LANDSLIDE IDENTIFICATION IN SATELLITE IMAGE USING U-NET

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ABSTRACT: Taiwan is a region frequently affected by natural disasters, such as typhoons, earthquakes, and landslides. However, traditional methods for identifying landslides have limitations in effectively detecting them. These limitations arise due to interference from vegetation cover, shadow effects, and varying lighting conditions. To overcome these challenges, this study utilizes the U-Net model as the primary tool for landslide identification. The dataset used in this research consists of aerial imagery from 2017, specifically from Nanfeng Village, Nantou County, Taiwan. The imagery was obtained from the Aerial Survey and Remote Sensing Branch of the Forestry and Nature Conservation Agency. The dataset was divided into three equal parts: training, validation, and testing (Figure 1a). The training data involved splitting the large image into smaller images sized 256x256, with a shift of 128 pixels. Additionally, the training images were augmented through rotating them by 90 degrees and flipping, resulting in an increase in the number of training images from 384 to 1536. The validation and test images were divided into 256x256, with a shift of 256 pixels. Consequently, the validation set consisted of 40 images, while the test set had eight images. It should be noted that ground truth was provided via the manually built landslide masks. The U-Net model was trained using the Google Colab cloud computing services. The training was carried out with a batch size of 16, a learning rate set to 0.001, and a total of 20 epochs. The model achieved a Mean Intersection Over Union (MeanIoU) score of 0.78, indicating significant potential for landslide prediction (Figure 1b). The findings of this study hold immense importance for the management and prevention of geological disasters. They contribute to better planning and implementation of measures to mitigate the impact of mountainous landslides and ensure the safety of residents.
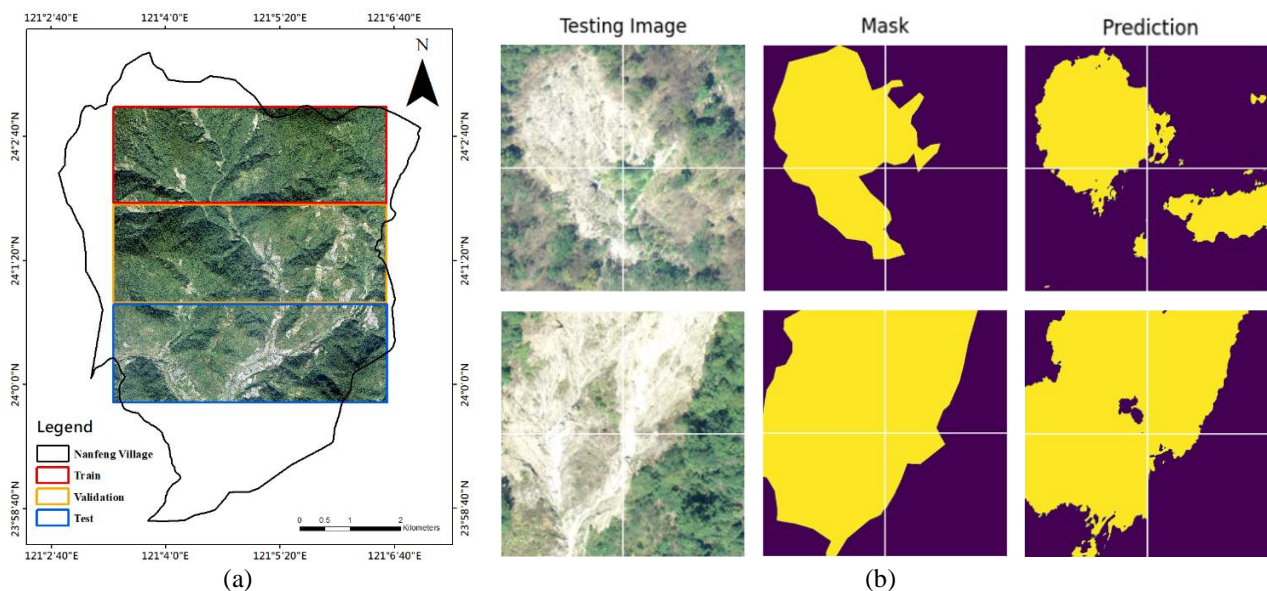
Figure 1. (a) The division of image; (b) The result of the U-net model.

KEY WORDS: Landslide, U-net, Taiwan