INTERESTS

Multiagent systems; Graph theory; Consensus; Multiconsensus; Finite-, fixed-, and predefined-time stability; Discontinuous control; Nonsmooth analysis; Sliding mode control; Backstepping control; Formation control; Attitude control and synchronization.

## PUBLICATIONS

1. Yong Xu, **Zhaozhan Yao**, Renquan Lu, Bijoy K. Ghosh, A novel fixed-time protocol for first-order consensus tracking with disturbance rejection, *IEEE Trans. Autom. Control*, to appear, doi:10.1109/TAC.2021.3131549.
2. **Zhaozhan Yao**, Ye Kuang, Chang Liu, Yuru Guo, Hongxia Rao, A discontinuous finite-time consensus tracking algorithm for single integrator multi-agent system with external disturbance, *Proc. China Control Conf.*, 657-661, 2021.

## RECENT RESEARCH

### First-order predefined-time consensus under digraphs

*Automatica*

**Zhaozhan Yao**, Yong Xu, Chang Liu, Renquan Lu, Bijoy K. Ghosh, *Life Fellow, IEEE*

to be submitted

- This paper considers a group of scalar agents subject to nonlinear dynamics and bounded disturbances under strongly connected graphs and designs two novel controllers to achieve consensus in an arbitrarily prespecified time.
- Most existing papers design controllers using some eigenvalue information of the Laplacian or its variants associated with the communication topology, which, however, is global information since each agent has to own the knowledge of the communication topology as to compute the eigenvalue.
- In the proposed controller, while the signum of the sum of the relative states of the agents w.r.t. their neighbors is still kept to guarantee consensusability, the magnitude of control inputs is designed via the self-states of the agents. This unorthodox practice, together with a matching Lyapunov function, removes the use of any eigenvalue information of the Laplacian or its variants in the consensus analysis, following a favored result that the agents are capable of achieving consensus in a fully distributed manner.

### Finite-time multiconsensus with disturbance rejection in signed digraphs

*IEEE Trans. Autom. Control*

**Zhaozhan Yao**, Yong Xu, Zijing Xiao, Hui Peng, Peng Shi, *Fellow, IEEE*

under review

- This paper considers a group of scalar agents with bounded disturbances and designs a discontinuous controller to achieve multiconsensus with disturbance rejection within a finite time.
- Agents won't achieve consensus when the underlying communication topology is weakly connected and, therefore, are partitioned into multiple cells. So, multiconsensus arises. Most recent papers study multiconsensus using external equivalent partitions that require all agents inside a cell to have the same indegree w.r.t. another one. However, this paper classifies the cells into independent ones and dependent ones and finds that only a portion of roots inside each dependent cell obeys the external equivalence rule is already sufficient to guarantee multiconsensusability.
- Still, the proposed controller does not use any global information associated with the communication topology. An aesthetically pleasing tuning condition is derived and presents that the minimum control gain has to be twice as large as the upper bound of disturbances as to guarantee disturbance rejection.

### A novel fixed-time protocol for first-order consensus tracking with disturbance rejection

*IEEE Trans. Autom. Control*

Yong Xu, **Zhaozhan Yao**, Renquan Lu, Bijoy K. Ghosh, *Life Fellow, IEEE*

to appear

- This paper mainly overcomes such a problem: given a group of scalar follower with bounded disturbances, a leader, and a directed communication topology, how to achieve consensus tracking within a fixed time, in the presence of a moving leader with bounded control input, instead of a static leader.

## AWARDS AND HONORS

- First Class Postgraduate Scholarship, awarded to the top 20% postgraduates of the school
- **National Scholarship**, awarded to the top three undergraduates of the school
- honored Top Ten Graduates of the school
- Second Prize at China Undergraduate Mathematical Contest in Modeling

## PROFESSIONAL SERVICE

- **Technical Manuscript Reviewer:** *Automatica* and *Neurocomputing*.

## SKILLS

- Matlab and Python.