

遺傳演算法應用於自由跌水沖刷行為之探討

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摘 要 遺傳演算法發展大約 40 年，近年來被廣泛應於工程及科學領域上，本文利用遺傳演算法(Genetic Algorithm)預測自由跌水下游沖刷坑之變化行為。渠槽試驗於清水流條件，由不同上游渠床坡度 ($S = 0.46 \sim 6\%$) 及河床顆粒粒徑($ds = 0.5mm \sim 3.69mm$)、改變跌流高度 ($H = 0.15 \sim 0.25cm$) 及單位寬流量($q = 0.0034 \sim 0.0237cms/m$) 進行之。以試驗數據 144 組為訓練樣本，再另取與訓練樣本不同之 36 組實驗成果為模擬樣本，進行檢驗模式訓練成果，且與經試驗獲致之迴歸式進行比較預測的精確性。模擬預測結果顯示自由跌流作用下之穩定最大刷深、最大刷深至跌址處水平距離、最大坑長及沖刷坑體積量採用遺傳演算較迴歸公式預測為準確。

關鍵詞：遺傳演算、自由跌水、沖刷坑。

Application of Genetic Algorithm on Scour Behavior of Free Overfall Flow

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ABSTRACT The development of Genetic Algorithm(GA) began approximately 40 years ago. In recent year, the GA can be used frequently on engineering and science fields. This paper uses Genetic Algorithm to predict the scour hole behavior of free over-fall flow in downstream channel. In this study, the extent of flow characteristics is explored by varying the bed slope ($S = 0.46 \sim 6\%$) in upstream, the drop height ($H = 0.15 \sim 0.25cm$), the particle size of bed material($ds = 0.5mm \sim 3.69mm$) and the discharge per unit width ($q = 0.0034 \sim 0.0237cms/m$) using channel tests. Firstly, we executed the laboratory experiment with clear water to obtain the total 144 sets data. Then we normalized and trained these experiment data sets by GA, in order to get the training parameters of GA. Added laboratory experimental 36 sets data was use to validate the usefulness of GA and regression equation in this study. The simulation results showed that the GA method provided accurate estimations for the maximum scour depth, the horizontal distance from the toe of the drop structure to the maximum scour depth, the maximum scour length and the scour hole volume, than the regression method.

Key Words : Genetic algorithm, free overfall flow, scour hole.

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