

應用深度學習 Mask R-CNN 於自動化 河川水位量測

Applying Deep Learning Mask R-CNN to Automated River Water Level Measurement

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摘 要

河川及渠道的水位準確監測對於水資源管理很重要，傳統的水位量測方法是使用壓力式水位計，但容易因為泥沙淤積或水位過低而無法量測，因此需要尋找適合的量測地點，且後期管理維護費用較高。本研究提出一種透過 CCTV 影像，使用深度學習中實例分割方法的 Mask R-CNN 模型進行自動化水位量測，提高水位監測的精度和效率，並降低傳統水位量測方法的成本與維護難度。

本研究收集新竹玉峰站的影像，並使用這些影像訓練 Mask R-CNN 模型，進行水位線位置的判識。接著將判識的水位線透過虛擬水尺計算水位高度，再與玉峰水位站量測之實際水位進行比較。研究結果顯示 Mask R-CNN 模型可以準確判識影像中水位線位置，並透過虛擬水尺計算出水位高度。

關鍵詞：深度學習，Mask R-CNN，實例分割，水位，虛擬水尺

Abstract

Accurate monitoring of river and channel water levels is essential for effective water resource management. Traditional methods, which rely on pressure-based level gauges, often encounter issues such as sediment buildup and low water levels, resulting in the need for meticulous site selection and high post-management and maintenance costs. This study introduces an automated water level measurement technique utilizing CCTV images and the Mask R-CNN deep learning model for instance segmentation. This approach aims to enhance the accuracy and efficiency of water level monitoring while mitigating the costs and maintenance challenges associated with conventional methods.

In this research, images from the Yufeng Station in Hsinchu were collected to train the Mask R-CNN model to detect the water level line. The detected water level line was used to calculate the water level via a virtual water gauge, and the results were compared with actual water levels recorded by the Yufeng water level station. Findings demonstrate that the Mask R-CNN model can precisely identify the water level line in images and accurately determine the water level using a virtual water gauge.

Keywords: Deep learning, Mask R-CNN, Instance segmentation, Water level, Virtual water gauge.