



Probabilistic modelling of reservoir operation during floods

L. Mediero (1), L. Garrote (1) and M. Molina (2)

(1) Department of Civil Engineering: Hydraulics and Energetics. Technical University of Madrid (ljmediero@yahoo.es), (2) Department of Artificial Intelligence. Technical University of Madrid (mmolina@fi.upm.es)

One important aspect of flood management is to determine the best reservoir operation that minimizes downstream damage and maximizes the water volume stored at the end of the flood event. This is a difficult task because of lack of knowledge about future inflow discharges into the reservoir. A methodology to select the best reservoir operation strategy is presented, based on learning from the results of a rainfall-runoff model coupled with a reservoir operation model. The methodology has been implemented in the computational framework of Bayesian networks. Two data sets of 5,000 inflow hydrographs have been obtained through a Monte Carlo simulation with a rainfall-runoff model of the basin. The outflow hydrograph data sets have been obtained by a reservoir management model applied over the inflow hydrograph series, varying the initial conditions and operation strategy of the reservoir. During real-time operation, the rainfall recorded in the basin is used to make probabilistic predictions of inflow discharges into the reservoir with a rainfall-runoff Bayesian network. The reservoir Bayesian network takes these probabilistic discharge values as input data and gives the probabilistic outflow discharge and water level in the future time steps for the different operation strategies considered. From these probabilistic results the best floodgate operation can be selected in terms of risk of damages and maximum discharge downstream of the reservoir. The Bayesian networks have learned from the first data set and have been validated with the second one. The methodology has been tested successfully for one reservoir located in the South of Spain with observed data recorded during recent flood events, checking its usefulness as a decision making tool in real-time reservoir management.