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房地產及建設系系主任及數字建造講座教授  
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**MiC Trio in Public Housing Construction Management**

**MiC 三寶在公共房屋建造管理的應用**

Prof. Lu has well collaborated with the Hong Kong Housing Authority (HKHA) since 2014. In recent years, his team has developed the "MiC Trio" (MiC 三寶) with HKHA. MiC Trio is an innovative, blockchain-enabled digital ecosystem developed to seamlessly manage the entire lifecycle of MiC ranging from offsite production, cross-border logistics, and on-site assembly. These processes become increasingly critical, this end-to-end solution digitally transforms construction management through three integrated applications. First, the system digitalizes factory production by capturing real-time inspection records and uploading them to a secure blockchain dashboard for remote quality monitoring. Second, during transit, an award winning technology called "AiCore" provide real-time tracking, condition monitoring, and accurate arrival predictions. Finally, upon site arrival, the platform ensures precise installation by verifying hoisting paths and module placement accuracy. By significantly enhancing transparency, accuracy, and productivity across the supply chain, MiC Trio establishes a new benchmark for the industry.

自 2014 年起，呂教授與香港房屋委員會（房委會）一直保持良好的合作關係。近年來，他的團隊與房委會共同開發了「MiC 三寶」。這是一個創新的、基於區塊鏈技術的數字化生態系統，旨在無縫管理「組裝合成」建築法（MiC）從場外生產、跨境物流到現場裝配的整個生命週期。隨著這些流程變得日益關鍵，這一端到端解決方案透過三個綜合應用程式，實現了建築管理的數字化轉型。首先，該系統將工廠生產過程數字化，透過擷取實時檢驗記錄並將其上傳至安全的區塊鏈系統，以進行遠程質量監控。其次，在運輸過程中，一項名為「AiCore」的屢獲殊榮技術可提供實時追蹤、狀態監測和準確的抵達時間預測。最後，當組件運抵工地後，該平台透過核實吊裝路徑和組件放置的準確性，確保安裝精確無誤。透過大幅提升整個供應鏈的透明度、準確性和生產力，「MiC 三寶」為業界樹立了新標杆。

## **2) Prof. Wei Pan**

Head, Department of Civil Engineering

土木工程系系主任

潘巍教授

### **MiC for Public Housing Development**

#### **MiC 赋能公共房屋建造**

Providing quality public housing is never an easy task. HKU Civil Engineering Dept., with its Centre for Innovation in Construction and Infrastructure Development and MiCLab, has contributed systems engineering solutions. To highlight: (1) We have studied the feasibility of adopting MiC for public housing development from 2018, and developed 35 KPIs for benchmarking performance of three MiC pilot projects, revealing over 10% faster programme, 40% reduced waste, and 50% reduced accident. We are introducing our MiC inventions to add value to 40-storey development. (2) We have implemented our ground-breaking mobile mapping system and 3D swept path analysis technology for smart transportation planning for Kam Sheung Road MiC project, with accuracy improvement by 200% and significantly reduced safety risks. (3) We have unfolded the lifecycle carbon emissions of high-rise public housing with robust energy modeling, metering, microclimate monitoring and Post-Occupancy Evaluation (POE), and developed solutions for reducing the lifecycle carbon by over two-thirds.

提供優質的公共房屋絕非易事。香港大學土木工程系及其建造及基建創新研究中心和 MiCLab 實驗室，為此貢獻了系統解決方案。(1) 自 2018 年起，我們研究了將 MiC 應用於公共房屋建造的可行性，並制定了 35 項關鍵績效指標

(KPI)，用於評估三個 MiC 試點項目的成效。結果顯示，MiC 能把工期縮短超過 10%，浪費減少 40%，事故發生率降低 50%。我們正將 MiC 創新成果應用於 40 層樓高的公共房屋項目以赋能。(2) 我們已將突破性的移動測繪系統與 3D 掃描路徑分析技術應用於錦上路 MiC 項目的智慧交通運輸規劃，把精度提升 200%，顯著地降低安全風險。(3) 我們運用能耗建模、微氣候監測和用後評估技術，深入分析了高層公共房屋的全生命週期碳排放，並提出可減少三分之二以上全生命週期碳排放的解決方案。

