三維地形圖資技術發展工作案

Development of 3D Topographic Mapping Technology

主管單位：內政部

蔡富安 [1]　　　　　　　張智安 [2]　　　　　　　黃智遠 [1]

Tsai, Fuan[1]　　　　　　Teo, Tee-Ann[2]　　　　Huang, Chih-Yuan[1]

[1] 國立中央大學太空及遙測研究中心

[2] 國立交通大學土木工程學系

摘要

　　大比例尺(千分之一)基本地形圖是國內最重要的基本圖資之一，也廣泛應用於不同領域。目前大比例尺地形圖仍為二維圖資，雖然有精確的二維坐標，但缺乏精確完整的三維資訊。空間資訊的應用由傳統二維平面逐漸往三維模型、室內外整合及多時序發展，並且與物聯網等新興技術結合，以達到智慧城市發展與應用。內政部自 95 年起陸續推動三維數位城市模型發展相關研究，對於三維房屋與道路模型建置、技術規劃與發展、模型更新、不同等級模型整合等已累積相當程度成果。隨著智慧城市的議題逐漸受到重視，如何擴充及立體化現有大比例尺基本地形圖，成為三維立體數值基本地形圖，作為新一代空間資訊基礎圖資，以滿足日趨複雜的智慧城市相關應用需求已成為刻不容緩的重要課題。

　　本計畫目的為分析、精進三維基本地形圖資技術發展與應用需求，並研發三維地形基礎圖資測製技術，以及整合三維地形圖資與物聯網並進行應用服務試辦，以期推廣、加值三維地形圖資成果。在技術發展與應用方面，本計畫工作及成果包含：(1)研發三維數值基本地形圖房屋模型及道路標線自動化產製技術；(2)提升三維數值基本地形圖紋理品質及建築尺度細緻度；(3)三維室內圖資與物聯網之整合方案及應用試辦。

　　在推動與評估方面，本計畫工作成果包含：(1)精進三維地形圖測製及檢核作業技術文件指引；(2)提出三維地形圖資測製技術之成本分析、應用領域及成果效益；(3)探討三維地形圖資測製中遭遇之困難或三維地形圖資技術發展需克服之問題並提出可能之解決方案；(4)提出三維地形圖資測製成果物件化、三維空間資料結構與編碼之策略與建議。本計畫的執行與成果，不僅可以整合與強化國內三維地形圖資技術發展，落實科技紮根，對於三維地形圖資應用的推廣和人才培育等也有正面貢獻，進而提昇相關產業與國家整體的競爭力。

關鍵詞：三維模型、智慧城市、三維基本地形圖、物聯網

Abstract

Large-scale (1/1000) topographic map is one of the important geo-spatial data in Taiwan and it has been extensively applied to different domains. However, traditional 2D topographic map only provides planar coordinates and limited information about height, e.g. the number of building floors. In order to develop the necessary infra-structure in geoinformatics for smart city applications, the Ministry of Interior has been promoting 3D cyber city and related studies since 2006, including 3D building modeling, 3D road modeling, 3D model updating, technical planning and multi-scale model integration. Therefore, it has a great potential to extend the existing 2D topographic maps and city models to 3D topographic maps.

The core objectives of this project include: (1) analysis of the demand of 3D topographic maps; (2) development of the 3D mapping techniques; (3) value-added applications using developed 3D topographic maps.

In terms of execution, evaluation and promotion, the tasks carried out and outcomes of this project include: (1) improving documentation in 3D topographic map generation and quality control; (2) 3D topographic map cost analysis, applications and effectiveness evaluation; (3) identifying challenges in 3D topographic map generation and development as well as possible solutions; (4) strategy development and recommendations on 3D topographic map object reconstruction, data structure and encoding schema.

This project will help integrate and strengthen the technical development of 3D topographic map generation so as to further increase technology capacity. In addition, the execution and results of this 3D topographic map development project can also contribute to the long-term related education, application, industry development and economic growth.

Keywords: 3D model, Smart city, 3D Topomap, Internet of Things