創新科研
與時並進

CONNECTING
INNOVATION & REALITY

LSCM 物流研發中心

Logistics and Supply Chain MultiTech R&D Centre
物流及供應鏈多元技術研發中心

目錄

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Logistics and Supply Chain MultiTech R&D Centre (Abbreviated as "LSCM")

物流及供應鏈多元技術研發中心 (簡稱「物流研發中心」)

The mission of LSCM is to foster the development of core competencies in logistics and supply chain related technologies and to facilitate the adoption of these technologies by industries in Hong Kong and the Chinese Mainland.

LSCM一直致力研發促進物流及供應鏈之相關行業發展的各種技術，並通過持續研發，提升物流及供應鏈行業的核心科技實力，同時協助本港及中國內地不同行業採用有關技術以提升競爭力。

Joint Research Efforts with Local Universities for Technological Innovations in Hong Kong

與本地大學合作研發創新科技

香港浸會大學 HONG KONG BAPTIST UNIVERSITY

香港中文大學 The Chinese University of Hong Kong

CityU 香港城市大學 City University of Hong Kong

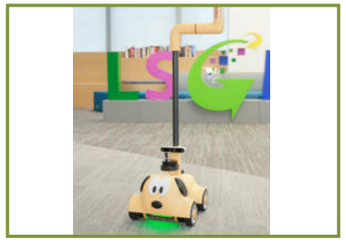
香港科技大學 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

香港大學 THE UNIVERSITY OF HONG KONG

The Edison Awards 2025
2025年愛迪生獎

LSCM won both Gold Award and Silver Award at The Edison Awards 2025, recognising the Centre's strength and expertise in the research and development of innovation and technology.
LSCM於2025年愛迪生獎勇奪1項金獎及1項銀獎共兩項殊榮，印證中心的科研實力與專長。



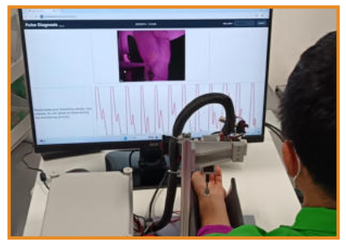
Gold Award: Robo-9 with Multi-Sensor Technologies for the Visually Impaired
金獎:Robo-9: 為視障人士而設的傳感器融合技術

Silver Award: XRCC – Extended Reality Content Creation Suite
銀獎: XRCC - 延展實境創作套件

50th International Exhibition of Inventions Geneva
第50屆日內瓦國際發明展

LSCM's four award-winning technologies at the 50th International Exhibition of Inventions Geneva in 2025.
LSCM的技術於2025年第50屆日內瓦國際發明展榮獲4項獎項。

3D Visualisation with Sensor Data for Sustainable Project Development
應用基於傳感器數據的3D 可視化技術以促進發展項目的可持續性



Assistive Technologies for Traditional Chinese Medicine Tele-Practice
傳統中醫遠程診療之輔助技術

Multi-Sensor Object Detection for Better Traffic Control
提升交通流量的智能區域交通控制系統

Detachable Follow-me Robot
可拆卸式自動隨行機械人

AI in Assisting Crop Pest and Disease Control

協助防治農作物蟲害及疾病的人工智能技術

Overview 簡介

LSCM developed the first artificial intelligence technology for crop cultivation in Hong Kong. The project aims to enhance the efficiency of pest and disease control in the agricultural sector.

LSCM研發了香港首項應用於農作物種植的人工智能技術，旨在提升農業界防治蟲害及疾病的能力。

Problem addressed 解決方案

Crop pests and disease damages are the major threats to the quality of agricultural products and will lead to economic losses. Scouting and monitoring are critical in the early stage of detection and control on pests and disease. However, local farmers often lack access to advanced technologies and sufficient infrastructure, they may not be able to tackle the problems at once.

農作物蟲害及疾病會對農作物品質和經濟造成嚴重影響，因此，有效地偵察和監測對於及早發現及控制蟲害及疾病尤其重要。但一般農民缺乏先進技術和充足的檢測設施，因而未能及早應對問題。

Innovation 創新技術

- Collect and recognise images of crop pest and disease by using AI video analysis modelling
- Build a management system for the farmland, crop and scouting activities
- A mobile app, which employs advanced algorithms to pinpoint instances of crop damage, perform analysis of the underlying causes, and recommend effective control measures, was developed for farmers to achieve precise pest and disease control
- Develop a knowledge database of control method based on the types and severity of crop pest and disease
- A public information web access and a website developed to publicise the pest and disease information
- 使用人工智能視頻分析系統來收集和辨識農作物蟲害及疾病的影像
- 建立管理農地、農作物及偵察活動的系統
- 開發手機應用程式為農民實現更精確的蟲害及疾病防治方法。此應用程式利用先進的演算法，識別農作物受損害的情況，分析相關的原因，並提供有效的控制措施
- 建立根據農作物蟲害及疾病的類型和嚴重程度以提供防治方法的知識庫
- 開設網上公共資訊網絡及平台以發放蟲害及疾病的資訊

Key Impact 主要成效

A customised AI app that identifies crop damage and correlates it to specific causes
這個客製化人工智能應用程能識別農作物受損害的情況及分析相關原因

- This is the first time of using artificial intelligence technology in crop cultivation in Hong Kong.
- Integrated and easily accessible knowledge database for farmers.
- Collecting and managing field scouting data by using mobile app.
- 香港首次將人工智能技術應用於農作物種植
- 為農民提供全面及易於存取的知識庫
- 利用手機應用程式收集和管理農田偵察的數據

Award 獎項

Bronze Medal in the 49th International Exhibition of Inventions Geneva in 2024
Gold Medal at the 4th Asia Exhibition of Innovations and Inventions Hong Kong in 2024
2024年第49屆日內瓦國際發明展銅獎
2024年第4屆亞洲創新發明展覽會 — 香港 金獎

Research Completion
2025

Applications

- Hong Kong local farmers and farmer associations
- GBA farmers and the related organisations

Commercialisation opportunities

- Technology licensing

完成研究年份
2025

應用範疇

- 香港本地農民及農民協會
- 大灣區農民及相關組織

商品化機會

- 技術授權許可

Digital Twin-based ESG Platform for Property and Facility Management Industries

基於機械人定位和時空分析以及數字孿生技術的ESG平台

Overview 簡介

In collaboration with The Hong Kong University of Science and Technology, LSCM developed the digital twin-based robot-assisted surveillance platform, combining Building Information Modeling (BIM), Internet of Things (IoT), robotics and AI technologies to enhance environmental, social and governance (ESG) reporting, as well as the environmental management capabilities of the real estate sector.

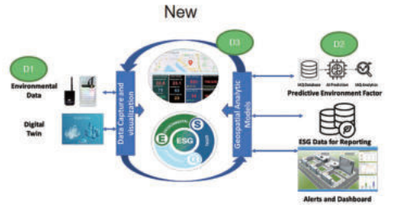
LSCM與香港科技大學合作，研發一個以數字孿生技術為基礎的機械人輔助監控平台，結合建築信息模擬(BIM)、物聯網(IoT)、機械人及人工智能(AI)等技術，有助房地產行業優化其環境、社會及企業管治(ESG)報告，同時加強環境管理能力。

Problem addressed 解決方案

There are increasing concerns about indoor air quality (IAQ) from the occupants of the buildings. However, the industry lacks the manpower and expertise to conduct regular on-site inspections and monitor the IAQ. Delayed data collection, inconsistent records and inadequate path planning capability of the robots in the market cannot meet the high demands for constantly conducting IAQ monitoring. Moreover, there is insufficient data analysis capability for decision making in building control and a lack of analytics for ESG management in the industry.

普羅大眾對室內空氣質素(IAQ)日益關注。然而，業界缺乏人力和專業知識進行定期現場檢查和監測。現時的數據收集有延遲、記錄不一致的問題，而機械人的路徑規劃能力也難以滿足持續進行IAQ監測的高需求。而且在建築管制中，業界缺乏足夠的數據分析能力以進行決策，同時也缺乏以分析為基礎的ESG管理。

Innovation 創新技術



Digital Twin-based ESG Platform for Property and Facility Management Industries
基於機械人定位和時空分析以及
數字孿生技術的ESG平台

- Data fusion on digital twin for ESG reporting
- IoT data capturing and integration for IAQ monitoring
- Point-of-Interest analytics for facility management with alert system
- Robotics location data capturing for AI-based spatial-temporal analysis
- Holistic robot path planning
- 在ESG報告中將數據實時反饋在數字孿生
- 應用於IAQ監測的物聯網數據收集和整合
- 為設施管理提供關鍵位置分析及警報系統
- 基於機械人定位的人工智能時空分析
- 全面機械人路徑規劃

Key Impact 主要成效

- Provide insights on how to improve building control in compliance with international standards.
- Support facility and property managers to improve ESG performance in terms of air quality, as well as occupants' level of satisfaction and health.
- Increase IAQ coverage to meet the high on-site inspection and IAQ monitoring demand in high-density public places; facilitating digital twin-based integration and dynamic display of data.
- ESG platform will improve building operation efficiency and coordination, and therefore enable cost savings in facility management.
- Instil confidence in the building industry to adopt digital twins and robotics to improve IAQ and ESG performance. This also reduces the manpower requirement for facility management for sustainability and improves the quality of living.
- With novel robot localisation, digital twin integration, and AI-based spatial-temporal analytics technologies, it delivers comprehensive monitoring and analysis capabilities.
- Enable the property and facility management industries to effectively manage their environmental impact.
- Optimise resource utilisation and enable data-driven decisions, assisting the industry in implementing sustainable and efficient management practices.
- 為如何符合國際標準及改善設施管理流程提供資訊。
- 支援設施和物業管理人員改善ESG表現，包括空氣質素、住客滿意度和健康。
- 增加室內空氣質量(IAQ)的覆蓋範圍，以滿足高密度公共場所的現場檢查和IAQ監測需求；促進基於數字孿生的數據整合和動態展示。
- ESG平台將提高建築營運效率和協調性，從而在設施管理方面節約成本。
- 增強建築行業對於應用數字孿生和機械人技術以提升室內空氣質量和ESG表現的信心。同時，這也減少對可持續性設施管理的人力需求，提升生活品質。
- 平台透過嶄新的機械人定位、數字孿生整合，以及基於人工智能的時空數據分析等技術，提供全面的監控及分析功能。
- 讓物業及設施管理行業能有效地管理其對環境的影響。
- 優化資源運用，有助於根據數據而進行決策，協助房地產及其他行業進行可持續及高效管理。

Award 獎項

Silver Medal in the 49th International Exhibition of Inventions Geneva in 2024

Outstanding ESG Platform for Property & Facility Management Industries in Smart Living Partnership Awards in 2023/24

2024年第49屆日內瓦國際發明展銀獎

2023/24智慧生活夥伴大獎 — 傑出物業和設施管理ESG平台

Research Completion
2025

Applications
- Property and Facility Management

Commercialisation opportunities
- Technology licensing

完成研究年份
2025

應用範疇
- 物業和設施管理

商品化機會
- 技術授權許可

Intrusion Detected Continuous Re-authentication (IDCRA) Technology

入侵偵測及持續重新認證 (IDCRA) 技術

Overview 簡介

LSCM developed the Hong Kong Cross-boundary Public Services self-service kiosks in collaboration with the Efficiency Office, supporting the initiative of the HKSAR Government and Guangdong Provincial Government to promote the Cross-boundary Public Services.

LSCM與效率促進辦公室合作研發了「跨境通辦」自助服務機，支援特區政府與廣東省政府積極推動的「跨境通辦」政務服務。

Problem addressed 解決方案

This Intrusion Detected Continuous Re-authentication (IDCRA) technology aims to address the problem of active users leaving self-service machines without logging out. In such cases, there might be data breach issues, session hijacking risks, and potential scams set up by experienced hackers, putting users' sensitive data at risk. Relying on session timeout alone cannot solve the problem, as excessively short timeouts may result in users being frequently logged out, which is inconvenient and will affect the user experience.

這項入侵偵測及持續重新認證 (IDCRA) 技術旨在解決當使用者離開自助服務機時尚未進行系統登出的問題。在這種情況下，有機會導致私人資料外洩及黑客入侵等問題，而富經驗的黑客或會設下網絡騙局，盜取使用者的敏感訊息。僅靠系統閒置時而自動登出的方法未能解決問題，而過短的閒置時間限制又可能導致使用者經常被登出，因而引起不便及影響使用者的用戶體驗。

Innovation 創新技術

- The IDCRA technology is an innovative and robust solution designed to enhance the security and privacy of self-service machines.
- By accounting for potential intrusions by non-human objects, avoiding traditional face verification methods, accommodating changes in face position, and processing multiple faces simultaneously, the IDCRA technology captures the essential data of the active human user and processes it within the IDCRA engine.
- Based on the above information, the IDCRA engine determines whether the user is authenticated or not detected. If the user is not detected within the countdown time, the system will automatically log out.
- The IDCRA technology ensures continuous and accurate authentication of active users in various situations and environments.
- IDCRA是一項創新且穩健的技術，旨在提升自助服務機的安全性和私隱保安。
- IDCRA技術透過辨識非人類用戶入侵、避免使用傳統的人臉辨識方法、適應人臉位置的變化，以及同時處理多個人臉，以獲取當前使用者的數據，並在IDCRA引擎內進行處理。
- 根據以上的訊息，IDCRA引擎會判斷使用者是否通過驗證或未能被偵測。若在倒數計時的時間內未能偵測到使用者，系統將會自動登出。
- IDCRA技術能確保在各種情況及環境下對使用者進行持續且準確的認證。

Key Impact 主要成效

Intrusion Detected Continuous Re-authentication (IDCRA) Technology
入侵偵測及持續重新認證 (IDCRA) 技術

- The Intrusion Detected Continuous Re-authentication technology can achieve the accuracy of 99% or above in recognising the presence of active user under normal environment and usage.
- 入侵偵測及持續重新認證技術於正常環境及使用情況下可達至99%或以上的準確度，以識別正在使用自助服務機的使用者。

Award 獎項

Bronze Medal in the 49th International Exhibition of Inventions Geneva in 2024
Silver Medal at the 4th Asia Exhibition of Innovations and Inventions Hong Kong in 2024
2024年第49屆日內瓦國際發明展銅獎
2024年第4屆亞洲創新發明展覽會 — 香港 銀獎

Research Completion
2025

Applications
- Self-service kiosk providers

Commercialisation opportunities
- Technology licensing

完成研究年份
2025

應用範疇
- 自助服務機供應商

商品化機會
- 技術授權許可

Video Analytics Based Detection of Defective Underground Stormwater Drains

應用視頻分析技術以檢測地下雨水渠異常情況

Overview 簡介

This is an automatic means based on unsupervised machine learning, neural network computing, and computer vision techniques to analyse video content filmed inside underground stormwater drains to help find out any structural and functional related anomalies.

LSCM研發了基於非監督式機械學習、神經網絡計算和電腦視覺技術的自動化方法來分析於地下雨水渠內拍攝的影片內容，有助找出與雨水渠結構和功能相關的異常情況。

Problem addressed 解決方案

To ensure slope safety and prevent landslides is important for the densely populated hillside areas in Hong Kong. This system adopted the use of deep learning methods to vectorise video imagery of underground stormwater drains for further cluster analysis. The resulting image clusters will then be visualised for identifying which groups have damage-related issues and then compute the severity of the defective drains to determine the priority of remedial works.

對於人口稠密的香港山坡地區，維護斜坡安全以防止山泥傾瀉是非常重要的。此系統運用深度學習方法，把地下雨水渠之視頻圖像進行向量化處理，以便進一步的聚類分析。系統將產生出來的圖像群組可視化，以識別具有損壞問題的組別，隨後通過電腦計算確認雨水渠損壞的嚴重程度，以制定維修工作的優先次序。

Innovation 創新技術

- Use deep learning methods to extract image features for vectorising video imagery of underground stormwater drains
- Cluster all vectorised images into various groups
- Visualise resulting clusters to identify which groups have damage-related issues
- Compute the severity of the defective drains to determine the priority of remedial works
- 使用深度學習方法擷取影像特徵，對地下雨水渠之視頻影像進行向量化處理
- 將所有向量化圖像分為不同的組別
- 將產生出來的圖像群組可視化，以識別具有相關損壞問題的組別
- 透過電腦計算確認雨水渠損壞的嚴重程度，以制定維修工作的優先次序

Key Impact 主要成效

Video Analytics Based Detection of Defective Underground Stormwater Drains
應用視頻分析技術以檢測地下雨水渠異常情況

- This video analytics technology and application for recognising damages, defects, and general anomalies inside underground stormwater drains enable a systematic, consistent, and reliable means to ensure the massively constructed stormwater drainage infrastructure under slopes is in a well maintained condition.
- Reduce the chance of landslide caused by frequent heavy rainfall in Hong Kong.
- 此視頻分析技術能夠識別地下雨水渠內的損壞、缺陷和一般異常情況，從而提供系統化、統一且可靠的方法，以確保斜坡下大規模建造的雨水排水基礎設施處於良好的狀態。
- 減少因頻密性暴雨而引發山泥傾瀉的機會。

Research Completion
2024

Applications
- Underground Stormwater Drains Survey and Management

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 地下雨水渠檢查與管理

商品化機會
- 技術授權許可

AIS Vessel Trajectory Analysis for Illegal Fishing

應用於打擊非法捕魚的AIS船舶軌跡分析

Overview 簡介

LSCM has developed an automated and intelligent approach tailored for Hong Kong that can effectively detect fishing activities, thereby assisting the marine authorities in combating illegal fishing in Hong Kong.

LSCM研發了專為香港而設的自動化及智能化方案，能有效偵測漁業活動，從而協助海事相關部門打擊非法捕魚活動。

Problem addressed 解決方案

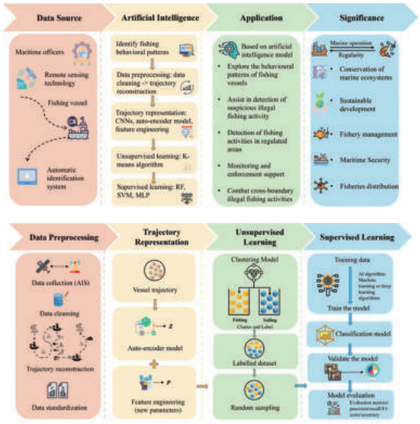
Illegal fishing would severely affect fisheries resources and marine ecosystems within Hong Kong waters. Hence, effectively monitoring and detecting fishing vessel activity are some of the crucial measures to tackle the problem of illegal fishing.

