



金城營造集團
Kum Shing Group

無人機航拍系統於架空電纜巡視工作的應用 Unmanned Aircraft System (UAS) Application in Overhead Line Inspection



團隊名稱 Team Name	飛俯視野 Vision Flight
成立日期 Date of Formation	2018年9月 September 2018
業務單位 Business Unit	電網工程部 - 架空電纜項目 Electrical Services Department - Overhead Line
部門促進員 Team Facilitator	陳爾駿 Karson Chan
隊長 Team Leader	陳爾駿 Karson Chan
團隊 Team Members	丘兆貴 陳正順 謝春源 郭永賢 黃國浩 S. K. Yau Ivan Chan Benson Tse Corner Kwok Raymond Wong

背景 BACKGROUND

數十年，架空電纜工人一直以目測的傳統方式檢測架空電纜。然而，工人老化、人力資源短缺、營運成本增加及潛在的安全隱患，為傳統檢測帶來不少挑戰。有見及此，金城採用了無人機航拍系統及最新技術改善及提升施工安全、效率及效益。

Traditional manual overhead line inspection has been adopted for decades. However, with current limitations like aging workforce, shortage of manpower, high operation cost and safety hazards, the application of the "UAS" and the latest technologies are adopted to improve safety, working efficiency and effectiveness.

由無人機航拍系統所拍攝的高解像度影片及進行的攝影測量有助偵測損壞的組件，而紅外線檢測則可識別電纜系統的異常情況。此外，人工智能亦可偵測組件缺陷並將缺陷分類，協助工程人員精準修補破損組件，檢查結果更準確、工作效率更高。

High definition videos and photos surveys are used to identifying physical defects, whereas thermograph survey is used to spot abnormal condition in the power line system. With the help of Artificial Intelligence (AI) model, defects are identified and classified into different categories for easier handling. Human judgmental errors can be minimized and reliability and efficiency can be enhanced.

問題成因 CAUSE OF THE PROBLEM

- 架空電纜工人年紀老化
- 營運成本上升
- 高空工作及長時間於戶外工作引致健康安全問題
- 地面目視檢查不夠準確和全面
- 遠距離檢測準確性低

- Aging workforce
- Increasing operation cost
- Safety and health problems (working at height and exposure under sun)
- Limited effective range and inspection angle of visual inspection on ground
- Low accuracy rate due to long distance

解決方法 SOLUTION

- 以無人機航拍系統取錄地面目視檢查
- 以4K超高清解析度視頻及紅外線攝影測量偵測損壞的組件
- 以紅外線檢測識別電纜系統的異常情況
- 以人工智能進行偵測，協助工程人員精準修補破損組件
- 重要數據如GPS座標、檢查日期、視頻及影像會被紀錄下來，以供參考，可用於預防性維護分析

- Replacement of human inspection by the UAS system
- Adoption of high definition videos (4K) and photogrammetry to identify physical defects
- Adoption of thermographic survey to spot abnormal condition in the power line system
- Adoption of Artificial Intelligence (AI) model to identify defects and to reduce human judgmental errors
- The recorded key data like GPS coordinates, inspection date, videos and photos can be reviewed anytime and can create data base for preventive maintenance analysis

成果及效益 ACHIEVEMENT & BENEFIT

檢測層面

- 變得更安全、更高效率，以及更省時
- 結果更準確
- 所收集的數據可用於預防性維護分析

Operational Level

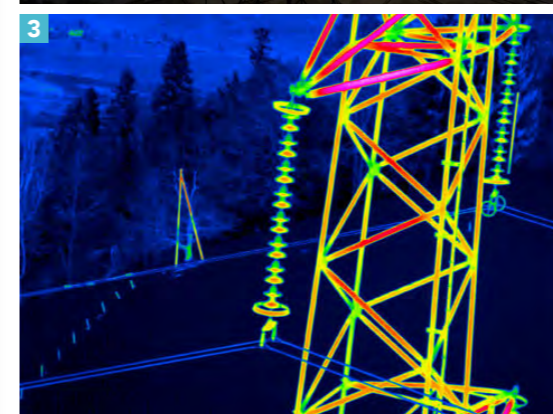
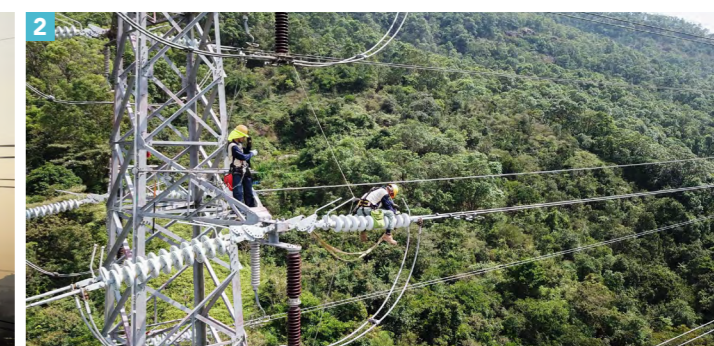
- Enhance safety, operation efficiency. Inspections now become less time-consuming
- Enhance the reliability of the inspections
- Provide data base for preventive maintenance analysis in the future

企業層面

- 為客戶提供可靠的服務，切合他們所需
- 培養及加強企業創新文化

Corporate Level

- Provide reliable service to meet clients' expectation
- Nurture and strengthen innovative culture of the corporation



- 1 航拍系統取錄目視檢查
Replacement of human inspection by the UAS system
- 2 巡查更安全更高效
Enhance safety, operation efficiency. Inspections now become less time-consuming
- 3 使用紅外線溫度偵測損壞組件
Adoption of thermographic survey to spot abnormal condition in the power line system