

Optimization of Detention Basin at Watershed Level Scale

Thi Thuy Ngo*, Jafar Yazdi**, Joong Hoon Kim***

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Abstract

Urbanization and waterworks construction in natural watershed have been causing higher flood risks in lowland areas. Detention basins have become one of the most efficient fundamental instruments for storm water and environmental management at watershed scale. Nowadays, there are many studies coupled numerical methods of flood routing with optimization algorithms to investigate factors that impact on the efficiency of detention basins in flood reduction in a watershed, such as detention basin location, size, and cost and watershed characteristics. Although these couplings have been become more widespread but cumbersome computation and hydraulic data requirement still are their limitations. To tackle the procedure efforts due to numerical integration and data collection, simple approach is proposed to primarily estimate effects of detention basins. The approach basis is the linear system theory applied to the solution of hydrologic flood routing.

The paper introduces an analytical method for estimating detention effects deriving by recent studies and innovatively analyses this equation on fractal perspective. Then, an optimization technique is performed by applying harmony search algorithms (HSA) to optimize efficiency of detention basins at watershed scale. The location and size of upstream detention basin are simultaneously obtained. Finally, the proposed methodology, practically applied for a real watershed in Kan river, Iran.

Keywords : Effects of detention basin · Optimization · Analytical solution

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* Member · Dept. of Civil, Environmental and Architectural Engineering, Korea University · E-mail : ngothuy@korea.ac.kr

** Member · Assistant Professor, Faculty of Civil Engineering, University of Shahrood

*** Member · Professor, Dept. of Civil, Environmental and Architectural Engineering, Korea University