非法捕魚會嚴重影響香港水域內的漁業資源和海洋生態系統，所以有效地監控和偵測漁船活動是解決非法捕魚問題之關鍵措施。

Innovation 創新技術

- A mobility pattern extraction algorithm based on convolutional auto-encoder networks to extract the hidden representation of vessel trajectory
- Identify the vessels that may involve in suspicious fishing activities based on Automatic Identification System (AIS) data
- Provide intelligence for efficient patrol planning
- 以基於卷積自動編碼器網絡的移動模式數據擷取演算法，擷取隱藏的船舶軌跡數據
- 應用AIS船舶軌跡分析，有助辨識可能涉及非法捕魚活動的可疑船舶
- 提供資訊以制定高效的巡邏計劃

Key Impact 主要成效



AIS Vessel Trajectory Analysis for Illegal Fishing
應用於打擊非法捕魚的AIS 船舶軌跡分析

- Combine AI technologies to develop a machine learning based classification tool that fits the Hong Kong environment.
- Perform more efficient and effective detection of suspicious illegal fishing.
- Develop suspicious vessel's illegal fishing trajectory in Hong Kong.
- 結合人工智能技術，開發適合香港環境應用的基於機械學習之分類工具。
- 提升監測可疑非法捕魚活動的效率。
- 建立可疑非法捕魚的船舶軌跡。

Research Completion
2024

Applications
- Environment protection

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 環境保護

商品化機會
- 技術授權許可

3D Visualisation System with Sensor Data for Sustainable Project Development

應用基於傳感器數據的3D可視化技術以促進發展項目的可持續性

Overview 簡介

The project applies a series of sensors and an integrated 3D system to collect environmental data, including air quality, water conditions, and construction waste. It enables the real-time tracking and analysis of pollution levels in a development area.

此項目應用一系列傳感器及一體化3D系統，實時收集空氣質量，水質狀況及建築廢料等環境數據，實時追蹤及分析發展區的污染水平。

Problem addressed 解決方案

The Environmental Protection Department (EPD) has deployed an integrated 3D visualisation system in the Lok Ma Chau Loop as a trial site for this project.

This system assists the EPD in preparing the Environmental Impact Assessment Report (EIA). This report assesses the environmental and social impacts to recommend mitigation strategies, and establish comprehensive management and monitoring protocols to minimise potential adverse impact on the environment throughout the project development cycle.

環境保護署 (環保署) 已於落馬洲河套區安裝了此一體化3D可視化系統，作為此項目的試點。

此系統可協助環保署編製《環境影響評估報告》，該報告評估發展項目對環境與社會造成的影響，以提出針對性的緩減措施，並制定全面的管理及監察守則，從而在項目進行期間有效地減低對環境的潛在影響。

Innovation 創新技術

3D Visualisation System with Sensor Data
傳感器數據整合3D可視化平台

- A Real-Time Monitoring Data Platform to provide API integration for overlaying environmental data on a 3D Map interface.
  - IoT sensors for water, air, and noise monitoring, designed for reliable and long-term environmental analysis.
  - Video Analytics modules for multi-variable detection, including AI-powered analysis of water colour monitoring at river inlet pipes and construction waste identification and tracking.
- Smart IoT devices that turn the analog utility meter's data into Digital Data.
- Unsupervised auxiliary algorithms for network-invariant fake image detection.
- 利用實時監察數據平台的應用程式介面(API)，以便在3D地圖界面上展示環境數據。
  - 應用物聯網傳感器監測水質、空氣及噪音，可以長期提供可靠的環境分析。
  - 智能視頻分析組件可支援多樣化的檢測要求，包括應用AI分析及監測河渠入水口的水質顏色及識別和追蹤建築廢料。
- 透過智能物聯網裝置，能夠把模擬公用儀表的數據數碼化。
- 利用無監督輔助式演算法，可偵測網絡不變的偽造圖像。

Key Impact 主要成效

- The system enables efficient and effective environmental monitoring and auditing.
- Enhance the capacity to assess both short-and long-term impacts on the environment, with comprehensive tracking of current and historical data
- With the real-time data availability, the EPD can make timely decisions and take immediate action, enabling more effective handling of public complaints
- Minimise adverse environmental impact by the real-time monitoring of environmental data
- 此系統實現了高效和精準的環境監測和審核。
- 結合實時與歷史數據的全面追蹤功能，提升評估發展項目對環境的長期和短期影響的能力。
- 環保署利用實時數據，可及時制定決策並迅速採取行動，從而更高效地處理公眾的投訴。
- 透過實時監測環境數據，大大減低發展項目對環境造成的負面影響。

Award 獎項

Silver Medal in the 50th International Exhibition of Inventions Geneva in 2025

2025年第50屆日內瓦國際發明展銀獎

Research Completion
2024

Applications
- Environmental monitoring
- Smart City application

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 環境監測
- 智慧城市應用

商品化機會
- 技術授權許可

Smart IoT Module for Portable Rapid Diagnostic Platform

智能物聯網模組應用於輕型快速診斷平台

Overview 簡介

Partnered with Sanwa Biotech Limited (Sanwa), LSCM has developed a project to design IoT capability for enabling Sanwa's proprietary medical rapid diagnostic device-ALiAs, to automatically report diagnostic results from different geographic locations. The collected diagnostic data will then facilitate the real-time monitoring of any outbreak of diseases.

LSCM與三和生物科技有限公司(「三和」)合作，開展合作研究項目，旨在設計物聯網能力，讓三和開發的醫療快速診斷設備—ALiA能夠自動匯報來自不同地理位置的診斷結果；而收集到的診斷數據將有助於實時監測任何疾病的爆發。

Problem addressed 解決方案

Smart IoT Module for Facilitating Vast Deployment of Portable Rapid Diagnostic Platform
智能物聯網模組輕型快速診斷平台

The COVID-19 pandemic outbreak has had a critical impact on different industries and brought about significant changes to the society. Time-critical and life-threatening diseases and outbreaks require impending changes from conventional clinical diagnostic and academic R&D for bio-discoveries.

新型冠狀病毒肺炎爆發為各行各業帶來沉重打擊，也為社會帶來了重大變化。為應對威脅生命的疾病和疫情的爆發，傳統的臨床診斷和生物發現學術研究有著逼切改變的需要。

Innovation 創新技術

- The IoT-enabled rapid medical diagnostic platform device is part of the healthcare infrastructure to strengthen the ability to collect relevant information (diagnostic results) for determining whether any outbreak has happened in a particular time and place.
- A wireless communication device (with backup battery) and a powered medical diagnostic device can be independently developed and certified with the latest wireless communication technologies and diagnostic biotechnologies, respectively. This helps reduce the production complexity and align with United Nations' Sustainable Development Goals for ensuring sustainable consumption and production patterns.
- 支援物聯網的快速醫療診斷平台設備是醫療基礎設施的一部分，用於提升收集相關訊息(診斷結果)的能力，以評估在特定時間和地點內是否有任何疫情爆發的危機。
- 可運用最新的無線通訊技術和診斷生物技術，分別獨立開發和認證無線通訊設備(備有備用電池)和供電醫療診斷設備。這有助於降低生產時的複雜性，並符合聯合國確保可持續消費和生產模式的可持續發展目標。

Key Impact 主要成效

- The pluggable design and usage of a communication module to a medical device can help demonstrate the usage of separate IoT module to enable more electronic devices and equipment to be part of the IoT.
- The health statuses of medical or other electronic equipment can be automatically monitored so that device downtown time can be reduced or even prevented. Thus, the quality of services provided by corresponding devices can be maintained in expected level.
- The pluggable design allows personnel with different skill sets, knowledge, and expertise to work independently on different functional modules. Thus, junior engineers with less skill sets may have the opportunities to participate in the engineering work.
- 可插拔式醫療設備和通訊模組的使用，有助展示物聯網模組分開使用的狀態，讓更多電子儀器和設備成為物聯網的一部份。
- 可以自動監控醫療或其他電子設備的健康狀態，從而減少甚至防止設備停機時間。因此，相應設備的服務質量可以維持在預期的水平內。
- 可插拔式設計讓擁有不同技術、知識和專長的人員可獨立地參與各功能模組工作，使資歷較淺的工程師也能參與工程工作。

Research Completion
2022

Applications

- Develop IoT-capability for electronic devices, medical devices, and machinery equipment items

完成研究年份
2022

應用範疇

- 為電子設備、醫療設備和機械設備項目開發物聯網功能

Outdoor IoT Sensing Network and Data Management Platform for Tree Management

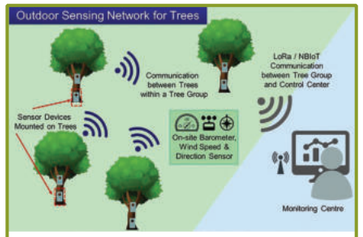
應用於樹木管理的物聯網戶外傳感器及資料管理平台

Overview 簡介

This project aims to improve the tree management effort by developing a systematic and continuous mechanism to monitor the stability of trees under different weather conditions to facilitate prompt actions when alerts are raised.

LSCM建立了一個有系統和持續的機制，從而監控樹木在各種天氣下的穩定性，並可發出警報，通知相關人員迅速採取行動，以改善樹木管理工作。

Problem addressed 解決方案



Outdoor IoT Sensing Network and Data Management Platform for Site-specific Tree Management
應用於特定地點樹木管理的物聯網戶外傳感器及資料管理平台

Adverse weather conditions may lead to the collapse of trees which will be dangerous to the public. The system provides statistics of collapsed trees to enable the relevant departments to optimise the disposal work to minimise the traffic disruption and improve public safety.

惡劣天氣會使樹木倒塌，造成危險。此系統於颱風後自動統計已倒塌的樹木數量，提供數據予相關人員規劃樹木的清理工作，以減低對道路的阻塞及提升公眾安全。

Innovation 創新技術

- Trials are conducted at various sites, collect information about the trees within individual sites and send the data to the monitoring centre.
- During the trial, each tree will be attached with two sensors to determine the direction and tilt angle when the tree is weakened.
- The monitoring system with visualisation software will analyse the data based on AI algorithms for identifying patterns of tree failures and abnormal tree stability conditions, to notify GLTMS and tree management agents of any signs of adverse movement of trees under different weather conditions.
- 在不同地點進行試用，收集樹木的資料，並把數據傳送到監控中心。
- 進行測試時，每棵樹都會安裝兩個傳感器，以確定開始枯壞的樹木的傾斜方向和角度。
- 備有可視化軟件的監控系統將基於人工智能演算法分析數據，識別樹木的問題和樹木穩定性相關的異常情況，將樹木在各種天氣下的任何異常跡象通知GLTMS和樹木管理代理。

Key Impact 主要成效

- Provide 24/7 real-time monitoring system for all the trees concerned under various weather conditions.
- Site-specific data helps identify problematic trees so that preventive works can be done.
- Impacts of different temperature, rainfall and wind speeds can be observed.
- 提供24/7全天候實時監控系統，在各種天氣下對所有相關樹木進行監測。
- 特定地點的數據有助於識別有問題的樹木，以便進行有關預防工作。
- 可以觀察不同溫度、降雨量和風速帶來的影響。

Research Completion
2022

Applications
- Tree Monitoring and Management for housing estates, public and private facilities

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 屋苑、公共或私人設施的樹木監測和管理

商品化機會
- 技術授權許可

Automated Hill Fire Surveillance System

自動山火監控系統

Overview 簡介

This project deploys artificial intelligence (AI) and video analytics technologies for wildfire detection in the country parks of Hong Kong. This unique fusion of the methodologies has been deployed in one of the fire lookout facilities in Hong Kong.

本項目結合了人工智能(AI)和影像分析技術，在郊野公園自動偵測山火。此技術已於本港的一個山火瞭望台設施中應用。

Problem addressed 解決方案

Automated Hill Fire Surveillance System
自動山火監控系統

Wildfires in Hong Kong are mostly caused by human activities. Although the Agriculture, Fisheries and Conservation Department (AFCD) has adopted a detection system to provide early alerts, the existing system sometimes generates false alarms and reports the location of fires wrongly, mostly caused by other heat sources and sunlight reflection.

香港的山火大多涉及人為疏忽因素。雖然漁農自然護理署(漁護署)已採用偵測系統以及早發出警報，但現有的系統有時會因偵測到其他熱源和陽光反射而誤報或誤判山火的位置。

Innovation 創新技術

- Using video analytics and artificial intelligence (AI) algorithms to identify different heat sources and enhance the accuracy of location positioning.
- The inaccuracy of location information can be effectively reduced by constantly monitoring the relative position of the camera on the base and using landmarks identified by the artificial intelligence (AI) detector.
- 應用影像分析和人工智能(AI)演算法來識別不同的熱源，並提高位置定位的準確性。
- 透過放置持續監控攝像鏡頭於底座的相對位置，和利用人工智能(AI)檢測器所識別的地標，可以有效減低位置訊息的不準確性。

Key Impact 主要成效

- By reducing false alarms, such as those caused by sunlight reflection and engine heat, manpower for verifying the validity of alarms can be saved.
- These technologies improved the accuracy of the existing monitoring system.
- 通過減少誤報(例如由陽光反射和加熱發動機而產生的熱量所引起的誤報)，可以節省用來驗證警報之真確性的人力資源。
- 這些技術提高了現有監測系統的準確性。

Award 獎項

Bronze Medal in the 48th International Exhibition of Inventions Geneva in 2023

Gold with Congratulations of Jury Award & Chinese Association of Inventions (CAI) Award in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023

Outstanding AI Hill Fire Detection System in Smart Living Partnership Awards 2022

2023年第48屆日內瓦國際發明展銅獎

2023年第3屆亞洲創新發明展覽會 — 香港 評審團嘉許金獎及中國發明協會大獎

2022智慧生活夥伴大獎 — 傑出人工智能山火檢測系統

Research Completion
2021

Applications
- Hill fire surveillance

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 山火監控

商品化機會
- 技術授權許可

Smart Barrier System

智能泥石壩系統

Overview 簡介

The Smart Barrier System developed by LSCM enables the real-time monitoring of falling debris and build-up, and uses a web platform and a mobile app to issue alerts to the authority. This low-cost, reliable, low-power-consumption system ensures the real-time detection of landslide impact on the barriers.

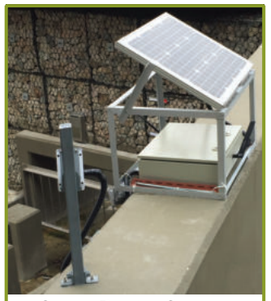
LSCM研發的智能泥石霸系統實時監控掉落的泥石碎片及堆積情況，並利用網絡平台及流動應用程式向有關當局發出警報。這個低成本、可靠及低功耗的監察系統可實時偵測山泥傾瀉發生的風險。

Problem addressed 解決方案

To improve public safety against landslides, this system adopted internet-of-things sensor technologies to detect the impact of landslide debris on the barriers in real time and issue instant alerts to the authority for follow-up actions.

為了減低山泥傾瀉對公眾安全造成的風險，此項目利用物聯網傳感器技術，實時檢測山泥傾瀉防護屏障是否遭到山泥撞擊，並即時通知相關部門跟進。

Innovation 創新技術



Smart Barrier System
智能泥石壩系統

- An instant camera system with infrared light has been developed to provide images and instantly transmit them to the related departments for follow-ups.
- An on-site Warning Message System (WMS) helps deliver the landslide warning messages by using the technique of Moving Message Display and the structure of the system is strengthened to withstand the external load brought by extreme weather.
- 系統應用備有紅外線的相機，提供實時圖像，以便立即傳送給相關部門作出跟進。
- 系統使用流動訊息顯示技術於最接近山坡的位置發出「警告」的訊息，並加強系統的結構穩固，以承受極端天氣帶來的損壞。

Key Impact 主要成效

- The system enhances the effectiveness of the remote barriers built by the Civil Engineering and Development Department (CEDD) of the HKSAR Government throughout the years.
- The system helps to remind the public not to stay too close to the high-risk areas during adverse weather, which can mitigate the risk of landslide hazards in natural terrains.
- 系統協助政府土木工程拓展署提高多年來於偏遠地區建立的山泥傾瀉防護屏障的效能。
- 系統有助於提醒公眾在惡劣天氣下避免逗留在有機會發生山泥傾瀉的地方，從而減輕因天然山坡山泥傾瀉帶來災害的風險。

Award 獎項

Silver Medal at the 47th International Exhibition of Inventions Geneva in 2019

2019年第47屆日內瓦國際發明展銀獎

Research Completion
2020

Applications
- Landslide detection

Patent Applications
- HK 3202 1024 847.7

Commercialisation opportunities
- Technology licensing

完成研究年份
2020

應用範疇
- 偵測山泥傾瀉

專利申請
- HK 3202 1024 847.7

商品化機會
- 技術授權許可

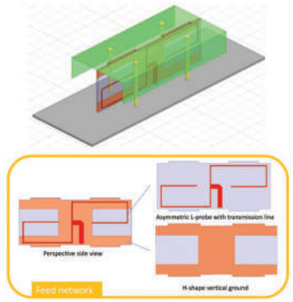
RFID Reader Antenna

無線射頻識別集成閱讀器天線

Overview 簡介

This project aims to design a compact and high-performance UHF RFID antenna for integrated reader.
此項目旨在設計小巧且高性能的無線射頻識別(UHF RFID)閱讀器天線。

Problem addressed 解決方案



RFID Reader Antenna
無線射頻識別閱讀器天線

Most UHF RFID integrated reader is huge in size due to its large antenna for long read range. LSCM designed the unidirectional radiation, long reading distance and compact-sized UHF RFID reader antenna so that the size of the integrated UHF RFID reader can be significantly reduced.

