Geophysical Research Abstracts
Vol. 19, EGU2017-12417-3, 2017
EGU General Assembly 2017

Policy tree optimization for adaptive management of water resources systems

Jonathan Herman (1) and Matteo Giuliani (2)

(1) University of California Davis, Dept. Civil and Environmental Engineering, Davis, California (jdherman@ucdavis.edu),
(2) Politecnico di Milano, Dept. Electronics, Information, and Bioengineering, Milano, Italy (matteo.giuliani@polimi.it)

Water resources systems must cope with irreducible uncertainty in supply and demand, requiring policy alternatives capable of adapting to a range of possible future scenarios. Recent studies have developed adaptive policies based on “signposts” or “tipping points” that suggest the need of updating the policy. However, there remains a need for a general method to optimize the choice of the signposts to be used and their threshold values. This work contributes a general framework and computational algorithm to design adaptive policies as a tree structure (i.e. a hierarchical set of logical rules) using a simulation-optimization approach based on genetic programming. Given a set of feature variables (e.g., reservoir level, inflow observations, inflow forecasts), the resulting policy defines both the optimal reservoir operations and the conditions under which such operations should be triggered. We demonstrate the approach using Folsom Reservoir (California) as a case study, in which operating policies must balance the risk of both floods and droughts. Numerical results show that the tree-based policies outperform the ones designed via Dynamic Programming. In addition, they display good adaptive capacity to the changing climate, successfully adapting the reservoir operations across a large set of uncertain climate scenarios.