應用新監測資訊研發災害預警及衝擊技術

Developing Disaster Early Warning and Impact Technologies Using New Monitoring Information

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摘　要

隨著氣候變遷的影響，導致臺灣極端天氣事件頻傳，為了提升防救災的能力，需要建構高空間解析度與跨領域的災害預警及衝擊研判技術。國家災害防救科技中心積極開發災害預警系統，整合氣象預報、物聯網(IoT)監測、三維空間資訊與遙測影像，展現出高度的跨域氣象防災應用成效。本研究的主要核心技術針對豪雨及強風導致的災害預警研判。短時強風對建物與農業衝擊的評估，利用AI短時強陣風模擬技術，快速取得未來風速資訊，藉此評估強風與高風險脆弱建物的損害影響。在農業預警方面，則以AI數據中的最大風速7級與10級風作為風險預警門檻，針對全臺283農業專區的作物危害影響評估，提供特定鄉鎮區的強風農作物預警。淹水災害的應用，整合下水道與淹水感測器進行淹水區域評估，並結合5公尺數位高程模型DEM資料與全臺586萬筆3D建物模型，研發快速淹水範圍推估模組。而福衛八號遙測影像在防災的應用，透過自然色與紅邊波段偽色合成技術，針對堰塞湖災害監測與受災區域影響範圍之高精度變遷動態展示，以了解堰塞湖災害衝擊範圍與災後復原概況。

關鍵字：強風衝擊評估、淹水範圍推估、福衛八號

Abstract

Driven by the impacts of climate change, extreme weather events have become increasingly frequent in Taiwan. To enhance disaster prevention and rescue capabilities, there is a critical need to construct high-spatial-resolution, cross-disciplinary technologies for disaster early warning and impact assessment. The National Science and Technology Center for Disaster Reduction (NCDR) has actively developed disaster early warning systems, integrating weather forecasting, Internet of Things (IoT) monitoring, 3D spatial information, and remote sensing imagery, demonstrating highly effective cross-domain meteorological applications for disaster prevention.

The major technology of this research focuses on disaster early warning and impact assessment for heavy rain and strong winds. For assessing the impact of short-duration strong winds on buildings and agriculture, an AI-driven short-duration gust simulation technology is utilized to rapidly obtain future wind speed data, thereby evaluating the damage impacts of strong winds on high-risk, vulnerable buildings. In terms of agricultural early warning, the maximum wind speeds of Beaufort scale 7 and 10 from AI data are set as risk warning thresholds. This enables crop hazard impact assessments across 283 agricultural zones in Taiwan, providing strong-wind agricultural warnings for specific townships and districts.

For flooding applications, the system integrates sewer and flood sensors to conduct inundated area assessments. By combining 5-meter Digital Elevation Model (DEM) data with 5.86 million 3D building models across Taiwan, a rapid flood extent estimation module was developed. Regarding the disaster prevention application of FORMOSAT-8 remote sensing imagery, natural color and red-edge band false-color composite technologies are employed. This allows for high-precision dynamic change visualization for barrier lake monitoring and affected areas, facilitating a comprehensive understanding of the barrier lake disaster's impact range and post-disaster recovery status.

Keywords: Strong Wind Impact Assessment, Inundation Area Estimation, FORMOSAT-8