大多數UHF RFID集成閱讀器的尺寸都很大，因為要達到長讀取距離需要備有較大的天線。LSCM設計了單向輻射、長讀取距離和尺寸小巧的UHF RFID閱讀器天線，令UHF RFID集成閱讀器的體積可以顯著減小。

Innovation 創新技術

- Long read range and unidirectional radiation
- Yagi antenna with radiator
- Compact RF combiner embedded with radiator
- Circular polarised to read the tag in any direction
- 長的讀取距離和單向輻射
- 具微波輻射器的八木天線
- 內置微波輻射器的小型射頻合路器
- 圓極化可在任何方向讀取標籤

Key Impact 主要成效

- Compact integrated UHF RFID reader size
- Enhance reading distance
- Access UHF RFID tag in any orientations
- 小巧的集成UHF RFID閱讀器
- 提高閱讀距離
- 能在任何方向讀取UHF RFID標籤

Research Completion
2020

Applications
- Retailing
- Inventory management
- Positioning

Commercialisation opportunities
- Technology licensing

完成研究年份
2020

應用範疇
- 零售業
- 庫存管理
- 定位

商品化機會
- 技術授權許可

RFID Asset Management System

無線射頻識別物資管理系統

Overview 簡介

RFID Asset Management System is designed to transform traditional stock-taking workflow from paper-based to digitally automated. It shortens project completion time from months to days. The system involves a few simple steps which consist of tagging, scanning, matching and reporting.

無線射頻識別(RFID)物資管理系統旨在改變傳統的盤點工作流程。這些工作一般涉及大量文書處理，並需時數月。這系統有助將盤點時間縮短至數天，並只需簡單的步驟：編制標籤、掃描、配對和報告。

Problem addressed 解決方案

The RFID trolley is self-contained, Wi-Fi-enabled and highly mobile. It runs on rechargeable battery that can last up to a few hours after charging once, and it detects the RFID tags on the items with the large antennas attached on the trolley.

無線射頻識別物資管理閱讀器設備齊全，能支援Wi-Fi並易於移動。供電來源為充電電池，一次充電便可持續使用數小時。它備有大型天線，能有效及準確讀取在物資上的無線射頻識別標籤。

Innovation 創新技術

RFID Asset Management System
無線射頻識別物資管理系統

- Compared with the traditional 2D barcode-based system, RFID technology streamlines asset registration process and enables asset scanning to recording within minutes.
- It allows the stock-taking workflow to be done by batch instead of identifying and recording the items one by one manually.
- With the click of a button, the scanning process can locate the items and identify missing ones with ease.
- 相比傳統的條碼系統，無線射頻識別技術簡化了物資登記的流程，令操作、掃描以至記錄物資的流程更加快捷方便。
- 系統可以將物品整批地進行紀錄，不需依賴人手為每件物件逐個記錄。
- 只需輕按一鍵，便能輕鬆快捷地掃描及尋找指定的物資，並找出遺失了的物品。

Key Impact 主要成效

- Enhance the efficiency and accuracy of identifying items
- Replace the existing paper-based inventory management system
- 提升識別物品的效率和準確性
- 取替現有的人手庫存管理系統

Research Completion
2018

Applications
- Inventory tracking and management

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 庫存追蹤和管理

商品化機會
- 技術授權許可

Ultra-Wideband Package Scanner

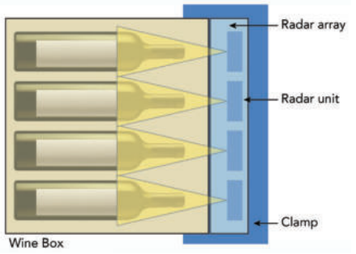
超寬頻包裝掃瞄器

Overview 簡介

Ultra-wideband (UWB) radar technology has been utilised to develop a non-destructive low-cost object scanner. By correlating changes of different radar output waveforms, it is able to identify non-standard scanned objects for screening purposes.

本項目應用超寬帶雷達技術，研發非破壞性及低成本的掃描器。透過不同雷達接收到的數據，篩選出不合乎標準的物件。

Problem addressed 解決方案



UWB Package Scanner for Inventory Management
應用於庫存管理的超寬帶包裝掃瞄器

It is common for small/medium-sized local factories and warehouses to perform goods packaging manually. They will carry out quality control, such as weighing the product packages and comparing them with the well-packed counterparts to identify potentially mis-packed goods. Weighing method may identify missing parts but it is notable to detect the wrong parts of the same weight as the correct ones. Therefore, a non-destructive object scanner is developed. It correlates changes of different radar output waveforms to identify non-standard scanned objects for screening purposes.

本地中小型工廠和倉庫通常以人手進行貨物包裝。他們進行質量監控時，例如量度產品的包裝，並將它跟包裝良好的另一件貨物進行比較，以識別有潛在問題的包裝。量度方法可以識別有缺失的部件，但無法檢測到與正確零件重量相同的錯誤部份。而這種非破壞性物件掃描儀器能把不同雷達輸出的波形變化作出關聯，以識別非標準的物件並作出篩選。

Innovation 創新技術

A portable and non-invasive scanner which uses UWB and RF technologies

- Utilising time-of-flight and waveform data to analyse inner conditions of an object
- Digital signal processing to compare and correlate changes of radar output waveforms
- Identifying non-standard scanned objects for screening purposes

使用UWB和RF技術的便攜式非入侵式掃描儀器

- 利用飛行時間和波形數據分析物體的內部狀況
- 用於比較和關聯雷達輸出的波形變化的數字訊號
- 識別非標準物件並作出篩選

Key Impact 主要成效

- A low-cost non-destructive screening method
- Inventory control or quality assurance system without unpacking the items
- Effective workflow and increased productivity
- 一個低成本、非破壞性的篩選方法
- 無需打開物品包裝的庫存監控/質量保證系統
- 高效的工作流程和更高的生產力

Research Completion
2018

Applications
- Quality assurance
- Inventory control

Patent Applications
- US 16/234,737
- CN 2019 1017 1854.9
- HK 18116742.7
- US 16/295,110
- CN 2019 1024 1409.5
- HK 19120627.5

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 質量監控
- 庫存管理

專利申請
- US 16/234,737
- CN 2019 1017 1854.9
- HK 18116742.7
- US 16/295,110
- CN 2019 1024 1409.5
- HK 19120627.5

商品化機會
- 技術授權許可

Smart Drainage System

智能渠道管理系統

Overview 簡介

In collaboration with the Chinese University of Hong Kong, LSCM developed a flexible and effective underground to above ground sensing and wireless network for real-time collection of water level and hazardous gas information from drainage and sewage systems for the effective monitoring of water level changes and gas concentration changes within drainage and sewage manholes.

LSCM與香港中文大學攜手合作，建立一個靈活高效、從地下到地上的無線傳感網絡，採集城市及周邊地區的排水渠及排污渠內的水位訊息及有害氣體訊息，實現對城市雨水及污水排放系統的實時監控。

Problem addressed 解決方案

An Integrated Sensor Module and Ubiquitous Wireless Network for Smart Drainage System
結合無線傳感模組及網絡的智能渠道管理系統

The traditional way to monitor and collect data of drainage system is to assign workers to go inside a drainage. It required a lot of manpower and workers' health may be affected as there might be hazardous gas inside the drainage. This system can monitor and collect data remotely. It analyses collected data and past data to issue alert for potential risks.

傳統渠道監測工作需要工作人員親身到渠道內偵測數據，需要大量人力。渠道內的有害氣體，亦會影響健康。這系統將偵測器放置在渠道內，根據收集所得的實時數據和以往的數據作分析，對潛在危險發出預警。

Innovation 創新技術

- A unique sensing network for effectively collecting underground sensor data in an extremely severe environment
- Specially design antenna for underground to above ground communication
- An above ground mesh network is developed for backend system communication
- 獨特的傳感網絡，可在惡劣環境下，有效地收集地下渠道傳感器數據
- 適用於地下到地上通訊的特殊設計天線
- 開發了地上網狀網絡，應用於後端系統通訊

Key Impact 主要成效

- This project provides a very unique sensing network for effectively collecting underground sensor data in an extremely severe environment.
- With the cloud computing and storage technologies, the accumulated big data collected by sensor modules become valuable assets for future data mining.
- The wireless sensing network can largely reduce manpower costs and other costs related to routing inspections.
- 此項目提供一個非常獨特的傳感網絡，適用於在極其惡劣的環境下，有效地收集地下傳感器數據。
- 借助雲端計算和存儲技術，傳感器模組收集並累積的大數據將成為數據挖掘的寶貴資料。
- 無線傳感網絡可以大大降低人力成本和其他與路徑檢查相關的成本。

Award 獎項

Outstanding Smart Drainage System in Smart City Awards 2018
香港智慧城市大獎2018 — 傑出智能渠道管理系統

Research Completion
2018

Applications
- Drainage Management

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 渠道管理

商品化機會
- 技術授權許可

RFID Metal Tags

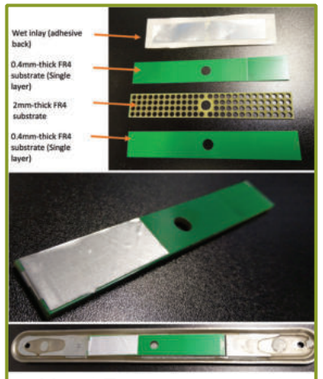
無線射頻識別金屬標籤

Overview 簡介

This project aims to design a high-performance UHF RFID tag on different material substrate. The research results show that RFID can be effectively used on cement and metal.

項目旨在設計可應用在不同材料基板上的高性能無線射頻識別標籤(UHF RFID)。研究結果顯示，RFID可以有效地應用於水泥和金屬上。

Problem addressed 解決方案

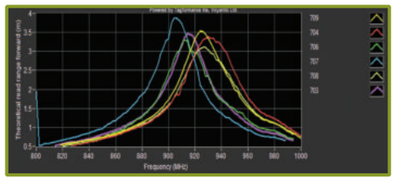


Metal Tag structure and embedded in guidance for the visually impaired
金屬標籤結構並嵌入到視障人士引導徑中

The read range of typical UHF RFID tag is significantly degraded on cement and metal. LSCM designed different UHF RFID inlay antennas which are compatible with different materials, like metal, soil, and plastic, etc. Additionally, LSCM has developed technologies for embedding RFID tags into product packages and make them adaptable to different environment, with high performance.

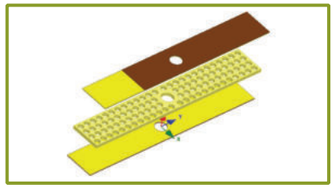
一般UHF RFID標籤的讀取範圍在使用在水泥和金屬時會嚴重下降。因此，LSCM設計了不同的UHF RFID嵌入式天線，能兼容不同的材料，如金屬、土壤和塑料等。此外，LSCM還開發了將RFID標籤嵌入產品包裝中的技術，使它能夠應用於不同的環境中，兼具高性能。

Innovation 創新技術



- Long read range on metal substrate by using directional reflector technology
- Thin and compact antenna
- Soft printed RFID antenna technology on different materials
- 透過使用定向反射器技術在金屬基板上達到更長的讀取範圍
- 纖薄小巧的天線
- 能在不同材料上印刷的RFID天線技術

Key Impact 主要成效



- Various UHF RFID tag antennas designed for metal, brick, soil and plastic, etc.
- UHF RFID tag antenna customisation
- 設計在金屬、磚塊、土壤和塑料等材料上的各種UHF RFID標籤天線
- 客制化的UHF RFID標籤天線

Research Completion
2017

Applications
- RFID embedded in floor tiles for guidance for the visually impaired
- Simultaneous localisation and mapping
- Construction material inventory management

Patent Applications
- US 16/493,827
- CN 2017 8009 0692.5
- HK 62020002532.3

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- UHF RFID嵌入視障人士引導徑地磚
- 實時定位和建圖
- 建築材料庫存管理

專利申請
- US 16/493,827
- CN 2017 8009 0692.5
- HK 62020002532.3

商品化機會
- 技術授權許可

Hong Kong GNSS Signal Quality Monitoring and Interference Detection System

GNSS訊號質量監測與干擾檢測系統

Overview 簡介

The Global Navigation Satellite System (GNSS) infrastructure in Hong Kong supports various positioning, navigation and timing applications. It has been widely adopted for high precision use across the region.

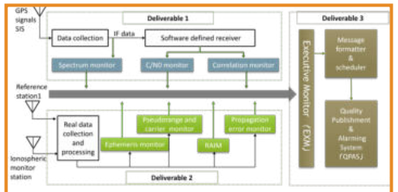
香港的全球GNSS基礎設施支援多項定位、導航和授時應用。此系統已在區內廣泛應用於需要高精準度的領域。

Problem addressed 解決方案

The current GNSS infrastructure is susceptible to frequent system failures and interference. These disruptions can lead to significant positioning errors and, in some cases, complete signal loss in receivers. Such impacts can severely affect critical applications, including civil aviation, communication networks, and power distribution systems.

現時的GNSS基礎設施容易受到頻繁的系統故障及訊號干擾的影響。這些中斷可能導致嚴重的定位偏差，甚至使接收器完全失去訊號，繼而對民航導航、 通訊網絡、 配電系統等關鍵基礎設施造成嚴重影響。

Innovation 創新技術



Hong Kong GNSS Signal Quality Monitoring and Interference Detection System
GNSS訊號質量監測與干擾檢測系統

- The system performs continuous GNSS quality monitoring with 99.9% fault detection accuracy. The monitor can detect pseudo range errors larger than 2m, and carrier phase errors larger than 10mm, as well as the ionosphere model error larger than 5m.
- The warning system provides real-time alerts when malfunctions occur, timely warning messages are published on websites within 10 seconds and it ensures that critical users receive alerts promptly via email and SMS.
- The system enables comprehensive detection and positioning of all GNSS signal interference sources. By integrating the direction finder with the range differences from GNSS receivers to locate the interference signals, it achieves an accuracy of 20 meters.
- 此系統可對GNSS訊號質量進行持續監測，並達致99.9%的故障檢測準確率。亦可檢測超過2米的偽距誤差、超過10毫米的載波相位誤差以及超過5米的電離層模型誤差。
- 警報系統能在發現異常時的10秒內透過網站發佈預警訊息，亦能通過電子郵件、短訊等方式確保重要用戶及時收到警報。
- 系統具備GNSS訊號干擾源的全方位偵測與定位功能，透過融合無線電測向儀與GNSS接收器的測距差分技術確定干擾源，達致20米的精準度。

Key Impact 主要成效

- Significantly enhances positioning service reliability for critical applications, including civil aviation, unmanned aerial vehicle (UAV) and communication networks
- 顯著提升重要應用範疇的定位服務之可靠性，包括民用航空、 無人機 (UAV) 及通訊網絡等。

Award 獎項

Gold Medal in the 49th International Exhibition of Inventions Geneva in 2024
2024年第49屆日內瓦國際發明展金獎

Research Completion
2024

Applications
- Smart city navigation

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 智慧城市導航

商品化機會
- 技術授權許可

Multi-Sensor Object Detection for Better Traffic Control

提升交通流量的智能區域交通控制系統

Overview 簡介

This project applies predictive traffic analytics in traffic signal control in road junctions to reduce delays and stops in order to enhance mobility, as well as improving efficiency and road safety.

此系統於路口交通訊號控制上利用預測性分析來減少車輛延誤及停留的時間，從而改善交通流量，以提升效率和道路安全。

Problem addressed 解決方案

The Transport Department has deployed various systems for traffic management. This real-time traffic signal control system can collect data for smooth deployment in the associated applications and systems.

運輸署在道路上配置了許多交通管理系統。而這個實時交通訊號管理系統能將收集到的數據適切地應用於相關的系統中。

Innovation 創新技術

Multi-Sensor Object Detection for Better Traffic Control
提升交通流量的智能區域交通控制系統

- A multi-sensor platform for traffic data collection.
- A traffic analytics platform based on Vissim, a microscopic multi-modal traffic flow simulation software.
- A real-time dynamic traffic control platform that adjusts signal timing based on traffic conditions.
- 多元感應平台收集交通數據。
- 以Vissim(仿真建模軟件)為基礎的交通分析平台。
- 實時交通動態管理平台，以交通狀況為基礎來調整交通訊號時間。

Key Impact 主要成效

- Enhance mobility by reducing delays and stops at road junctions.
- Minimise adverse environmental impact by reducing gas consumption.
- 減少車輛於路口延誤和停留的時間以提升交通流動性。
- 減少氣體排放以減低對環境的影響。

Award 獎項

Silver Medal in the 50th International Exhibition of Inventions Geneva in 2025
2025年第50屆日內瓦國際發明展銀獎

Research Completion
2023

Applications
- Traffic Management

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 交通管理

商品化機會
- 技術授權許可

Real-time Vehicle-actuated Traffic Signal System

應用於改善交通流量的車輛偵測及警報系統

Overview 簡介

In this project, LSCM develops a real-time vehicle-actuated traffic signal system that uses traffic flow data based on suitable detection technologies to derive the most suitable signal duration for better mobility.

在這個項目中，LSCM研發了一個實時偵測車輛的交通訊號系統，該系統應用合適的檢測技術，偵測交通流量數據來推算出最理想的訊號持續時間，以提升交通的流動性。

Problem addressed 解決方案

Roads in Hong Kong are usually busy and narrow. Traffic blockage may occur when two large vehicles encounter each other at the same time, resulting in traffic congestion. Although traffic data is collected from various data sources through the existing systems, they are seldom used for analysis for making intelligent decisions and actions for enhancing mobility efficiency.

香港的道路一般都是繁忙而狹窄的。當兩輛大型的車輛同時迎面相遇，往往會造成交通擠塞。儘管現有系統從各種數據源收集到交通數據，但這些數據很少用作分析以應用於智能決策和行動來提高出行效率。

Innovation 創新技術

Real-time Vehicle-actuated Traffic Signal System
應用於改善交通流量的車輛偵測及警報系統

- A narrow road segment can be configured from a single way two-lane to a one-lane two-way passage. The duration of green light and cycle times may vary according to the real-time traffic flow data at the road segment.
- When opposite and/or idle vehicles within the traffic control area are detected, alerts will be displayed on the electronic variable message signboards to warn the motorists well ahead of the time.
- A multi-sensor platform is used for predictive analytics and real-time junction traffic signal control.
- 由實時交通流量控制的交通訊號系統可以把狹窄的道路由單一的雙車道轉換為單車道雙向的配置。綠燈時間和循環時間的長度可以根據現場的實時交通流量作出改變。
- 系統在交通管制範圍內偵測到逆線行駛或違例停泊的車輛時，電子訊息顯示屏會發出提示，以提前通知駕駛者。
- 多傳感器平台用於預測分析和作實時路口交通訊號控制。

Key Impact 主要成效

- With this system, the commuting time will be reduced while the road safety will be enhanced. Hence, the social cost of traffic jams and accidents may be reduced.
- The deliverables of this project are in line with the Smart City Blueprint for Hong Kong to enhance Hong Kong's mobility.
- 此系統將減少通勤時間，並提高道路安全，亦有助減低因交通堵塞而造成的社會成本和減少交通意外。
- 本項目配合香港智慧城市發展藍圖， 為提升城市的交通流動性奠定基礎。

Award 獎項

Bronze Medal in the 48th International Exhibition of Inventions Geneva in 2023
Silver Award in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023
Outstanding Vehicles Detection and Alert System in Smart Living Partnership Awards 2022
2023年第48屆日內瓦國際發明展銅獎
2023年第3屆亞洲創新發明展覽會 — 香港 銀獎
2022智慧生活夥伴大獎 — 傑出車輛檢測及警報系統

Research Completion
2023

Applications
- Traffic Management

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 交通管理

商品化機會
- 技術授權許可

RFID Device (Two-piece Device for Tolling Application)

應用於道路收費系統之組合式無線射頻標籤

Overview 簡介

LSCM's UHF RFID Detachable Tag and Traffic Antenna Technologies have been adopted in the Government's new tolling system (HKeToll) to facilitate free-flow tolling for smart traffic management.

