WATER – POSTER #38

Metaheuristic Optimization of the Canal Structure Operations in the Treasure Valley, Idaho

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A computer program that was proven to produce optimal operational solutions for open-channel irrigation conveyance networks for synthetic data in previous research was tested with real world data for this research. Data gathered from databases and the field by the Boise Project, Idaho, provided input to the hydraulic model for the physical characteristics of the conveyance system. We selected three reaches of the Deer Flat Low Line for optimizing actual gate operations. The 59.1 km canal located in the Treasure Valley, with a maximum capacity of 34 m^3/s, irrigates mainly corn, wheat, sugar-beet, and potato crops.
The computer model uses an accuracy-based learning classifier system (XCS) with an embedded genetic algorithm to produce optimal rules for gate structure operation in irrigation canals. Rules are generated through the exploration and exploitation of a population, with the support of RootCanal, an unsteady-state hydraulic simulation model. The objective function was set for satisfying variable demand while minimizing water level deviations from target levels. It is noteworthy to mention that this simple 3-reach network requires the computer performing several thousand simulations continuously for days to find plausible solutions. The model is currently simulating the Deer Flat Low Line Canal near Caldwell, Idaho with promising results. The population evolution is measured by a fitness parameter, which shows that canal structure operations generated by the model are improving towards plausible solutions. This research is a step forward in optimizing water resources management. Relying on management practices of the past will no longer work in a world that is impacted by global climate variability.