### **3) Prof. Tong Zhang**

Department of Civil Engineering

土木工程系環境工程講座教授

張彤教授

#### **Using Sewer Microbiome Surveillance as an Early Warning System for Corrosion Prevention in Public Housing Infrastructure**

##### **利用污水微生物監測作為公共房屋基礎設施腐蝕預防的早期預警系統**

We propose a new research direction leveraging sewer microorganism surveillance to enhance housing infrastructure durability. This advanced approach detects and manages Microbiologically Influenced Corrosion in concrete and metal pipes before structural damage occurs. These corrosive microbial communities include sulfide-oxidizing bacteria, which produce sulfuric acid that progressively reduce the thickness of concrete pipe walls, and sulfate-reducing bacteria, which generate hydrogen sulfide that directly attacks metal components. Advanced DNA-based molecular techniques enable precise surveillance of these groups, allowing us to map high-risk pipe sections, predict remaining service life by integrating microbial data with environmental conditions, and evaluate the effectiveness of corrosion control measures. The key advantage over traditional inspection methods is early detection. Microbial activity signals deterioration weeks or months before visible damage or structural failure occurs, enabling targeted, cost-effective maintenance interventions. This will support the Housing Bureau's mission for sustainable, quality housing by enhancing building longevity and reducing repair costs.

我們建議一項全新的研究方向，透過下水道微生物監測技術，提升房屋基礎設施的耐用性。這個方法將可在微生物誘發腐蝕對混凝土及金屬管道造成結構性破壞前，及早作出檢測與管理。這類具腐蝕性的微生物群落包括硫氧化細菌，其產生的硫酸會逐步削弱混凝土管壁的厚度；以及硫酸鹽還原菌，其生成的硫化氫會直接侵蝕金屬構件。透過先進的 DNA 分子技術，我們能精準監測這類微生物群，從而識別高風險管道路段，並結合微生物數據與環境狀況，預測管道的剩餘使用年期，同時評估防蝕措施的成效。相比傳統檢測方法，本技術的關鍵優勢在於可實現早期預警——微生物活動的信號，能夠在肉眼可見的損壞或結構失效出現前發出警示，讓我們可以更具針對性地進行維護，達致最佳的資源運用。此項研究將有助房屋局貫徹建設可持續優質居所的使命，延長建築物壽命，並降低維護成本。

#### **4) Prof. Lixi Huang**

Executive Director, HKU Research Institute for Civil Low-Altitude Aviation

低空經濟研究院執行院長

黃立錫教授

#### **Low-Altitude Technology Serving High-Rise Buildings**

##### **低空技術在高層建築的應用**

The HKU Research Institute for Civil Low-Altitude Aviation was established in Jan 2025 to promote the new national initiative in low-altitude economy (LAE) in Hong Kong and to provide a national and international platform of collaborations. Currently we have five research themes: power system for medium-long distance flights, safe aerial vehicle design, airspace detection and management, applications, law and business model for LAE. In HK, one of the major urban applications will be building and facility inspections with autonomous drone flight/control and AI-enabled analysis system, coupled with suitable provisions in regulations to ensure public safety and privacy. In the housing sector, such new technology enables rapid, cost-effective structural inspections for aging buildings and supports low-altitude-ready designs for new estates, featuring rooftop landing pads and charging hubs for seamless drone deliveries and services. The partnership with the Housing Authority will drive the LAE to flourish in HK and help deliver smart living.

香港大學低空經濟研究院於 2025 年 1 月成立，旨在香港推動新的國家低空經濟倡議，並提供對內和對外的合作平台。目前我們有五大研究主題：中長程飛行的動力系統、安全飛行器設計、空域偵測與管理、應用、法律法規及低空經濟商業模式。在香港，主要的應用之一是建築及設施檢查。這個應用首先需要建立保障公共安全與隱私的法律法規、有效的管理系統和 AI 協助的無人機自主飛行能力和任務執行能力。一旦成熟，這些新技術將能為老舊高層住宅提供快速、低成本的巡檢服務，為新舊住宅提供未來低空經濟的各項服務。比如為配備了屋頂著陸平台的大樓提供物流運輸和出行服務。我們希望與房屋局合作，一同打造香港的智慧生活模式。