集水區自動劃分模式建立之研究

林文賜[1]　　林昭遠[2]　　黃碧慧[3]　　周文杰[4]

摘　　要　水土保持之理論基礎及實務應用多以集水區為評估單元，以往集水區資訊之萃取主要以人工方式量測，近年來隨電腦科技之進步，數值高程模型資料於集水區自動劃分之技術已臻成熟，利用電腦量化集水區資訊應用於坡地災害分析為時勢所趨。本研究以集水區自動劃分理論為主軸，針對窪地出口、流向迴路及集水區門檻值劃分等項目，提出窪地集水區及集水區動態劃分等改進方法。首先藉由高差法及所推導之斜面法計算集水區之初始流向，輔以窪地集水區法結合 PROMETHEE 理論建立集水區之無窪地流向。由石門水庫集水區之流向計算結果，與傳統之窪地填高法及逐步填高法比較，以窪地集水區法最為精確。在集水區之動態萃取，係由使用者指定集水區出流口點，可自動追蹤流經該點之所有排水區位，獲得集水區範圍。以石門水庫集水區之水庫大壩為出流口，動態萃取之集水區面積為 75633.60 ha，以 DEM 之網格大小 40x40 公尺計算，可得門檻值為 472710。

關鍵詞：無窪地流向、窪地集水區法、集水區自動劃分。

Model Establishment for Automated Watershed Delineation

Wen-Tzu Lin[1]　　Chao-Yuan Lin[2]　　Pi-Hui Huang[3]　　Wen-Chieh Chou[4]

ABSTRACT　　Watershed unit has been regarded as an analyzed object for slopeland disaster assessment. With the fast growing progress in computer technologies, instead of manual operation, there is a trend of applying Digital Elevation Model (DEM) in automated watershed delineation. This study first focused on improving extraction method for automated watershed delineation. The concepts for depression outlets decision, looped drainage direction calculation and reasonable watersheds area delineation are all revised to propose a new approach for more reasonable and efficient in watershed delineation. Using DEM to derive drainage directions of a watershed is frequently used in recent study. However, determinations of the optimal outlet and drainage directions for the depressions should be improved for fitting the real field data. This study proposed surface-inclining approach to couple with elevation-differencing approach for determining incipient drainage directions. The calculation of optimal outlet and drainage direction in the depressions can be performed using watershed depression approach with PROMETHEE (THE Preference Ranking Organization METHod for

〔1〕明道管理學院環境規劃暨設計研究所副教授(通訊作者)
　　Associate Professor, Graduate Institute of Environmental Planning and Design, Ming-Dao University, Changhua 523, Taiwan, R.O.C. (Corresponding Author)
　　E-mail: aiken@mdu.edu.tw
〔2〕國立中興大學水土保持學系教授
　　Professor, Department of Soil and Water Conservation, National Chung-Hsing University, Taichung 402, Taiwan, R.O.C.
〔3〕逢甲大學土木及水利工程研究所博士生
　　Doctoral Student, Graduate Institute of Civil and Hydraulic Engineering, Feng-Chia University, Taichung 407, Taiwan, R.O.C.
〔4〕中華大學土木與工程資訊學系副教授
　　Associate professor, Department of civil Engineering & Engineering Informatics, Chung-Hua University, Hsinchu 300, Taiwan

Enrichment Evaluations) theory. Compared with depression-filling and repeatedly elevation-incrementing approaches, the drainage directions for Shihmen reservoir watershed calculated by watershed depression approach show more reasonable and realistic outcomes. A dynamic extraction technique for tracing upstream drainage area based on user-specified outlet is also developed for fast automatically watershed delineating. The watershed area extracted for Shihmen reservoir with the outlet located at the site of dam is 75634 ha, equal to the threshold of 472710 after calculated with 40m cell size of DEM.

Key Words: depressionless drainage direction, depression watershed method, automated watershed delineation, PROMETHEE (THE Preference Ranking Organization METHod for Enrichment Evaluations).