LSCM的超高頻無線射頻識別(UHF RFID)可拆卸標籤和交通天線技術已獲政府的新收費系統(易通行)採用，以配合智能交通管理的自動繳費安排。

Problem addressed 解決方案

Hong Kong is a densely populated city with scarce land resources. Owing to the limited road space, the Government can hardly resolve the traffic congestion problem solely by the continuous construction of roads to cope with the ever-increasing traffic demand.

香港是人口稠密的城市，土地資源稀缺。由於道路空間有限，單靠政府不斷興建道路以應付日益增加的交通需求難以解決交通擠塞的問題。

Innovation 創新技術

- The system adopts dedicated short-range communication (DSRC) as the core technology with in-vehicle unit (IVU) as low power RF application. The DSRC system is based on an interchange of information between roadside readers.
- The unique identity of the driver's tolling account is kept in the standalone RFID card with a short-read range of around 3cm. Once the card is put into the card slot, the amplifying antenna can extend the read range to more than 6m.
- An innovative curved antenna that can be installed on gantries was developed. The customised antenna is small yet capable of maintaining adequate beam width control for the electronic tolling applications.
- 這系統採用專用的短程通訊(DSRC)作為核心技術，以車內感應器(IVU)作為低功率射頻應用。DSRC系統透過路邊的閱讀器作訊息交換。
- 駕駛者的個人道路收費帳戶資料儲存於獨立的RFID卡內，其讀取距離約為3厘米。當使用者將RFID卡放入插卡槽後，可令讀取距離擴展至6米以上。
- 項目亦開發了一種可以安裝在龍門架上的創新曲面天線。這定制的天線體積雖小，但能夠為電子收費應用保持足夠的波束寬度控制。

Key Impact 主要成效

RFID Device (Two-piece Device for Tolling Application)
應用於道路收費系統之組合式無線射頻標籤

- It helps to disseminate the traffic information to the public, facilitate traffic management through application of information technology, and supports traffic enforcement.
- It supports the Smart City Blueprint for Hong Kong with "Smart Mobility" approach.
- 它有助於向公眾發放交通訊息，透過應用訊息技術提升交通管理，並協助交通執法。
- 它支援香港智慧城市藍圖的智慧出行措施。

Award 獎項

Silver Medal in the 48th International Exhibition of Inventions Geneva in 2023
Silver Award in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023
Outstanding Vehicles Road Tolling RFID Tag in Smart Living Partnership Awards 2022
Outstanding Antenna Detection Payment Solution in Smart Living Partnership Awards 2022
2023年第48屆日內瓦國際發明展銀獎
2023年第3屆亞洲創新發明展覽會 — 香港 銀獎
2022智慧生活夥伴大獎 — 傑出車輛道路收費射頻標籤
2022智慧生活夥伴大獎 — 傑出天線偵測收費解決方案

Research Completion
2022

Applications
- Free-flow tolling for commercial vehicles
- Carparks
- Rental vehicle management
- Electronic road pricing system

Patent Applications
- US 18/193,989
- CN 2023 1034 0327.2
- HK 3202 3070 889.5

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 商用車輛自動繳費
- 停車場
- 租賃車輛管理
- 電子道路收費系統

專利申請
- US 18/193,989
- CN 2023 1034 0327.2
- HK 3202 3070 889.5

商品化機會
- 技術授權許可

InSAR Deformation Analysis Technologies

InSAR形變分析方法

Overview 簡介

In collaboration with SpaceSense Technology Limited, LSCM and the Chinese University of Hong Kong developed cutting-edge synthetic aperture radar (SAR) interferometry (InSAR) technologies to effectively diagnose urban infrastructural safety issues, such as structural settlement and deformation, and establish the Urban Infrastructural Safety-Oriented InSAR Cloud Computation System.

LSCM及香港中文大學與天順科技有限公司合作，針對城市建築結構沉降和形變問題，研發新一代的InSAR處理以及形變資訊挖掘方法，研發「城市建築結構安全InSAR監測雲平台」，為建築結構安全作有效評估。

Problem addressed 解決方案

InSAR Deformation Analysis Technologies for Urban Infrastructural Safety Diagnosis
面向城市建築結構安全檢查InSAR形變分析方法

With the rapid urbanisation, many cities need to monitor and evaluate the infrastructural safety of the built environment extensively. The existing InSAR systems in the market have limitations in terms of processing algorithms, computational efficiency, and user interface. The InSAR remote sensing methods researched and developed in this project will satisfy the increasing demand of structural safety diagnosis services at regional and international levels.

隨著急速的城市化進程，許多城市都需要對其建築環境的基礎設施進行廣泛的安全監測和評估。市場上現有的InSAR系統在處理算法、計算效率和用戶界面方面都存在局限性。此項目研究和開發的InSAR遙感系統，能滿足區域和國際上對結構安全檢查服務日益增長的需求。

Innovation 創新技術

- A DSInSAR method is developed to improve point density over large areas. By applying homogenous filter to low-coherence targets, the quality of the interferometric signals can be improved significantly.
- Optimise data pre-processing parameters based on the prior geographic knowledge and improve the automatic processing capabilities.
- A new framework for structural safety evaluation based on deep learning methods is developed to learn time-series deformation and identify deformation patterns.
- Develop sub-region parallel solution methods through instruction parallelism and thread parallelism based on Alibaba Cloud, and reconfigure algorithms that can be run on the GPU to improve computational efficiency and prompt response capabilities.
- Utilise high-performance cluster computing to process data-intensive tasks. The distributed resource manager of the cluster is responsible for monitoring and dispatching resources.
- A user-friendly interface is developed based on three-dimensional (3D) models to make it convenient for the user to display, query, compare and analyse large amounts of deformation data in near real time.
- 開發了一種DSInSAR方法以提高大面積的點密度。透過同質濾波器對低相干目標的應用，可以顯著提高干涉訊號的質量。
- 使用固有的地理知識來優化數據的預先處理參數，提高自動化的處理能力。
- 開發了一種基於深度學習方法的結構安全評估新框架，用於學習時間序列形變，並識別形變模式。
- 基於阿里雲，透過並行指令和並行線程開發並行子區域的解決方法，重新配置可在GPU上運行的算法，提高計算效率和快速反應的能力。
- 該項目利用高性能集群計算來處理數據密集工作。集群的分佈式資源管理器亦負責監控和調配資源。
- 基於三維模型開發的易於使用的界面，方便用戶接近實時地展示、查詢、比較和分析大量形變數據。

Key Impact 主要成效

- Enhance monitoring capabilities of InSAR technologies and provide convenient and efficient data services. The advanced data processing platform developed can be widely adapted to high- and low-coherence urban areas.
- The deliverables of this project have a wide range of applications such as ground settlement, wall cracking and failure, infrastructural deformation, landslides and debris flow in the regions with cloudy and rainy weather.
- The scientific achievements from this project will have impacts on the investigation of sea level change, groundwater cycle, geological evolution, earth dynamics in which an enhanced understanding of the dynamic mechanisms of urban built environments is also critical.
- Create the first InSAR cloud computation system that provides services for urban infrastructural safety diagnosis and promotes widespread applications of InSAR technologies in the monitoring of urban infrastructures and geological disasters. It will also promote the industrialisation level of remote sensing technologies and further upgrade of remote sensing industries.
- 該項目提高了InSAR技術的監測能力，提供了便捷高效的數據服務。此項目開發的先進數據處理平台，可廣泛適用於高一致性和低一致性的城市地區。
- 本項目成果在陰雨天氣地區的地面沉降、牆面裂縫和破壞、基礎設施的形變、滑坡、泥石流等領域具有廣泛的應用。
- 該項目的科學成果將對海平面變化、地下水循環、地質演化、地球動力學研究所產生的影響，其中加強對城市建築環境動力學機制的理解也至為重要。
- 該項目創建了首個InSAR雲計算系統，為城市基礎設施安全的診斷提供服務，推動InSAR技術在城市基礎設施和地質災害監測中的廣泛應用，也將促進遙感技術產業化，並進一步提升遙感工業。

Award 獎項

2021 Grand Prize of China Geographic Information Science and Technology Progress Award
2020 First prize of China Surveying and Mapping Science and Technology Progress Award
2021中國地理信息科技進步特等獎
2020中國測繪科技進步一等獎

Research Completion
2022

Applications
- Provide an integrated InSAR cloud computation system to provide full-chain services for urban infrastructural safety diagnosis.
- Help conduct infrastructural safety surveys over Hong Kong or to the Guangdong-Hong Kong-Macao Greater Bay Area.

Patent
- Ma, P., Ye, G. Zhang, F., Zhao, Z., Pattern Recognition-InSAR V1.0 (No. 2020SR1223595)
- Ma, P., Lin, H., Ye, G., Zhao, Z., InSAR Cloud V1.0 (No. 2020SR0451599)

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 提供集成的InSAR雲計算系統，為城市基礎設施安全檢查提供全線的服務。
- 協助進行香港或粵港澳大灣區的基建安全調查。

專利
- Ma, P., Ye, G. Zhang, F., Zhao, Z., 模式識別InSAR V1.0 (編號2020SR1223595)
- Ma, P., Lin, H., Ye, G., Zhao, Z., InSAR雲V1.0 (編號2020SR0451599)

商品化機會
- 技術授權許可

LoRa IoT Platform

LoRa物聯網平台

Overview 簡介

In order to support the development of Smart City, LSCM and the City University of Hong Kong have developed LoRa network which integrates smart devices, citizens and the city's services together to achieve sustainability, efficiency and mobility in Hong Kong.

為了配合智慧城市的發展，LSCM及香港城市大學研發了LoRa網絡，將智能裝置、市民和城市的服務整合，以實現香港的可持續發展、效率和流動性。

Problem addressed 解決方案

LoRa IoT Platform for Smart City Technology and Applications Development
配合智慧城市發展的LoRa物聯網平台

Three new LoRa-based Smart applications-interference-mitigated LoRa-based seamless localisation, real-time performance in LoRa network and sub-metering will be implemented. These are the new applications which can provide accurate localisation, as well as real-time and sub-metering services to potential users.

將實施的三個基於LoRa的新智能應用，包括低干擾的LoRa無縫定位、在LoRa網絡中進行實時的執行和分戶計量。這些新的應用程式可以為目標用戶提供準確的本地化、實時和分戶計量的服務。

Innovation 創新技術

- The newly developed LoRa-based Cloud prototype facilitates long-distance data manipulation efficiency and reduce computation cost for users. This project offers an alternative solution to mobile platforms since a good link budget is analysed.
- A novel seamless localisation technique based on LoRa is developed. It is more accurate than other low signal-to-interference-plus-noise-ratio (SINR) wireless techniques.
- The technology has been tested in Hong Kong International Airport, City University of Hong Kong, and Tai Lam Tunnel to evaluate the effectiveness of the proposed network.
- 透過新開發基於LoRa的雲端原型，將有助提高遠程的數據處理效率，並降低終端用戶的計算成本。透過分析，這項目能提供良好的鏈路預算，為流動平台提供另一種解決方案。
- 此項目開發一個基於LoRa的新型無縫定位技術，它比其他低訊號強度和干擾及背景訊號強度比(SINR)的無線技術更精準。
- 此技術已在香港國際機場、香港城市大學和大欖隧道進行測試，以評估這網絡的效用。

Key Impact 主要成效

- Due to the Long-ranged communication capability and low power consumption characteristics of LoRa, developing LoRa-related products will become a big trend of Smart City Development.
- Provide perfect connectivity with the Chinese Mainland market where LoRa is the basic elements in IoT development.
- 由於LoRa具遠距離通訊能力和低功耗特性，開發LoRa相關產品將成為智慧城市發展的新趨勢。
- LoRa物聯網的發展是與中國內地市場連接的重要元素。

Research Completion
2020

Applications
- Logistics and transportation
- Smart City applications

Patent Applications
- US 62916241

Commercialisation opportunities
- Technology licensing

完成研究年份
2020

應用範疇
- 物流和運輸
- 智慧城市應用

專利申請
- US 62916241

商品化機會
- 技術授權許可

Seamless Navigation in Urban Environment

城市無縫定位系統

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM developed algorithms for GNSS multipath error mitigation and for improving positioning availability in dense urban areas. It also provides a seamless positioning server platform that supports high precision positioning in Hong Kong.

本中心與香港理工大學攜手合作，開發了適用於改正GNSS多路徑誤差和改善人口密集的市區內的定位計算法。它亦能提供一個無縫定位伺服器平台，以提高定位服務的精確度。

Problem addressed 解決方案

This project developed an integrated solution to solve the multipath problem in Hong Kong. It integrates multiple sensors, including Micro-electromechanical Systems sensors, Wi-Fi, satellite in view, and multiple GNSS constellations together with 3D city model, to significantly reduce multipath effect by using advanced fusion algorithms and multipath modeling.

此項目開發一個綜合的解決方案，以解決香港的多路徑誤差問題。它集合多個感應器，包括微機電系統感應器、Wi-Fi、衛星視野和多個GNSS星系以及3D城市模型，透過使用先進的融合計算法和多路徑模式，顯著地減低多路徑所產生的影響。

Innovation 創新技術

Seamless Navigation in Urban Environment through Multiple Sensor Fusion and GNSS Multipath Mitigation
基於GNSS多徑效應改正和多傳感器融合的城市無縫定位系統

- With this project, we can significantly increase coverage and reduce multipath errors in dense urban areas using the aforesaid algorithms.
- By integrating multipath mitigation methods developed in this project and DGNSS platform for mobile phone that was developed earlier, we are able to provide an integrated service to offer metre-level positioning accuracy in open areas and 10 meters accuracy in dense urban areas in Hong Kong.
- 透過這項目，可以使用上述計算法以顯著地提高覆蓋率，並減少人口密集的市區內的多路徑誤差。
- 透過整合本項目開發的減低多路徑影響的方法和已開發的手機DGNSS平台，可提供綜合服務，在空曠地區提供米級的定位精確度；而在香港人口密集的市區內則提供達至10米的精確度。

Key Impact 主要成效

- Develop a reliable and seamless positioning technologies to support high accuracy positioning requirements in Hong Kong.
- Provide low cost, high accuracy and seamless positioning service.
- 開發可靠且無縫的定位技術，以支援香港的高精確度定位要求。
- 提供低成本、高精確度和無縫定位服務。

Award 獎項

Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days
2021年日內瓦國際發明展銀獎

Research Completion
2019

Applications
- Smart city navigation

Commercialisation opportunities
- Technology licensing

完成研究年份
2019

應用範疇
- 智慧城市導航

商品化機會
- 技術授權許可

3D Seamless Spatial Data Acquistion System

無縫三維空間數據採集系統

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM developed a 3D geodatabase framework for Lands Department's wide GIS applications in Hong Kong, enabling its applications in an effective and efficient 3D urban environment.

本項目與香港理工大學合作，根據地政總署的需要為香港開發一套三維地理數據庫框架，提供一套針對三維城市環境行之有效，且強而有力的解決方案，在香港地理信息系統中得到廣泛應用。

Problem addressed 解決方案

The key issue for implementing the 3D geodatabase framework is the corresponding data capture technology. A lightweight 3D Seamless Spatial Data Acquisition System (SSDAS) is thus proposed for the corresponding 3D data capture.

實現3D地理數據庫框架的關鍵因素在於相應的數據擷取技術。因此，此項目針對有關的3D數據擷取技術，建議一個輕量化的3D無縫空間數據採集系統(SSDAS)。

Innovation 創新技術

3D Geodatabase Framework for Hong Kong: A Lightweight 3D Seamless Spatial Data Acquisition System (SSDAS)
香港的三維地理數據庫架構:輕量化無縫三維空間數據採集系統

- This is a 3D interior building model produced by the spatial data acquisition system and the developed algorithm.
- The lightweight 3D Seamless Spatial Data Acquisition System synergises progressive spatial information technologies and a specialised software package for processing, generating and visualising 3D spatial data.
- The developed geodatabase and SSDAS will be widely utilised in many fields that need spatial information infrastructure in Smart City, such as lands and resources surveying and management, civil engineering, autopilot, intelligent transport, highway maintenance and urban planning .
- 這是一幅利用新開發的空間數據採集系統及演算化產生的三維建築物內部模型。
- 此三維數據採集系統是一個輕量化的三維無縫空間數據採集系統(SSDAS)。它是集合了先進的空間資訊技術，以及可以處理、產生和進行可視化三維空間數據的專業軟件。
- 本項目所研發的三維地理數據庫框架與其對應的數據採集系統(SSDAS)，有望被廣泛應用於智慧城市所需的空間信息基礎設施及相關的技術領域，包括土地與資源的測量及管理、土木工程，自動駕駛、智能交通、道路保養及城市規劃。

Key Impact 主要成效

- The 3D geodatabase framework and SSDAS are capable of enabling the efficient and effective management of indoor and outdoor 3D spaces, enabling 3D spatial big data manipulation capability, making survey works easier and more flexible in complicated environments, and building the 3D spatial data infrastructure for the smart city development in Hong Kong.
- 3D地理數據庫框架和SSDAS能夠實現室內外3D空間的高效管理和3D空間大數據操作，使複雜環境下的勘測工作更輕鬆靈活。它亦能構建3D空間數據基礎設施，促進香港的智慧城市發展。

Research Completion
2018

Applications
- Lands and resources surveying and management
- Civil engineering
- Autopilot
- Intelligent transport
- Highway maintenance
- Urban planning

Patent
- CN 2018 11544 586.2
- US 16/266 731
- CN 2018 1218 142.8

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 土地資源調查與管理
- 土木工程
- 自動駕駛
- 智能交通
- 公路維修
- 城市規劃

專利
- CN 2018 11544 586.2
- US 16/266 731
- CN 2018 1218 142.8

商品化機會
- 技術授權許可

Smart AP

智能接入點

Overview 簡介

LSCM has joined forces with the Hong Kong University of Science and Technology to research and implement Smart Wi-Fi, an intelligent embedded software technology for Access points (APs), to overcome the challenges in the Wi-Fi environment, such as high interference between Wi-Fi APs, APs load unbalance, the lack of user/asset tracking capability, etc.

