MAR17-2016-020496

Abstract for an Invited Paper
for the MAR17 Meeting of
the American Physical Society

Control of coupled oscillator networks with application to microgrid technologies

ALEX ARENAS, APS

The control of complex systems and network-coupled dynamical systems is a topic of vital theoretical importance in mathematics and physics with a wide range of applications in engineering and various other sciences. Motivated by recent research into smart grid technologies, we study the control of synchronization and consider the important case of networks of coupled phase oscillators with nonlinear interactions—a paradigmatic example that has guided our understanding of self-organization for decades. We develop a method for control based on identifying and stabilizing problematic oscillators, resulting in a stable spectrum of eigenvalues, and in turn a linearly stable syn- chronized state. The amount of control, that is, number of oscillators, required to stabilize the network is primarily dictated by the coupling strength, dynamical heterogeneity, and mean degree of the network, and depends little on the structural heterogeneity of the network itself.