

以共用臨域類神經網路架構土石流預警系統之研究

曾國源^[1] 張斐章^[2]

摘 要 近年來類神經網路被廣泛應用於各種工程及科學領域，對於影像辨識、預測等皆有許多成功的案例，本研究主要以曾多次發生土石流災害之陳有蘭溪集水區為研究區域，蒐集土石流發生之相關資料，架構一類神經網路作為土石流預警系統之用，並評判其準確度及實用的效果性。

共用臨域(Shared Near Neighbors)為一種非監督式學習方法，適用於一般具有非球狀群集特性的資料作具有特殊意義的分割，即利用其分類之特點，以土石流災害之水文與地文條件進行發生機制判釋，藉以對未來可能發生之情況做分類模擬；本研究為改善共用臨域分類之推判效果，也研議將共用臨域的分類結果架構一層神經網路，使之成為共用臨域類神經網路(Shared Near Neighbors Network, SNN)，而網路連結的權重則利用監督式的學習方式，提升網路的預判效果，研究中發現共用臨域類神經網路對土石流之預警具有良好的功效。

關鍵詞：土石流預警系統、共用臨域類神經網路、非監督式學習。

The Shared Near Neighbors Neural Network of Constructing the Debris Flow Warning System

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ABSTRACT The main purpose of this study is to propose an artificial neural network for constructing a debris flow warning system. The Chen-Eu-Lan creek, which is located in the center of Taiwan, was chosen as the study watershed. The creek is one of the most well-known debris flow areas where several serious debris flows have been reported in the last few years. The hydrological and geological data, which might cause debris flow, are collected and analyzed first. Then, the shared near neighbors neural network (SNN) is presented to construct the debris flow warning system for the watershed.

SNN is an unsupervised learning method, which has the advantages in dealing with the non-globular cluster and computational elegance. By using SNN, the collected hydro-geological data sets can easily and meaningfully be clustered into several categories. These categories can then be identified as “occur” or “non-occur” the debris flow. To improve the effectiveness of debris flow warning system, a neural network framework is designed to connect all the clusters produced by SNN, and the connected weights of the network are adjusted through a supervised learning method. This

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framework is used to investigate its applicability and practicability for debris flow. The results demonstrate that the proposed SNN neural network is an applicable and effective tool for debris flow warning system.

Key Words: debris flow warning system, shared near neighbors neural network, unsupervised learning.