LSCM聯同香港科技大學開發了創新的智能Wi-Fi，透過Wi-Fi接入點(AP)上運作的智能嵌入式軟件系統來克服Wi-Fi環境所面對的各種挑戰，如AP之間的高度干擾、AP負載不平均、缺乏用戶/物件追蹤能力等。

Problem addressed 解決方案

User location information ("user heatmap") enables many commercial business opportunities. With the heatmap, a mall operator will be able to offer the best floor layout, rental schemes for their tenants, timely coupons and location-based recommendations through mobile push advertisements ("Online to Offline").

用戶位置訊息(即「用戶熱能圖」)為商戶帶來更多商機。透過熱能圖，商場經營者可透過流動推送廣告(在線至離線模式)，提供最佳的商舖分佈圖、為租戶提供最佳的租賃計劃，即時優惠券和位置建議。

Innovation 創新技術

Smart AP : Wi-Fi Positioning and Optimisation for a Smart City
智能接入點:智慧城市的無線Wi-Fi定位和系統優化

- The SmartAP will scan the environment Wi-Fi signal to identify the location of Wi-Fi devices. The site owner can thus analyse the behaviour of their customers or track their valuable assets.
- A mobile app is developed to communicate with the cloud server to identify the current loading and channel busy time with different surrounding APs. The SmartAP will automatically connect to the best AP for enhancing users' Wi-Fi experience.
- SmartAP可掃描附近的Wi-Fi訊號，以識別Wi-Fi設備的位置。因此，商場經營者可以分析其客戶的行為或追蹤其重要物件。
- 透過流動應用程式及雲端伺服器進行通訊，以識別當前的負載和周邊不同頻道的繁忙時間。SmartAP將自動連接到最佳接入點以提升用戶的Wi-Fi體驗。

Key Impact 主要成效

- The user location information (heatmap) enables the mall operator to offer the best floor layout, rental schemes for their tenants, and the timely coupons and location-based recommendations through mobile push advisements.
- With intelligent and collaborative channel setting, power control, and AP association, users will be able to enjoy much better through out experience and Wi-Fi service.
- 借助用戶位置訊息(熱圖)，商場營運商能夠透過移動推送廣告為租戶提供最佳的商舖分佈圖、租賃方案，並及時地提供優惠券和位置建議。
- 透過智能協作的信訊道設置、功率控制和AP關聯，用戶能夠享受更好的傳輸體驗和Wi-Fi服務。

Award 獎項

In 2018, SmartAP has won the Silver Medal at the 46th International Exhibition of Inventions Geneva.

智能接入點技術在2018年第46屆日內瓦國際發明展獲得銀獎

Research Completion
2018

Applications
- Crowd analysis and management
- Smart city positioning for location-based recommendations

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 人群分析與管理
- 使用智能城市定位以位置提供推薦選擇

商品化機會
- 技術授權許可

Indoor Location Analytics System

室內位置數據分析系統

Overview 簡介

The Indoor Location Analytics Systems (ILAS) was jointly developed by LSCM and Hong Kong Baptist University. Backend Location Analytics System Server analyses the visitors' movement data and predicts their potential preference using the content-based and collaborative filtering approaches, and makes use of the flow patterns extracted for better booth arrangement for exhibitors, especially in the sub-optimal booth areas.

室內位置分析系統(ILAS)是由LSCM和香港浸會大學共同研發。後端位置分析系統伺服器使用基於內容的協作過濾方法，分析參觀者的移動數據，預測他們的喜好，並利用所提取的流動模式，為參展商提供(特別是在次優的展覽區)更好的展位安排。

Problem addressed 解決方案

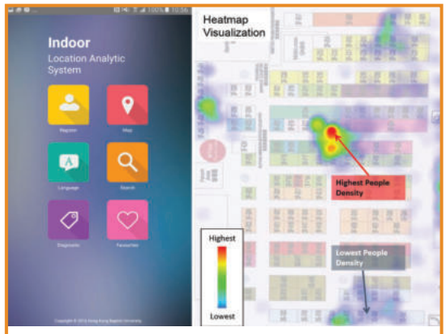
With limited space available for conventions and exhibitions in Hong Kong, there is a need to maximise the usage of the available space within exhibition halls. An Indoor Location Analytics System (ILAS) is therefore developed to determine the dynamic flow of visitors in exhibition centres.

由於香港的會議和展覽空間有限，需要充份利用展廳內的所有空間。這個室內位置分析系統 (ILAS) 有助確認展覽中心內參觀者的動態流量。

Innovation 創新技術

- Location Analytics APIs for Mobile Apps is a set of programming interfaces to facilitate the development of Mobile Apps with location-based value-added services used in the exhibition.
- Fast Calibration System is a trolley equipped with a smartphone as a Wi-Fi signal beacon. It goes around the exhibition hall for fast data collection and calibration of the indoor positioning system.
- The system has been tested in two trade fairs organised by Hong Kong Trade Development Council (HKTDC) at Hong Kong Convention and Exhibition Centre (HKCEC) to evaluate the viability of its deployment.
- 位置分析應用程式介面是一組編程介面，有助開發應用於展覽會的位基增值服務流動應用程式。
- 快速調校系統是一台配備了智能手機收發Wi-Fi訊號的手推車。它圍繞展覽廳進行室內定位系統的快速數據採集和調校。
- 系統於香港貿易發展局在香港會議展覽中心舉辦的兩個展覽會進行測試，以評估其實際應用的可行性。

Key Impact 主要成效



Physical Indoor Location Analytics System for Exhibition and Convention Industries
適用於展覽及會議行業的室內位置數據分析系統

- The system creates a new business opportunity on the use of femtocell for active marketing in the exhibition industry.
- It provides customised services to the visitors which can enrich their satisfaction levels.
- 此系統使用femtocell，協助展覽業界進行積極營銷，創造新的商機
- 為參觀者提供客制化服務，提升他們的滿意度

Research Completion
2017

Applications
- Indoor location analytics system for exhibition and convention industries

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 展覽及會議行業的室內位置數據分析系統

商品化機會
- 技術授權許可

GNSS Based Infrastructure

基於GNSS的基礎設施

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM developed a system based on the existing Hong Kong SatRef network and offers a fundamental positioning infrastructure that provides multiple location based services to support the economic development in Hong Kong.

本項目與香港理工大學合作，開發了建基於香港現行SatRef網絡的基礎定位設施，提供多種位置基礎服務，以支援香港在測量、物流、地理信息系統(GIS)應用及位置基礎服務的技術提升。

Problem addressed 解決方案

The system provides technological advancements in surveying, logistics operation, Geographic Information System (GIS) applications, and location-based services in Hong Kong. It enhances the performance of the SatRef network by integrating GPS and Beidou, and achieves more reliable Real-Time Kinematic (RTK) positioning with the accuracy of 1 centimetre for surveying and engineering applications.

這系統改進測量、物流操作、地理訊息系統應用及位置基礎服務的技術。它集成了GPS和北斗網絡，進一步提升SatRef系統的表現，在測量和工程應用上提供更可靠並定位至1厘米精準度的實時動態(RTK) 。

Innovation 創新技術

- The system implements GNSS heightening in Hong Kong to improve engineering surveying efficiency.
- The system provides a reliable platform with DGNSS differential technologies for mobile operators in Hong Kong and surrounding territories to support personal and vehicle positioning & navigation with metre level accuracy (2~3m).
- A full-scale gravity survey in Hong Kong is measured with modern gravimeter to evaluate the quality of the existing gravity data available and to fill the gaps of the existing data coverage, particularly in mountain areas.
- 這系統在香港實施GNSS加高模式以提高工程測量效率。
- 系統以DGNSS差分技術提供一個可靠的平台，為流動網絡營運商在香港及周邊地區提供個人和車輛的定位及導航服務，並達至米級的準確度(2~3米)。
- 利用現代重力儀在香港作全面性的重力測量，以評估現有重力資料的質量，並填補現有資料(特別是在山區)在覆蓋上的不足。

Key Impact 主要成效

Development of a Hong Kong Positioning Infrastructure Based on GPS, Beidou, and Ground Based Augmentation System
基於GPS、北斗及地面增強系統的香港衛星定位平台

- With the DGNSS System, it can significantly improve the GPS accuracy of the platform.
- It can help logistics companies and the Customs & Excise Department to better monitor cargo vehicles.
- 使用DGNSS系統，可以顯著提高平台的GPS精準度。
- 可以協助物流公司和海關有效地監控貨運車輛。

Award 獎項

Outstanding GNSS Positioning Service and Integration Technology Solution in Smart Living Partnership Awards 2022

2022智慧生活夥伴大獎 — 傑出GNSS定位整合及服務技術方案

Research Completion
2016

Applications
- Smart city navigation

Commercialisation opportunities
- Technology licensing

完成研究年份
2016

應用範疇
- 智慧城市導航

商品化機會
- 技術授權許可

Indoor Localisation Tracking and Navigation

室內定位、追蹤和導向

Overview 簡介

Satellite-based global positioning technologies are easy to use. They can easily locate and assist in navigation in outdoor areas. But for indoor environments, they become unsuitable due to poor reception of satellite signals. In light of the challenge, LSCM has collaborated with the Hong Kong University of Science and Technology to develop a Wi-Fi positioning system-"Wherami"-for indoor localisation tracking and navigation.

基於衛星的全球定位技術簡單易用。在室外，它可以輕易地進行定位及協助導航，但在室內環境中卻因為接收不到衛星訊號而無法使用。LSCM與香港科技大學利用室內廣泛存在的WiFi訊號，研發一套既創新又準確的室內移動定位及導航系統－「依道」Wi-Fi網絡定位系統。

Problem addressed 解決方案

Wherami is an innovative and highly Wi-Fi-based accurate indoor positioning system (IPS) which is able to "fuse" different location estimations for a mobile user. The estimators may include Wi-Fi fingerprinting, map matching, infrastructure hints, Inertial Measurement Units (IMU), etc. Using our software as add-on, improvements in accuracy can be achieved. It supports multi-storey and/or multi-site scenarios. The system will be interoperable with and non-intrusive to the existing Wi-Fi infrastructure.

依道是一個創新而高度精確的Wi-Fi室內定位系統(IPS)，能為流動用戶「融合」不同的位置估計。估算器可包括Wi-Fi指紋識別、地圖配對、基礎設施提示、慣性測量單元(IMU)等。使用我們的附加軟件後，可以提高精確度。它提供多樓層和/或多地點方案。該系統可與現有以Wi-Fi作基礎的設施互相操作而並不互相干擾。

Innovation 創新技術

- Mobile apps for indoor localisation, tracking and navigation, enabling targeted services and advertisement. The apps will run in various mobile platforms, including smart phones, tablets and personal computers.
- Map matching of building's floor plans together with an efficient route selection algorithm.
- Computationally efficient algorithm to reduce the estimation time of location. The position estimation time does not increase with the size of the fingerprint model.
- 流動應用程式可用於室內定位、追蹤和導航，提供針對性的服務和廣告。這些應用程式可用於各種流動設備，包括智能手機、平板電腦和個人電腦。
- 利用高效的路線計算法，把建築物平面圖配對於地圖上。
- 系統使用了有效的計算法，減少估計位置的時間。用作估計位置的時間不會隨著指紋模型的擴大而增加。

Key Impact 主要成效

Indoor Localisation, Tracking and Navigation
室內定位、追蹤和導向

- Provision of an accurate and efficient Wi-Fi-based LBS with a set of innovative and effective technologies which are in great demand in industries.
- Its navigation function goes much beyond "mobile directory", because it is a context-aware application that is built upon efficient and accurate position estimation.
- Enhance the customer services provided by shopping malls, airports, or hospitals.
- It enables a plethora of indoor LBS which can change our lifestyle by making it more convenient.
- 提供準確而有效的WiFi流動位置服務，並提供一套業界需求的創新技術。
- 在導航方面，它遠遠超出「移動導向」的功能，因為它透過高效準確的位置估計，可以構建上下文感知應用程式。
- 提升商場、機場或醫院的客戶服務。
- 它應用了大量的室內移動位置服務，令我們的生活更方便。

Research Completion
2015

Applications
- Crowd analysis and management
- Indoor localisation, tracking and navigation

Commercialisation opportunities
- Technology licensing

完成研究年份
2015

應用範疇
- 人群分析與管理
- 室內定位、追蹤和導向

商品化機會
- 技術授權許可

UniMap: One Map Fits Multiple Robots with Supportive Map Services

整合地圖 : 適用於多個機械人之整合地圖庫及相關地圖支援服務

Overview 簡介

This project aims to develop a cloud-based robot map repository for Autonomous Mobile Robot (AMR). Through multi-floor master map development and sharing, autonomous map updating and change detection, cross-developer robot compatibility combined with backend integration technologies, the platform provides users with accelerated AMR deployment time and streamlined robot management.

此項目旨在為自主移動機械人(AMRs)開發一個基於雲端的機械人地圖儲存庫。透過建構及共享多個樓層的主地圖、自動更新地圖與變化檢測技術、跨開發商機械人兼容性，以及後台整合技術，平台可加快使用者應用AMR的時間，並簡化機械人管理流程。

Problem addressed 解決方案

Despite the increasing adoption of Autonomous Mobile Robots (AMRs) in Hong Kong, AMR deployment is frequently delayed due to a lengthy mapping procedure and inability of inter-robot sharing of map data. For example, 1.5 to 2 man-days are usually required for the mapping of every 100m^2 area.

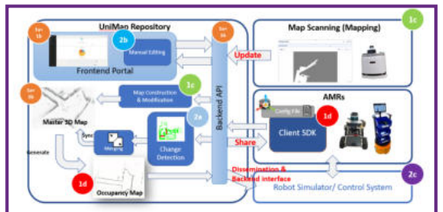
To tackle this problem , LSCM has created a comprehensive cloud-based robot map repository incorporated with master map development and sharing services, map format conversion capability, map change detection by using innovative denoising algorithm with compatibility across popular dashboard map and robot simulation tools (e.g. Gazebo)

儘管香港業界已開始應用自主移動機械人(AMRs)，但由於建圖程序耗時，每一百平方米的區域普遍需時一至兩天才可完成建圖程序，而且機械人之間無法共享地圖數據，以致每當應用AMR的時候經常遇上延誤的情況。為解決以上的問題，LSCM創建了全面的雲端機械人地圖儲存庫，並整合了各項功能，包括：構建與共享主地圖服務、地圖格式轉換功能、使用去噪演算法的地圖變化檢測技術，以及兼容主流儀表板地圖及機械人模擬工具 (如Gazebo)。

Innovation 創新技術

- A comprehensive cloud-based robot map repository for indoor AMRs with floor-level authentication, designed to support multi-floor master map (5cm x 5cm resolution) developed via Lidar SLAM or BIM/CAD, and sharable with robots in occupancy, and 3D point cloud map format.
- The Robot Client SDK (Soft Development Kit) enables change detection and advanced denoising algorithm for rapid automatic map updates with minimal computation time.
- Supports 3D scene and 2D map exportation for seamless integration with dashboard map or robotic simulation tools.
- 專為室內自主移動機械人設計的綜合雲端地圖儲存庫，具備樓層驗證功能，支援透過Lidar SLAM或BIM/CAD 技術構建的多樓層主地圖 (5cm x 5cm 解像度)，並能以佔用地圖及3D點雲地圖格式與機械人共享。
- 機械人客戶端SDK (Software Development Kit) 具備變化檢測功能與去噪演算法，能以最短的運算時間迅速地自動更新地圖。
- 支援3D場景與2D地圖導出功能，可無縫整合至儀表板地圖或機械人模擬工具。

Key Impact 主要成效



UniMap: One Map Fits Multiple Robots with Supportive Map Services
整合地圖:適用於多個機械人之整合地圖庫及相關地圖支援服務

- Cloud-based Map repository eliminates the need for repeated mapping of the same location, enabling faster deployment of new AMRs.
- With the cross-developer robot compatibility, venue owners are able to implement and control robots of various architecture seamlessly.
- Centralised platform simplifies robot management and map maintenance in one location.
- 雲端地圖儲存庫免除了對同一地點重覆建圖的需求，能加快新型自主移動機械人(AMR) 的應用。
- 憑藉跨開發商機械人的兼容性，場地經營者可無縫整合與操控不同架構的機械人系統。
- 統一平台將管理機械人與維修地圖工作簡化於單一介面中。

Research Completion
2025

Applications
- For venues with environment / facilities that are subject to frequent changes, such as shopping malls / airport departure halls

Commercialisation opportunities
- Technology licensing

完成研究年份
2025

應用範疇
- 環境/設施經常變動的場地，例如商場或機場離境大堂

商品化機會
- 技術授權許可

Soft Material Handling Technology Using Reinforcement Learning

基於強化學習的軟材料處理技術

Overview 簡介

LSCM developed an AI-based robot manipulation technology for soft material handling.

LSCM研發了一項應用於處理軟性材料的人工智能機械人操作技術。

Problem addressed 解決方案

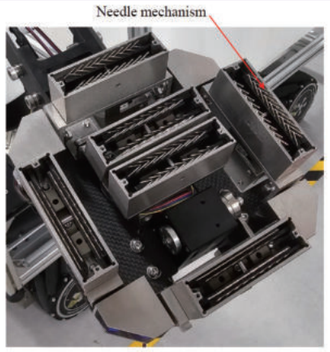
The hydrothermal separation process in industrial laundry services is labour intensive, and the repetitive tasks of loading and unloading recycled textiles into the machines are not efficient enough. LSCM thus developed a mobile with multiple degree-of-freedoms robotic device that can handle soft objects with such repetitive tasks to ease the problems.

