A simulation based optimization of power production in hydropower systems

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Optimal power production in a hydropower system involves determining the daily operational strategy to be followed to maximize the profit in accordance to the electrical power price trend on the market. At same time, the water consumption has to be minimized and a large set of hydrological conditions and operation guidelines must be obeyed. Our paper presents the framework for solving this complex multi-objective optimization problem using parallel multi-objective genetic algorithm. Due to the time-consuming evaluations which includes running computationally expensive simulation of coupled hydraulic and hydro-energetic model, it may take days and months for the GA to find an acceptable solution. This is unacceptable in circumstances where decisions have to be made on hourly basis. Our solution uses WoBinGO [1] parallel framework for genetic algorithm based optimization which enables speed-up and consequently reduces optimization execution time significantly. Real-world case study with three highly coupled hydropower plants held by two different stakeholders shows that optimization can be done in a reasonable time and that results of the optimization are satisfying.

References

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