

# 以建築資訊模型與時空資料分析技術建置近零耗能大樓能源管理服務平台研究

執行單位

國立中央大學土木系防災  
與資訊應用組

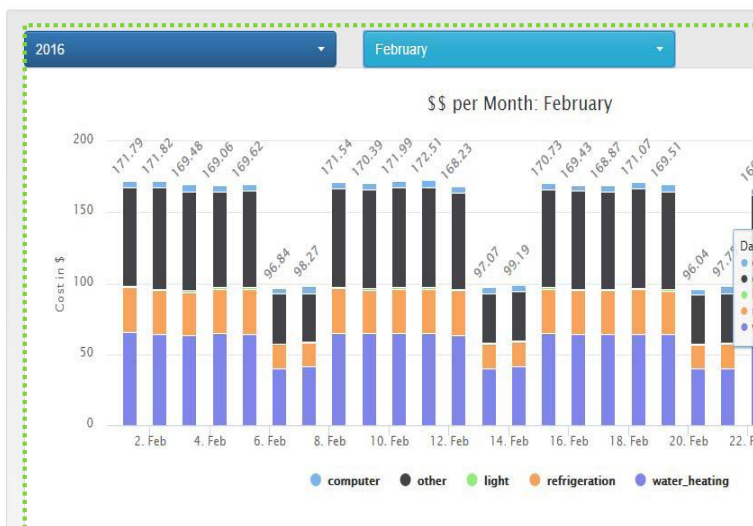
計畫主持人

周建成副教授

- 計畫團隊已與潤泰集團潤福照護事業討論，預計讓本計畫成果應用於該機構，並與原節能措施相互比較。在長照領域因居民行動不便，耗電常偏高，若能適當監控與分析出節電樣式，對業主與居民均有幫助。

## 專利/智財佈局

- 大樓用電資料儲存與管理措施：密集儲存用電資料既浪費空間，也讓分析工作複雜。本作法大幅減少儲存空間需求，分析前再還原資料集合。
- 綜整用電與環境面資訊作法：擷取BIM環境資料供用電分析用。



上圖：以時間電價形式呈現當月某天某房間耗電情形。  
右上：系統起始畫面。  
右下：系統查詢畫面。



本計畫為應用**BIM**與時空資料庫技術來建立大樓能源管理平台，期望透過大數據與資料探勘作法呈現用戶節電建議。105年為三年期計畫的最後一年，著重在測試場域資料收集與分析，包含系統功能調整與穩定化，並分析建置本系統的成本效益。計畫執行期間收集**50**萬筆用電紀錄，採每五分鐘一筆的頻率，包含住家四個月、學校研究室三個月、消防分隊兩個月的資料量。透過去年團隊開發的資料減量技術，最後可形成**7.5**萬筆，研究至今共有兩篇**SCI**英文論文，並於**2017**年獲得國內土木水利學會頒發另一篇中文論文為最佳論文。在國際上**2016**年參加**ICSDEC**在美國鳳凰城舉辦的研討會，並與美國**Lawrence Berkeley National Laboratory**建築節能副主管進行研究交流，另一篇在**2017 ICCBEI**研討會獲得最佳論文之一，轉投**SCI**期刊審查中。計畫雖已結束，但團段近日正與潤福照護事業洽談未來合作、佈署本研究結果事宜。

# Interactive Augmented Reality system for Temporal and Spatial analysis of power consumption data integrated with building information models

Execution Unit

National Central University, Department of Civil Engineering, Information Technology Program

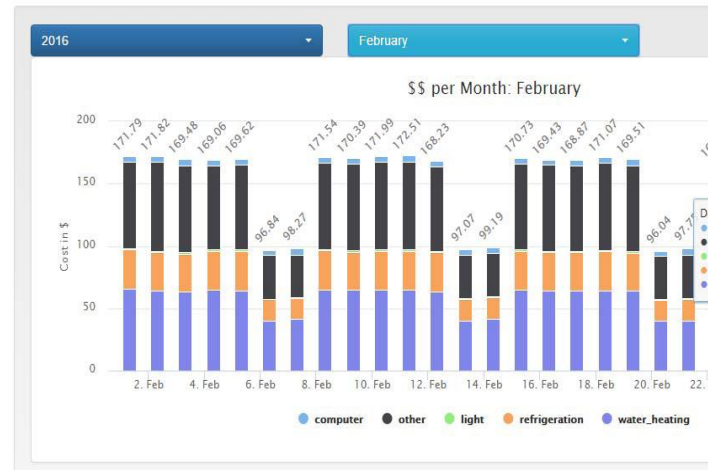
Project Director

Associate Professor: Dr. Chien-Cheng Chou

- The research team is coordinating Ruenfu, an elderly care institution of the Ruentex Group, to serve as the testbed for the proposed system. We will evaluate the power saved due to the use of the system, compared with their original system performance.

## Patents

- Data management mechanism for power consumption data in a building
- Synthesizing BIM and power consumption data for energy-saving knowledge extraction



Left-Top: Time-of-Use Rate information for one appliance.

Right-Top: Welcome page of the system.  
Right-Bottom: Query form of the system.



Proper management and analysis of power consumption data for buildings are the key to achieving sustainable development. BIM data should be integrated into power consumption data sets by filling in each power socket's location and room information. Thus, this study proposed and developed the iARTS (interactive Augmented Reality system for Temporal and Spatial analysis of power consumption data integrated with building information models) that can be used to persist, manage and analyze the fused power consumption data sets. As long as the appliance-sensor assignments are accurately recorded, the locations of the appliances could be determined via the corresponding sensor positions, which could be systematically extracted from their BIM data source. The fused power consumption data sets might provide researchers and residents with more building-related information for further analysis. Therefore, iARTS can identify the usage patterns of those appliances that do not need to operate continuously, such as dehumidifiers. Finally, since the privacy concern regarding a household's power consumption data sets is always the priority, iARTS is designed to operate inside a well-protected home network. Similar to IoTs for a smart home, a wireless router that is currently utilized in almost every household with an internet connection should be the best place to implement iARTS. Finally, more transformation work for other BIM authoring tools should be carried out in the future.