由於工業用途的洗衣服務中的水熱分離過程需要大量人手將回收紡織品裝卸到機器，而依賴人手進行這些重複性工作的效率較低。LSCM因此研發了可移動及具有多個自由度的機械人裝置，能夠用於處理軟性物件的重複性工作以紓緩問題。

Innovation 創新技術

- Develop a compliant robotic arm and an end-effector to handle soft and irregular objects. In particular, a bio-inspired (cuttlefish-alike design) force sensing and compliant feedback gripper is designed to handle soft and irregular objects.
- Develop a novel robot vision/imaging technique using Reinforcement Learning (RL). A reward function is used to train the RL model in real time.
- Leveraging on system integration and implementation, a robovator will be constructed whilst the RL model will be deployed in the Robovator.
- 研發一個合規格的機械臂和末端執行器，以處理軟性和不規則的物件。特別設計一個具力度感測和回饋功能的仿生物機械抓(仿似墨魚的設計)，用於抓住軟性和不規則的物件。
- 研發使用強化學習(RL)的創新機械人視覺或影像技術，利用獎勵機制實時訓練RL模型。
- 利用系統整合和應用，將建造一個機械人升降機(robovator)，同時將RL模型應用於此機中。

Key Impact 主要成效



Soft Material Handling Technology Using Reinforcement Learning
基於強化學習的軟材料處理技術

- Deploy in applied researches pertaining to new industrialisation (i.e. process automation) for the textile recycling industry in Hong Kong
- Ease the shortage of resources and manpower
- Improve productivity and efficiency
- 應用於香港回收紡織品行業的新型工業化應用研究(如流程自動化)
- 紓緩資源和人手短缺問題
- 提升生產力和效率

Research Completion
2025

Applications
- Textile Recycling System
- Industrial laundry services

Commercialisation opportunities
- Technology licensing

完成研究年份
2025

應用範疇
- 紡織品回收系統
- 工業洗衣服務

商品化機會
- 技術授權許可

Sensor Fusion Technology for Glass Detection and Recognition

感測和識別玻璃的感測器融合技術

Overview 簡介

This technology developed by LSCM aims to research on sensor fusion and related artificial intelligence technologies for robot navigation applications in glassy environment.

LSCM研發此技術的目的是旨在協助機械人當身處於大量玻璃的環境下，應用合適的感測器融合技術和相關的人工智能技術，以進行導航和執行工作。

Problem addressed 解決方案

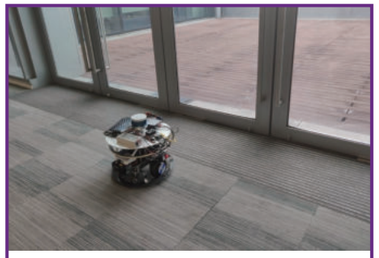
Robot navigation mainly relies on vision and / or laser technologies. However, both are not good at detecting glass and mirrors because the light will direct the robot to unwanted directions. This makes it difficult to deploy robots in glassy places like shopping malls.

現時機械人的導航主要依靠視覺及/或雷射技術，然而這兩種技術並不擅長於感測玻璃和鏡子。機械人往往會被光線引導至不正確的方向，因此，在有大量玻璃裝飾的購物商場等場所應用機械人會變得相對困難。

Innovation 創新技術

- Sensor fusion platform hardware
  1. LiDAR
  2. Mm-Wave Radar
  3. Robot Base
- Transparent Objects Detection Algorithm
- Sensors Fusion Algorithm for Autonomous Mobile Robot (ARM) navigation and object avoidance in glassy environment
- 感測器融合平台硬件
  1. 激光雷達
  2. 毫米波雷達
  3. 機械人基礎
- 偵測透明物件的演算法
- 用於玻璃環境中的自主移動機械人(ARM) 導航和避開物件的感測器融合演算法

Key Impact 主要成效



Sensor Fusion Technology for Glass Detection and Recognition
感測和識別玻璃的感測器融合技術

- Fusing other sensors with mm-wave radar, the reliability of the robots can be greatly improved
- Foster the implementation of Smart Hong Kong
- 將其他感測器與毫米波雷達融合，可大幅提升機械人的可靠性
- 推動香港的智慧城市發展

Research Completion
2024

Applications
- Glassy environment, such as shopping malls

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 有大量玻璃的環境，例如購物商場

商品化機會
- 技術授權許可

Smart Robotics Coordination System (SRoCoS) for Hospital Logistics

應用於醫院物流的智能機械人協調系統

Overview 簡介

In collaboration with Hong Kong Hospital Authority (HKHA), LSCM develops a smart robotics coordination system (SRoCoS) deploying robots with advanced technologies in order to reduce manual labour for repetitive tasks.

LSCM與香港醫院管理局(醫管局)合作，開發一個智能機械人協調系統(SRoCoS)，旨在應用具有先進技術的機械人，以減少工作人員進行重複性工作時的體力勞動。

Problem addressed 解決方案

Smart Robotics Coordination System (SRoCoS) for Hospital Logistics
應用於醫院物流的智能機械人協調系統

Despite the strategic initiatives of HKHA to take advantage of the advanced technologies for sustainable development, the existing solutions have deficiencies in compatibility and control. For examples:

(1) One model only works for one function;
(2) Unable to take the elevators autonomously;
(3) No system to control multiple robots;
(4) Difficult to make hardware and software modifications to fit the hospital's requirements.

雖然醫管局已推行特別措施以利用創新科技作可持續發展，但現有的解決方案在兼容性與管理方面仍有不足之處，例如：

(一) 每種模式只能提供一種功能
(二) 不能自動乘搭升降機
(三) 欠缺可同時控制多個機械人的系統
(四) 難以修改硬件和軟件以配合本地醫院的要求

Innovation 創新技術

- A smart robotics coordination system (SroCoS) that provides delivery services in hospitals and autonomous mobile robot system that supports vertical logistics.
  - A universal base robot that can support different kinds of delivery devices.
  - A remote elevator riding mechanism for taking the elevators autonomously and carrying a heavy load on an inclined path.
  - Using computer vision in challenging scenarios to track moving objects to suit the operation of the hospital.
- Fleet planning and management system with open Application Programming Interface is developed to control the overall operation of the autonomous mobile robots.
- 智能機械人協調系統 (SroCoS) 及自主移動機械人系統能於醫院提供運送服務，支援垂直物流：
  - 這款通用運送機械人能支援不同類形的運送設備。
  - 遙距控制裝置使機械人能自動乘搭升降機，它亦能裝載重物在斜路上行走。
  - 在惡劣的環境下能利用電腦視覺追蹤移動物件以配合醫院的運作。
- 備有應用程式開發介面之規劃和管理系統以控制自主移動機械人的整體運作。

Key Impact 主要成效

- With the help of robotics, workflow and order management technologies, material delivery in hospitals can be automated so as to enhance efficiency.
- The technology will be served as the building blocks of Smart Hospital where healthcare organisations can take reference to the design and implementation for future infrastructure and system set-up.
- Advanced sensing visual technology will enable the robots to perform agile and safe navigation in dynamic environment.
- Fleet of deliverbots complements the limited human resources for material delivery.
- 在機械人、工作流程及訂單管理技術的協助下，醫院能將物資運送自動化，提升效率。
- 此項目將成為智慧醫院的基礎，讓醫療機構在設計及應用科技系統進行基礎建設時可作參考。
- 進階視覺感應技術能讓機械人在動態環境中進行靈活和安全的導航。
- 運送機械人團隊能支援人手不足的問題，協助運送物資。

Research Completion
2024

Applications
- Delivery services in Hong Kong hospitals
- Fleet planning

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 香港醫院內的運送服務
- 機械人團隊管理

商品化機會
- 技術授權許可

Electronic Power Assist Trolley System

電動助力手推車

Overview 簡介

Adopting power assist technology, LSCM's Human-Robot Direct Tactile Interaction System (HARDTIS) can measure the micro deformation of the handlebars of the cart or trolley when it is in use, so that amplified input force and direction signals will be generated to make a heavily loaded cart/trolley very lightweight and easy-to-use.

LSCM的人機直驅互動系統(HARDTIS)採用動力輔助技術，可測量手推車手柄在使用時微細的變型程度，從而產生可以放大輸入力度和方向的訊號，令負載重物的手推車變得非常輕巧和易於使用。

Problem addressed 解決方案

The traditional motor-powered carts require the users to receive training in advance in order to get used to the controller. A button for changing direction is also needed to change the moving direction. Besides, users may get hurt if they are not paying enough attention when operating it.

使用者在使用傳統電動手推車前需要先接受一些培訓才能習慣其操作，亦需要按動按鈕來更改移動的方向。此外，如果使用者在操作時稍有不慎，便可能會受傷。

Innovation 創新技術

Electronic Power Assist Trolley System
電動助力手推車

- Sensors are strategically embedded in the trolley handlebar to measure the micro deformation of the materials when force is applied by the user.
- The torque vector is calculated in 100 times per second based on the sensor's value by an onboard AI controller. Amplified torque is generated by two motors connected to the wheels of the trolley. By calculating the torque vector, the control of this power assist trolley without buttons is the same as the common trolleys.
- The built-in regenerative braking system makes it safe to be used even on the ramp.
- 此系統的傳感器內置於手推車的手柄中，當使用者推動手推車時，傳感器便會測量手柄物料微細的變型程度。
- 人工智能控制器以每秒100次的頻率計算出當中所涉及的扭矩力，與車輪連接的兩個摩打將扭矩力倍增，以控制手推車左轉/右轉或前進/後退。由於沒有加設按鈕，此電動助力手推車的操控方式與普通手推車無異。
- 內置的再生制動系統讓手推車即使在斜坡上亦能安全使用。

Key Impact 主要成效

- The human-robot direct tactile interaction system can greatly reduce human effort in moving heavy items.
- It can help the workers to reduce the chances of getting musculoskeletal disorders and occupational injuries.
- The regenerative braking system makes moving it on the ramp more reliable and safe.
- The speed is much faster than the traditional approach though less effort is needed.
- 人機直驅互動系統可以大大減少移動重物時所需的力度。
- 它可以減少搬運工人肌肉筋骨勞損和發生工傷的機會。
- 再生制動系統令在斜坡上使用時變得更可靠和安全。
- 雖然施加的力度較少，但移動速度比傳統方法快很多。

Award 獎項

Gold Medal in the 48th International Exhibition of Inventions Geneva in 2023

2023年第48屆日內瓦國際發明展金獎

Research Completion
2024

Applications
- Logistics and warehouses
- Hotels
- Hospitals

Patent Applications
- US 17/885,900
- CN 2022 1097 1259.5
- HK 3202 2057 424.0

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 物流和倉庫
- 酒店
- 醫院

專利申請
- US 17/885,900
- CN 2022 1097 1259.5
- HK 3202 2057 424.0

商品化機會
- 技術授權許可

Robo-9 : Sensor Fusion Technologies for the Visually Impaired

Robo-9：為視障人士而設的傳感器融合技術

Overview 簡介

LSCM has developed a cost-effective robot vision and sensing technology. The robot is equipped with navigation and locationing functions which can provide walking guidance to the user. And SLAM technology is deployed to provide orientation and navigation information to the user for free walking and going to the target destination.

LSCM研發了具成本效益的機械人視覺和傳感技術。這機械人配備導航和定位功能，可為使用者提供行走路線指引。另外，它利用即時定位與地圖構建(SLAM)技術，透過傳感器獲得周邊環境訊息，協助使用者隨意行走和到達指定的目的地。

Problem addressed 解決方案

The visually impaired encounters various obstacles when going out on their own. Therefore, LSCM has developed this cost-effective robot vision and sensing technology for mobility assistance. The technology has been developed to simulate important functions provided by guide dogs, including obstacle avoidance and guidance.The technology aims to enhance the quality of life of the visually impaired.

視障人士獨自出行時會遇到不少困難。因此，LSCM研發這個具成本效益的機械人視覺和傳感技術，以模仿導盲犬提供包括避障和領航的重要功能，提升視障人士的生活質素。

Innovation 創新技術

Robo-9 : Sensor Fusion Technologies for the Visually Impaired
Robo-9 : 為視障人士而設的傳感器融合技術

- It consists of vision module for object detection, obstacle avoidance, path planning, object movement detection.
- The robot consists of two parts: cane and base. Inside the cane, haptic feedback is used to raise alert and to serve as a control panel to give commands such as go left, go right, go straight and stop. Inside the base, different sensors are installed, which help determine the turning angle and speed.
- Navigation & locationing function provides walking guidance including free walking and going to the target destination, which is designed to be integrated to a cloud platform.
- 機械人備有適用於物體檢測、避障、路徑規劃、物體移動檢測的視覺模組。
- 機械人由兩部分組成：手杖和底座。手杖的內部透過觸覺反饋發出警示，並用作控制中心，發出向左、向右、直行和停止等指令。而底座的內部則放置了不同的傳感器，有助於決定轉動角度和速度。
- 導航定位功能提供步行指引，包括隨意行走和到達指定目的地，此功能亦整合到雲端平台上。

Key Impact 主要成效

- Employ robot vision and multi-sensing technologies for mobility assistance to provide point-to-point navigation information.
- Enhance the quality of life of the visually impaired and enable them to participate fully in social activities.
- 使用機械人視覺和多傳感技術進行出行輔助，提供點到點導航資訊。
- 提升視障人士的生活質素，方便他們參與社交活動。

Award 獎項

Gold Award at The Edison Awards 2025

Silver Medal at the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023

Bronze medal at the Special Edition 2022 Inventions Geneva Evaluation Days

2025年愛迪生獎金獎

2023年第3屆亞洲創新發明展覽會 — 香港 銀獎

2022年日內瓦國際發明展銅獎

Research Completion
2023

Applications
- Provide walking guidance to the visually impaired

Patent Applications
- US 17/099,887 / CN 2020 1148 9531.3
- US 16/823,558 / CN 202010733988.8 / HK 32020004548.4

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 為視障人士提供行走指引

專利申請
- US 17/099,887 / CN 2020 1148 9531.3
- US 16/823,558 / CN 202010733988.8 / HK 32020004548.4

商品化機會
- 技術授權許可

Cost Competitive Motor Driving System

具價格競爭力的驅動系統

Overview 簡介

Partnered with Superior Autonomation Limited, LSCM enhanced the features of the existing AGVs to offer an alternative driving system at competitive prices to the market.

LSCM與豐卓自動化科技有限公司合作，把現有的AGV功能加強，為市場提供具價格競爭力的替代驅動系統。

Problem addressed 解決方案

Electric motors are the core of robot locomotion that power the main drive motors for forward and reverse motions, as well as steering. In this project, a customised brushless motor driver is developed using phase advancing technology.

電動機是機械人移動的核心，它為主驅動電動機提供動力，以作出前進、後退移動以及轉向的動作。這項目中使用了相位提前技術，開發客製化的無刷電機驅動器。

Innovation 創新技術

- Brushless motors are used to provide more accurate speed control and positioning. Different kinds of brushless motor systems have been investigated and their performance, such as price and performance ratio, has been tested.
- Multi-channels motor driver has been developed to lower the production cost and enhance the performance of the system. Multi-channels synchronisation, which is not available in standard servo motor systems, is also introduced in this new system.
- A novel "phase advancing" technique has been applied to the motor driver to extend the motor working range. Phase advancing technique helps precisely control the commutation timing against the magnetic field so that a lower power motor can be used to reduce cost.
- 無刷電機能提供更精確的速度控制和定位。這項目研究了不同種類的無刷電機系統，並對它們的性能，如性價比，作出測試。
- 這項目開發了多通道電機驅動器，從而減低生產成本，並提高系統的性能。這個新系統還引入了一般伺服電機系統中沒有的多通道同步功能。
- 此電機驅動器應用了嶄新的「相位提前」技術，以擴展電動機的工作範圍。相位提前技術有助於精確地控制磁場的換向時間，從而可以使用較低功率的電動機來降低成本。

Key Impact 主要成效

Cost competitive motor driving system for warehouse AGV
應用於倉庫自動導航車、具價格競爭力的驅動系統

- This AGV specific motor/driving system helps reduce costs
- High accuracy
- Easy to control
- AGV 專用電機/驅動系統有助於降低成本
- 高精確度
- 易於操作

Research Completion
2022

Applications
- Logistics & Warehouse management

完成研究年份
2022

應用範疇
- 物流和倉庫管理

Detachable Follow-me Robot

可拆卸式自動隨行機械人

Overview 簡介

LSCM develops a follow-me robot with platooning technology to alleviate the workload of warehouse operators and ehnance the overall logistics efficiency.

LSCM開發具有列隊行駛技術的隨行機械人，以減輕倉務員的工作量，並提升整體的物流效率。

Problem addressed 解決方案

Detachable Follow-me Robot
可拆卸式自動隨行機械人

With the booming of e-commerce in recent years, warehouse operation faces new challenges. Changing from B2B to B2C operation, warehouse logistics tasks become more fragmented. The Follow-me Robot can help the workers carry goods and follow them around the warehouse. And the platooning technology enables the robot to increase capacity instantly without any need of infrastructure modification. This is more cost-effective for small-sized enterprises.

隨著近年電子商務的蓬勃發展，倉庫的運作面臨新的挑戰。營運模式從「企業對企業」轉變為「企業對客戶」，令倉庫的物流工作變得零散，工作量增加。而隨行機械人可以協助倉務員搬運貨物，並跟隨他們在倉庫中行走。列隊行駛技術則能令機械人即時增加負載量，而無需修改基礎設施，對於小型企業來說更具成本效益。

Innovation 創新技術

- Using Ultra-wide Band and vision technologies for personal tracking and platooning
- Automatic collision avoidance
- 使用超寬帶和視覺技術進行個人化跟隨和列隊行駛
- 自動防止碰撞

Key Impact 主要成效

- Enhance warehouse efficiency and productivity.
- Reduce workers' strain and workload.
- Help operator to transfer bulky and heavy items.
- 提升倉庫效率和生產力。
- 減輕工人的壓力和工作量。
- 協助操作員搬運重物。

Award 獎項

Silver Medal in the 50th International Exhibition of Inventions Geneva in 2025
Outstanding Indoor and Outdoor Entourage Robot in Smart Living Partnership Awards 2022
Bronze Medal at the 2nd Asia Exhibition of Innovations and Inventions Hong Kong in 2019
2025年第50屆日內瓦國際發明展銀獎
2022智慧生活夥伴大獎 — 傑出室內外隨行機械人
2019年第2屆亞洲創新發明展覽會 — 香港 銅獎

Research Completion
2022

Applications
- Logistics
- E-commerce centres
- Traditional warehouses
- Factories

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 物流
- 電子商務中心
- 傳統倉庫
- 工廠

商品化機會
- 技術授權許可

Heavy Duty Autonomous Guided Vehicles

重型自動導航搬運車

Overview 簡介

To keep pace with the rapid development of worldwide e-commerce, the industry relies on advanced warehouse management systems to minimise the processing time and enhance efficiency. The Heavy Duty Autonomous Guided Vehicle (AGV) developed by LSCM is suitable for local warehouses, mini-stores, factories and mass retailing shops. The AGV is not only capable of carrying goods of up to 1,000kg, but also handling stock-taking tasks during closing time.

