Application of Switched Iterative Learning Control to Multi-Agent System Coordination

He Li, Dr. Douglas A. Bristow, Dr. Robert G. Landers

ABSTRACT
This paper proposes a switching algorithm under the Iterative Learning Control (ILC) framework for multivariable systems whose output channels cannot be accessed simultaneously. The developed scheme is named SILC for short and is applied to a multi-agent system coordination problem. Previous works have shown that zero tracking error cannot be accomplished for such systems with regular ILC, i.e., switching algorithm is not in effective. Zero tracking error, however, is guaranteed if the switching algorithm is in operation and the learning matrix is designed appropriately using a plant-inversion approach. The developed algorithm and the plant-inversion design are applied to a multi-agent coordination problem where each agent is required to track its own global trajectory while maintaining desired relative positions with respect to its neighbors. The global sensor can access only limited number of agents at any time, and, thus, the switching algorithm is necessary in order to achieve perfect tracking for all the agents.