Multi-Agent Collision Approach for Stabilizing Multi-Machine Power Networks with Distributed Excitation Systems

Cui Wang, Jun Zhou, Zhaoxia Duan

PII: S2468-6018(18)30040-3
DOI: 10.1016/j.ifacsc.2018.07.001
Reference: IFACSC 17

To appear in: *IFAC Journal of Systems and Control*

Received date: 14 March 2018
Revised date: 7 July 2018
Accepted date: 25 July 2018

Please cite this article as: Cui Wang, Jun Zhou, Zhaoxia Duan, Multi-Agent Collision Approach for Stabilizing Multi-Machine Power Networks with Distributed Excitation Systems, *IFAC Journal of Systems and Control* (2018), doi: 10.1016/j.ifacsc.2018.07.001

Multi-Agent Collision Approach for Stabilizing Multi-Machine Power Networks with Distributed Excitation Systems

Cui Wang[a,*], Jun Zhou[a], Zhaoxia Duan[a]

[a]*School of Energy and Electrical Engineering, Hohai University, Nanjing 211100, China*

Abstract

Stabilization in terms of frequency synchronism and power angle specification in multi-machine power networks is addressed by distributed multi-agent flocking control actuated through excitation systems (ES), while taking into account static var compensators (SVC) as auxiliary control for other generator performances. More precisely, frequency synchronism and power angle specification in a multi-machine power system are re-formulated as formation control of multiple generator agents in the corresponding multi-agent network. By inducing multi-agent collision under virtual controls defined by the generalized Olfati-Saber's flocking algorithm, stabilization among all synchronous generators is achieved while the steady-state torque angles are specified to a same power angle. Distributed real control actions of ES's are determined via nonlinear algebraic and differential equations for individual generators with respect to the virtual controls. Numeric examples of a three-machine power network are included to illustrate the main results.

Keywords: multi-agent collision, stabilization, frequency synchronism, power angle specification, excitation system.

*Corresponding author
Email address: emeraldwang@126.com (Cui Wang)