隨着全球電子商貿發展日趨成熟，業界對倉存管理有極高的要求，希望藉此減少處理訂單的時間及提升整體管理和運作效率。LSCM研發的重型自動導航搬運車(AGV)適用於本地貨倉、工廠和大型零售店，它除了可以搬運重達1,000公斤的貨物，還可以於下班時段自動進行盤點工作，省時省力。

Problem addressed 解決方案

Local warehouses have been challenged by increasing rental and labour costs. There is also additional pressure to provide more value-added services. The deployment of autonomous guided vehicles in warehouses can reduce the reliance on manpower, enable a more efficient use of space, as well as quicker response to orders and more accurate operation.

本地倉庫一直面對人工和租金成本上升的挑戰，以及需要提供更多增值服務的壓力。而在倉庫中使用自動導航搬運車可減少人力，及更有效地善用倉庫的空間，亦可更快捷地處理訂單和令運作更準確。

Innovation 創新技術

Heavy Duty Autonomous Guided Vehicles
重型自動導航搬運車(AGV)

- AGV hardware:
  - Self-balancing (with uneven floor compensation)
  - Fast battery swapping / auto-charging
- AGV management software:
  - Applies intelligent algorithm to maximise space utilisation and supports a high-density storage configuration
  - Possesses simulation tools for layout design validation and AGV fleet size determination
  - Provides real-time monitoring of the current location, status alarm, and battery usage of the AGVs via mobile app
- AGV硬件：
  - 自動平衡(可於不平坦的地板作出調較)
  - 快速更換電池/自動充電
- AGV管理軟件：
  - 應用智能演算法，以充份利用空間及支援高密度儲存配置
  - 備有用於驗證佈局設計和制定AGV車隊規模的模擬工具
  - 透過流動應用程式實時監察AGV當前的位置、狀態、警報和電池用量

Key Impact 主要成效

- Significantly save manpower and time as well as increase operational safety in daily warehouse operations.
- Increased utilisation in shelves storage space with dense shelves arrangement.
- Provide 7 x 24 self-help cabinet access for mini-storage tenants with reserved time-slot for storage and retrieval.
- 顯著節省人力和時間，並提高日常倉庫操作的安全性。
- 透過密集的貨架排列以提高存儲空間的使用率。
- 為已預約作存儲和取件的小型租戶提供7x24的自助服務。

Research Completion
2021

Applications
- Logistics & Warehouse management
- Stores
- Storage

Patent Applications
- US 16/145,738 / CN 201811631932 / HK 18112532 / HK42020007684.2
- US 16/229,019 / CN 201910221119.4 / HK 18116433.1 / HK42020020203.4
- US 16/293,993 / CN 201910221119.4 / HK 19120552.5 / HK42020020192.9
- US 16/229,032 / CN 201910221119.4 / HK 18116437.7 / HK42020019421.5

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 物流和倉庫管理
- 商店
- 存儲空間

專利申請
- US 16/145,738 / CN 201811631932 / HK 18112532 / HK42020007684.2
- US 16/229,019 / CN 201910221119.4 / HK 18116433.1 / HK42020020203.4
- US 16/293,993 / CN 201910221119.4 / HK 19120552.5 / HK42020020192.9
- US 16/229,032 / CN 201910221119.4 / HK 18116437.7 / HK42020019421.5

商品化機會
- 技術授權許可

Tele-Control Warehouse Stackers Using 5G

5G遙控倉庫堆高車

Overview 簡介

LSCM enhances the functions of existing warehouse stackers by using Fifth Generation Cellular Network (5G) and advanced sensing technologies.

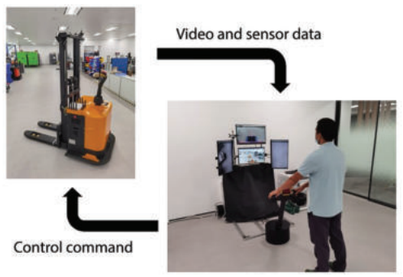
LSCM將第五代移動通訊網絡(5G)和先進的傳感器等技術融入現有的堆高車，以提升其功能。

Problem addressed 解決方案

High labour cost and rental cost are two common challenges faced by many local warehouses. Therefore, LSCM utilises 5G to provide high-speed and low-latency data transmission to enable the tele-control of multiple stackers at the same time, and allow the incorporation of remote sensing technologies such as cameras for live image processing, and distance detection through laser technology (LiDAR).

許多本地倉庫皆面對人工成本和租金高這兩大挑戰。因此，LSCM利用5G提供高速、低延遲的數據傳輸，以同時遠距離控制多輛堆高車，而且還可以結合遙距傳感技術來提高安全性，例如應用於實時圖像處理的攝錄鏡頭和透過激光雷達技術進行距離檢測。

Innovation 創新技術



Tele-Control Warehouse Stackers Using 5G
5G遙控倉庫堆高車

- High data transfer rate enabled by 5G technology with the features of enhanced mobile broadband (eMBB), massive machine-type communications (mMTC) and ultra-reliable low latency communication (URLLC) allows tele-control by establishing large-coverage, high performance and reliable communication.
- URLLC facilitates real-time control by lowering control latency to around 100ms, which is short enough for operators to respond in nearly real time according to what is displayed on the screen.
- Real-time assistive driving technologies and safety sensors have been applied. Operators can handle it without much training.
- 由5G技術實現的高數據傳輸速率，具有增強移動寬帶(eMBB)、海量機器通訊(mMTC)和高度可靠的低時延通訊(URLLC)等特點，能建立覆蓋範圍大、性能高和可靠的傳訊。
- 低時延通訊把時間延遲情況降低至大約100毫秒，操作員可以接近實時地根據屏幕上顯示的情況作出反應。
- 利用輔助移動技術及安全感應器，操作員無需太多培訓亦能操作。

Key Impact 主要成效

- The technologies allow multiple stackers, even in different locations, to be controlled in real time which can improve operational efficiency.
- More reliable and real-time communication compared to other wireless protocols.
- The technologies can be applied to remote vehicles in workspaces with dangerous/adverse environment. The working environment and safety can be enhanced.
- 這些技術允許實時控制多架堆高車(甚至在不同的地方進行)，提高運作效率。
- 與其他無線協議相比，通訊更加可靠和實時。
- 技術可以應用於需要在危險/環境惡劣的地方工作之車輛，以改善工作環境和其安全性。

Award 獎項

Outstanding Tele-Control Warehouse Stackers Using 5G in Smart Living Partnership Awards 2021

2021智慧生活夥伴大獎 — 傑出5G遙控倉庫堆高車

Research Completion
2021

Applications
- Logistics & Warehouse management

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 物流和倉庫管理

商品化機會
- 技術授權許可

Deliverbot

運送機械人

Overview 簡介

This technology developed by LSCM aims to provide automatic and reliable delivery services. The delivery robot was built with advanced software and hardware infrastructure, which enables it to operate in complex and dynamic environments.

這個由LSCM研發的技術旨在提供自動且可靠的送遞服務，這個以先進的軟件和硬件基礎架構構建的運送機械人，可在複雜和動態環境中行走。

Problem addressed 解決方案

The delivery robot helps to reduce the demand for manpower in offices and shops, etc., and enhance the operational efficiency.

運送機械人協助辦公室及商店等減低人手需求，並提高運作效率。

Innovation 創新技術

Deliverbot
運送機械人

- Deliverbot navigates via simultaneous localisation and mapping (SLAM) with lidar and LSCM's in-house trained deep-learning path planning policy, which enable it to smoothly pass through narrow paths with gateways and many moving obstacles.
- Data is collected automatically using state-of-the-art navigation algorithms with minimal manual control data for training. Furthermore, an end-to-end training framework for leveraging the strengths of various algorithms has been developed.
- Adopt content-based sensor fusion depth estimation for collision avoidance.
- 運送機械人利用激光雷達和LSCM研發的深度學習路徑規劃策略，透過即時定位與室內地圖構建(SLAM)進行導航，使之能夠順利通過帶有網關和充滿移動障礙物的狹窄路徑。
- 使用最先進的導航演算法自動收集數據，並使用最少的手動控制數據進行訓練。此外，還研究利用各種演算法的優勢作為端對端訓練的框架。
- 採用基於內容的傳感器融合深度估算來避免碰撞。

Key Impact 主要成效

- Ease the shortage of resources and manpower.
- Improve productivity and efficiency.
- Help tackle the challenges of coordinating with a team of robots and performing point-to-point navigation in dynamic and complex environments such as airport and warehouse.
- 舒緩資源和人力短缺的問題。
- 提高生產力和工作效率。
- 協助應對與機械人團隊進行協調以及在機場和倉庫等動態及複雜環境中執行點對點導航的挑戰。

Award 獎項

Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days

2021年日內瓦國際發明展銀獎

Research Completion
2021

Applications
- Logistics & Warehouse Management
- Office automation

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 物流和倉庫管理
- 辦公自動化

商品化機會
- 技術授權許可

Robotic Material Preparation Device for Product Conformity Assessements

適用於品質檢定的材料準備機械人裝置

Overview 簡介

The robotic material preparation device can help to prepare product samples of kitchenware, garment/clothing, woodware toys and so on for chemical or biological conformity assessments. The samples obtained can be in different colours, shapes, sizes and made of various materials.

機械人裝置適用於拿取廚具、衣服/布料、木製玩具等產品的樣本，以進行化學或生物質量評定。裝置可處理不同顏色、形狀、尺寸和物料的樣本。

Problem addressed 解決方案

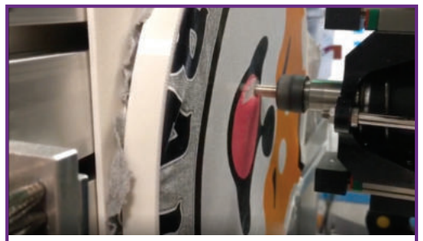
Common material preparation procedures are critical for product safety and necessary to be conducted in product compliance laboratories around the world. However, the conformity assessments are usually labour-intensive and repetitive. The robotic material preparation device facilitates product conformity assessments in an efficient way.

正確的材料準備程序對於世界各地許多產品安全和質量檢定的實驗室至為重要，但這些程序通常都是勞動密集和不斷重複的。而材料準備機械人裝置則有助提高產品質量評估的效率。

Innovation 創新技術

- This robotic device is comprised of tactile and visual guidance. An ionised air blower and a sample collection tank in the device are designed to avoid cross-contamination. In addition to the design, there is a novel high-speed milling cutter function to remove samples from the surface of selected items effectively.
- The device has successfully passed the conformity test with the support of SGS, a renowned product safety and conformity assessment organisation.
- 此機械人裝置是以觸覺和視覺來導引的。為了避免交叉污染，此裝置設置了電離子吹風機和樣本收集箱。此外，還加設了一個新型高速切割機，從而有效地從所選項目的表面上拿取樣本。
- 此機械人裝置在著名的產品安全和合格評定機構SGS的支持下，成功通過測試。

Key Impact 主要成效



Robotic Material Preparation Device Using Tactile and Visual Guidance
以觸覺和視覺導引的材料準備機械人

- Increase the efficiency of product conformity assessment
- Reduce human errors during the process
- 提高產品規格評定的效率
- 減少流程中的人為錯誤

Research Completion
2019

Applications
- Product and quality testing

Commercialisation opportunities
- Technology licensing

完成研究年份
2019

應用範疇
- 產品及質量驗測

商品化機會
- 技術授權許可

Smart Service Robot

智能服務機械人

Overview 簡介

LSCM developed key building block technologies of service robots for warehouses, banks, and elderly homes. People searching, navigation and motion stability techniques are developed.

LSCM研發了適用於倉庫、銀行和長者院舍的服務機械人的關鍵技術。當中包括尋人、導航和移動穩定性等技術。

Problem addressed 解決方案

Some industries are in need of manpower to interact with customers, or even perform complicated and dangerous tasks which could threaten human life. And different service robots could be deployed to handle specific tasks. For example, wall crawling robots are deployed to perform pipe inspection tasks in nuclear power plants.

不少行業需要員工與顧客進行互動；在特殊情況下，甚至需要執行既複雜又危險的工作。而不同的服務機械人就可以協助工作人員處理特定工作，例如在核電站應用爬牆機械人執行管道檢查工作。

Innovation 創新技術

- The Smart Service Robot can navigate and avoid obstacles in indoor environment. The SLAM and RGB-Depth camera are able to create an instant map of the area. It helps the robot navigate on its own path to reach its destination.
- The robot can move around and search for specifc persons. Infrared camera can be installed in the service robot to enable it to move towards the specific person.
- 這個智能服務機械人可以在室內環境下進行導航和避開障礙物。SLAM和RGB深度相機能夠即時創建該區域的地圖，它引導機械人根據自己的路徑行走以達到目的地。
- 智能服務機械人可安裝紅外線攝錄器，向目標人物的方向前進，以尋找指定的人。

Key Impact 主要成效

Smart Service Robot
智能服務機械人

- Its built-in functions of self-navigation and different interactive applications can cater for the needs of various sectors.
- 內置自動導航和不同互動功能的服務機械人，能滿足各行業的需求。

Award 獎項

Silver Medal at the 2nd Asia Exhibition of Innovations and Inventions Hong Kong in 2019

2019年第2屆亞洲創新發明展覽會 — 香港 銀獎

Research Completion
2019

Applications
- Elderly homes, Estate management, Shopping mall

Commercialisation opportunities
- Technology licensing

完成研究年份
2019

應用範疇
- 長者院舍、屋苑管理、商場

商品化機會
- 技術授權許可

Smart Lifter

智能起重機

Overview 簡介

LSCM's Smart Lifter is a lifter/transporter that can perform object handling tasks remotely through human-machine cooperation. It combines the functions of forklifts and cranes while its size is smaller than either of the machines. With additional sensors, such as force sensors, the operational efficiency can be enhanced.

LSCM研發的智能起重機是一個可搖控的起重/運輸機器，可透過人機協作以遙控方式執行工作。它的體積雖小，但結合了叉車和吊車的功能。同時亦可加上不同的感應器(如力度感應器)來提高操作效率。

Problem addressed 解決方案

Most of the local warehouses are small and crowded. LSCM's smart lifter/transporter is designed for conventional warehouses in Hong Kong. It can carry out delegated and fine-manipulative tasks. In addition, it can be modified and changed to a stratified (or personalised) lifter for elderly care.

一般本地倉庫面積細小狹窄。而LSCM的智能起重機/運輸機器是針對本地傳統倉庫而設計的。它不但可執行特定和精細的工作，還可以輕易地改裝為適用於長者護理的起重機。

Innovation 創新技術

- An adjustable level controller to provide additional supporting force for object manipulation/handling.
- The lifter is tailored for confined and unstructured warehouses or settings. It assists human operators to manoeuvre around such environment to enhance overall productivity and efficiency in warehouses.
- A new modular end-effector (including its controller) is equipped for handling various and multiple objects of different sizes.
- 可調節的高度控制器可提供額外的支援來操作和處理物件。
- 智能起重機有助操作人員在擠迫和複雜的倉庫或環境中工作，從而提高倉庫整體的生產力和效率。
- 智能起重機備有一個新的組合式末端執行器(包括其控制器)，協助處理多個不同形狀和種類的物件。

Key Impact 主要成效

Smart Lifter/Transporter for Object Handling in Confined Spaces
適用於擠迫環境的智能起重機/運輸機器

- Help workers to handle various objects safely and easily.
- Able to be changed into a stratified lifter for elderly care.
- 協助工作人員既安全又輕鬆地處理各種物件。
- 可改裝為適用於長者護理的升降台。

Research Completion
2019

Applications
- Transfer heavy items in warehouses
- Transfer elderly people in elderly homes

Patent Applications
- US 17/098,188
- CN 2021 1013 8900.2

Commercialisation opportunities
- Technology licensing

完成研究年份
2019

應用範疇
- 在倉庫搬運重物
- 在長者院舍內移動長者

專利申請
- US 17/098,188
- CN 2021 1013 8900.2

商品化機會
- 技術授權許可

Physical Sensory Systems for Human-Robot Collaborative Tasks

協作機械人的傳感系統

Overview 簡介

Robot Safety is a major requirement for any robotics application. This project aims to develop new sensors deployed by robots, to ensure the user's safety when interacting with robots.

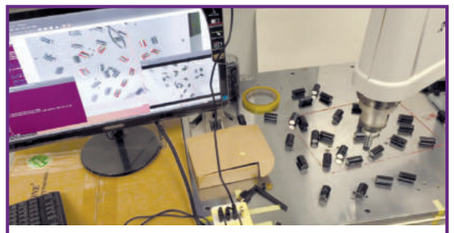
確保安全對於機械人應用最為重要。這項目旨在研發應用於機械人的新型傳感器，以確保與機械人進行互動時的安全。

Problem addressed 解決方案

Robot Safety is a prominent requirement for any robotics applications. In the past, robotic arms were installed in enclosed environments to avoid accidents. To reduce the potential hazards arising from such interactions, this project develops new sensors which can be deployed to ensure human safety when interacting with robots.

確保安全對於所有機械人的應用最為重要。以往，機械臂必須安裝在封閉的環境中，以避免對使用者造成傷害。為了減少意外，這項目研發了新的傳感器，它可以安裝在機械人上，以確保使用者和機械人在進行互動時的安全。

Innovation 創新技術



Physical Sensory Systems for Human-Robot Collaborative Tasks
協作機械人的傳感系統

- Robotic vision system for identifying capacitors
- Associated training application for training new electronic components
- Robot whiskers, robot skin, robot vision, and a human-robot collaborative (HRC) controller for facilitating safe integration of robotics technology in local industries
- 用於識別電容器的機械人視覺系統
- 用於培訓新電子組件的相關培訓應用程式
- 機械人鬍鬚、機械人皮膚、機械人視覺，和人機協作(HRC)控制器有助促進本地機械人技術的安全性

Key Impact 主要成效

- The robot whisker sensors aim to detect/sense the presence of humans or objects within the proximity range.
- A low-cost flexible robot skin sensor array is used for the detection of force/pressure.
- The project leverages DVS camera's high motion sensitivity and minimal data transfer overhead to detect the human body and react to it in real time. It also uses Deep Learning (DL) for effectively recognising hand movements and identifying moving hands.
- The invented technology detects and segments components from the background so that the robot can pick the correct components. It estimates the pose and sub-component for each type of component, so that the robot can pick up the component from the best direction. It also estimates the occlusion status of components so that the robot will not touch the components that are covered by others.
- 機械人鬍鬚傳感器用於檢測/感測附近的人或物體。
- 低成本的機械人皮膚傳感器陣列，適用於檢測動力/壓力。
- 此項目充分利用DVS攝像機的高動態靈敏度和低數據傳輸來檢測人體，並作出實時反應。它還能透過深度學習(DL)進行有效的手部移動識別和手部識別。
- 這技術可從後台檢測並分割不同類型組件，以便機械人選擇正確的組件。機械人能夠對每種組件的形態和配件進行評估，從而令機械人可從最佳的方向選取組件。同時，它能估計組件的遮擋狀態，這樣機械人便不會觸及其他被覆蓋著的組件。

Research Completion
2018

Applications
- Physical Sensory Systems for Human-Robot Collaborative Tasks

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 適用於人機協作任務的物理傳感系統

商品化機會
- 技術授權許可

Smart Robot Hand and Eye Co-ordination Enabling Technologies

智能手眼協調機械臂定位系統

Overview 簡介

LSCM's multi-camera vision coordination control system and flexible end-effector are designed for commercially available robotic arms to handle objects in different shapes, colours, sizes and surface textures that move along conveyor belts.

LSCM設計的多種影像協調控制系統，以及靈活的機械臂，可應用到商用機械臂上，處理輸送帶上不同形狀、顏色、尺寸和表面紋理的物件。

Problem addressed 解決方案

Repetitive tasks often cause strain injury, and are time-consuming. Service robots can be deployed to perform repetitive tasks, e.g. label affixing on baggages, to reduce workers' strain injury and save the time required to complete the tasks.

重複性工作容易令工人身體勞損，而且耗時。而服務機械人則可以代替人手進行重複性工作，例如利用機械臂於行李上張貼標簽，不但能減少工人的勞損，亦能節省時間。

Innovation 創新技術

- The RGB-D vision system sends shape, size and surface information of the baggage to the pneumatic end-effector for the label affixing tasks. The 3D model and RGB image are passed to a machine learning algorithm to segment the objects in the scene.
- After each object is detected and classified as target object by the end-effector, surface fitting algorithm is applied to the 3D model to identify the suitable position for the end effector to affix labels on the baggage.
- The pneumatic end-effector uses vacuum bump to draw out labels from the label dispenser, and replicates manual label affixing tasks while using air-jet to place the labels on the baggage.
- RGB-D視覺系統將行李的形狀、尺寸和表面紋理的資訊發送給氣動末端執行器，進行標籤黏貼。機械學習演算法會把接收到的3D模型和RGB圖像進行分析，從而即時劃分物件的位置。
- 當末端執行器偵測到物件，並把它鎖定為目標物件後，表面擬合演算法便會應用到3D模型中，從而在行李上找出適合黏貼標籤的位置。
- 氣動末端執行器使用真空氣泵，從盛載標籤的容器中吸起標籤，然後模仿手動黏貼標籤的方法，使用空氣噴射將標籤貼在行李上。

Key Impact 主要成效

Smart Robot Hand and Eye Co-ordination Enabling Technologies for e-Commerce Warehouse Management
應用於電子商貿倉庫之智慧型手眼協調機械臂定位系統

- This service robot can replicate manual repetitive label affixing tasks to reduce human fatigue.
- The pilot run of this technology has been conducted by the Hong Kong International Airport (HKIA) for testing its deployment in actual industrial environment.
- 服務機械人可以代替人手，進行張貼標籤的重複性工作，減少工人的勞損。
- 此技術已在香港國際機場(HKIA)試行，以便在真實的工業環境中應用。

Research Completion
2018

Applications
- Luggage label affixing

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 張貼行李標籤

商品化機會
- 技術授權許可

Port Community System (PCS)

港口社區系統

Overview 簡介

LSCM partners with the Transport and Logistics Bureau to develop and manage the Port Community System (PCS). Leveraging advanced technologies to effectively track and visualise the global supply chain and port logistics, it boosts the competitiveness of Hong Kong's port.

LSCM與運輸及物流局合作研發及管理港口社區系統，應用先進的創新技術對全球供應鏈和港口物流進行追蹤和可視化管理，提升香港港口的整體競爭力。

Problem addressed 解決方案

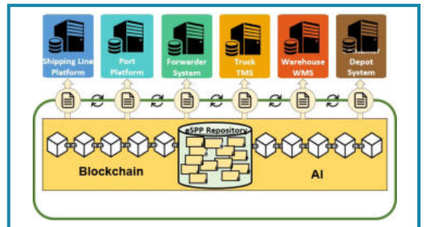
The growing uncertainty in the global supply chains is increasingly disrupting international trade and economy. To mitigate such challenges, Hong Kong must leverage advanced technologies to strengthen its logistics capabilities. Meanwhile, the rapid growth of e-commerce has driven a surge in the demand for high-quality and sophisticated e-logistics services. However, Hong Kong still lacks a unified logistics tracking system that integrates sea, air, and land transport data. To consolidate its position as a leading global logistics hub for multimodal transport, it's critical for Hong Kong to accelerate the digitalisation of its logistics infrastructure.

全球供應鏈的不穩定性正在影響環球貿易和經濟，為應對此類挑戰，香港必需利用先進科技提升物流服務能力。與此同時，電子商貿持續迅速發展令高品質電子物流服務的需求激增。但香港缺乏整合海、陸、空運資訊的統一物流追蹤系統。因此，加快物流基礎設施的數碼化轉型，是鞏固香港作為航空、航運及多式聯運的全球領先物流樞紐地位的關鍵。

Innovation 創新技術

- Research and development of a blockchain-based data repository with applications developed for port users and API for their systems to facilitate their digitisation and data sharing on blockchain.
- To support smart port analytics, LSCM has partnered with the Hong Kong Polytechnic University and Tsinghua University to study the vessel's AIS data to calculate complex vessel movements, berthing and mooring patterns, and generate analytics on port efficiency, congestion levels, and trajectory statistics, thereby enabling enhanced inter-port connectivity and data-driven route re-scheduling analysis
- 研究並開發基於區塊鏈的數據儲存庫，結合為港口用戶研發的應用程式，及其系統的API，以促進港口的數碼化，並透過區塊鏈共享數據。
- 為了支援智慧港口的分析工作，LSCM與香港理工大學及清華大學合作研究船舶的AIS數據，以計算其複雜的移動、靠泊及繫泊模式，並提供其運作效率、航道擠塞程度及軌跡之統計分析，從而提升港口間聯通性，並為航線重新調整分析提供數據支持。

Key Impact 主要成效



Port Community System 港口社區系統

- Leverage advanced technologies to enable efficient tracking and visualisation of global supply chains and port logistics.
- Facilitate trade by streamlining information exchange, reducing paperwork, accelerating customs clearance, and improving logistics efficiency through real-time data sharing among port stakeholders.
- 利用先進的科技，實現全球供應鏈及港口物流的高效追蹤與可視化管理。
- 透過港口社群內的即時數據共享，簡化資訊交換流程、減少文書工作、加快清關流程，並提升物流效率，從而促進貿易發展。

Award 獎項

Bronze Medal in the 49th International Exhibition of Inventions Geneva in 2024
2024年第49屆日內瓦國際發明展銅獎
2024年第4屆亞洲創新發明展覽會 — 香港 銅獎

Official Launch Year
2026

Applications
- Trade
- Logistics

Commercialisation opportunities
- Technology licensing

項目推出年份
2026

應用範疇
- 貿易
- 物流

商品化機會
- 技術授權許可

e-Publishing Platform

智能電子書轉換系統

Overview 簡介

LSCM develops a self-service platform for translation and audio book production using AI technology.

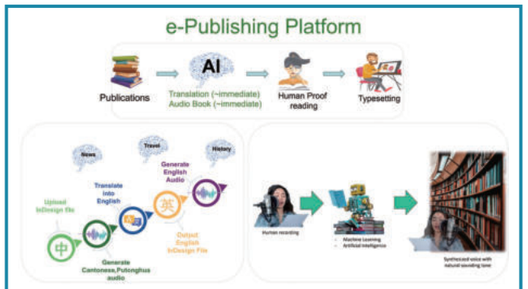
LSCM利用人工智能技術研發了一個適用於翻譯和製作有聲書的自助服務平台。

Problem addressed 解決方案

This is a self-service platform for translation and audio production using AI technology. With the latest AI technology, articles can be pre-translated for human's final proof reading while keeping the typesetting and formatting similar to the original version to minimise the re-typesetting tasks. It thus shortens the time to produce translated e-books. With the change in reading habit, the platform can also generate audio from text for audio book production which drastically shortens the time compared to human recording, thereby enhancing the efficiency and productivity of the publishing industry. Artificial intelligence enriches the quantity and variety of e-books available in Hong Kong, as well as providing a wider selection.

這個自助服務平台應用最新的人工智能技術，可先翻譯文字，並保留與原文版本近似的排版及格式，再由人手進行最後校對，以減少重新排版的工作，大大縮短了製作翻譯電子書的時間。隨著閱讀模式的改變，此平台亦可將文字轉換為音訊以製作有聲書，與真人錄音相比，大大縮短了製作有聲書的時間，亦減省了錄音的成本，有助提升出版業界的效率及生產力。人工智能技術有助香港增加電子書數量及種類以供讀者選擇。

Innovation 創新技術



e-Publishing Platform 智能電子書轉換系統

- With the latest AI technology, articles can be pre-translated for human proof reading whilst keeping the typesetting similar to the original version.
- The platform can generate audio from text for audio book production.
- 利用最新的人工智能技術，可預先翻譯文章，同時能保留與原文版本近似的排版效果，以便人手進行最後校對。
- 此平台可將文字轉換為音訊以製作有聲書。

Key Impact 主要成效

- Shorten the time to produce translated e-books.
- Drastically shorten the time and cost compared to human recording for producing audio books.
- 減省製作翻譯電子書的時間。
- 與真人錄音相比，大幅縮短了製作有聲書的時間及減省成本。

Award 獎項

Silver Medal in the 49th International Exhibition of Inventions Geneva in 2024

2024年第49屆日內瓦國際發明展銀獎

Research Completion
2024

Applications
- Publishing

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 出版

商品化機會
- 技術授權許可

Cross-boundary Blockchain for Pharmaceutical Logistics Information Management

基於區塊鏈的跨境藥物物流訊息平台

Overview 簡介

To facilitate the use of Hong Kong-registered pharmaceuticals in designated healthcare institutions in the Greater Bay Area (GBA), LSCM develops a cross-boundary track & trace platform for the management of pharmaceuticals supply chain and approval.

為配合在大灣區的指定醫療機構可以使用已獲香港註冊認可的藥物，LSCM研發了一個藥物供應鏈跨境溯源及藥物審批管理平台。

Problem addressed 解決方案

This project aims to tackle the issues arose related to the cross-boundary distribution of pharmaceuticals, such as standard compatibility, privacy protection, data sharing and data coordination.

此項目旨在解決針對藥物跨境流通所涉及的標準相容、隱私保護、數據共用與協同等方面的問題。

Innovation 創新技術

- A cross-boundary track & trace platform for pharmaceuticals supply chain based on consortium blockchain.
- Pharmaceutical approval management platform based on domestic blockchain.
- Develop Guangdong-Hong Kong data cross-chain channel technology, define data exchange standards, and provide data exchange interface.
- Formulate the standards and specifications of the development of Guangdong-Hong Kong pharmaceuticals quality and safety traceability system.
- 基於聯盟鏈為藥物供應鏈研發跨境溯源平台。
- 基於本地供應鏈研發藥物審批管理平台。
- 發展粵港數據跨鏈技術，界定數據協同交換標準，提供數據互換接口。
- 建立粵港藥業及安全可追溯系統的建造標準和規格。

Key Impact 主要成效

Cross-boundary Blockchain for Pharmaceutical Logistics Information Management
基於區塊鏈的跨境藥物物流訊息平台

- Establish a secure and efficient channel for data exchange.
- Provide a one-stop cross-boundary pharmaceuticals distribution and regulation platform for pharmaceuticals distributors in Hong Kong and GBA, hospitals in GBA, as well as regulatory authorities in Chinese Mainland.
- Achieve standard compatibility, trackability and traceability.
- 建立安全高效的數據協同交換通道。
- 為香港和大灣區的藥物批發企業、大灣區醫療機構、中國內地監管部門等提供一站式藥物跨境流通及監管平台。
- 實現標準相容、來源可查、去向可追。

Research Completion
2023

Applications
- Cross-boundary distribution of pharmaceuticals
- Product track & trace

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 藥物的跨境流通
- 商品溯源追蹤

商品化機會
- 技術授權許可

AIoT Herbal Picking and Delivery System for Chinese Medicine Hospital

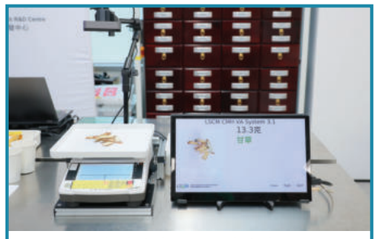
應用於中醫院之AIoT中藥物流系統

Overview 簡介

The first Chinese Medicine Hospital in Hong Kong is expected to commence service in phases starting from 2025. Expertised in applied technologies of artificial intelligence (AI), IoT, and Robotics, LSCM develops an AIoT Herbal Picking and Delivery System that can facilitate the hospitals' busy operations in future.

香港首間中醫醫院預計將於2025年起分階段投入服務。LSCM應用擅長的人工智能(AI)、物聯網(IoT)、機械人等技術，研發了AIoT中藥物流系統和運送機械人系統，以應付將來在醫院繁忙的運作。

Problem addressed 解決方案



AIoT Herbal Picking and Delivery System for Chinese Medicine Hospital
應用於中醫院之AIoT中藥物流系統

Typically, the gathering of herbal ingredients for decoctions of traditional Chinese medicine relies heavily on manual dispensing, which is a skill- and experience-intensive process. Hospitals have a high demand for speed and efficiency. Moreover, dispensary shop floor by its nature comprises many complicated processes from storage, dispensing, decocting, to delivery, which pose great challenges to Chinese Medicine Hospitals.

傳統上中藥煎劑都依賴人手配藥。這是一個需要專業技能和經驗的過程，而醫院對速度和效率的要求甚高。此外，藥房的工場由倉儲、配藥、煎藥到送藥，牽涉的流程十分繁複，為中醫醫院帶來不少挑戰。

Innovation 創新技術

- A pick-to-light system on a traditional Chinese Medicine cabinet to allow dispensing staff to quickly locate the herbal medicine, especially in a large operation like Chinese Medicine Hospital.
- An AI Visual Analytic system that can verify the picked Chinese Medicine against the prescription, trace the log records, and generate big data on medicine usage pattern. RFID and sensors on a conventional conveyor system that can guide the entire process from dispensing, decocting to delivery and trace the medicine.
- Medicine Delivery Management System that integrates the data and control among the different subsystems on the shop floor. It can also direct and coordinate the deliverbot fleet to deliver the dispensed medicines to designated locations in the hospital.
- 透過應用pick-to-light系統於傳統中藥櫃上，使配藥人員能夠快速找到中藥材，這尤其適合在如中醫醫院這樣的大規模應用中。
- 人工智能視覺分析系統能驗證所挑選的中藥，追溯日誌記錄，和藥物使用的大數據。傳統輸送帶系統上的RFID和傳感器可指導從配藥、煎煮到交付的整個過程和追溯藥物。
- 藥物配送管理系統集合了工場內不同系統之間的數據和管理。它還可以指揮和協調配送機械人團隊，將需要分發的藥物運送到醫院內的指定的地點。

Key Impact 主要成效

- IoT pick-to-light to facilitate the operation efficiency of prescription picking on a large-scale shopfloor.
- An AI Visual Analytic system to act as a quality gatekeeper to enhance the accuracy of prescription picking by verifying the picked medicines.
- Fleet of deliverbots to alleviate hospital staff from laborious delivery work around the hospital by auto-navigating safely in co-working space with human.
- Medicine Delivery Management System to facilitate the integrative and synchronous dispensing and delivery processes around the shopfloor, also to support real-time track-and-trace visibility with extensive IoT data captures, and that enables performance data analytics for management.
- 物聯網pick-to-light有助提升在大型工場內選取中藥材的效率。
- 人工智能視覺分析系統能驗證處方，監控質量，以提高配藥的準確性。
- 運送機械人團隊能在與工作人員共同工作的空間內安全地自動導航，減輕醫院職員需要運送藥物的工作量。
- 藥物配送管理系統可整合和同步協調配藥和送藥流程，還可透過廣泛的物聯網數據達到實時追蹤可視化，並且支援績效數據分析以進行管理。

Award 獎項

Bronze Medal in the 48th International Exhibition of Inventions Geneva in 2023

Silver Medal in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023

Outstanding Innovative Chinese Medicine Picking and Delivery System in Smart Living Partnership Awards 2022

2023年第48屆日內瓦國際發明展銅獎

2023年第3屆亞洲創新發明展覽會 — 香港 銀獎

2022智慧生活夥伴大獎 — 傑出創新中藥物流系統

Research Completion
2023

Applications
- Hospitals

Patent Applications
- US 18/184,154
- CN 2023 1030 8349.0
- HK 3202 3070 061.1

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 醫院

專利申請
- US 18/184,154
- CN 2023 1030 8349.0
- HK 3202 3070 061.1

商品化機會
- 技術授權許可

E-Commerce / E-Logistics Transaction On Cloud

電子商貿/電子物流交易執行的雲計算系統

Overview 簡介

In this project, the cloud-based application and API platform are developed for Micro, Small and Medium Enterprises (MSMEs) to facilitate business negotiations over the internet, progressing trade deals like signing business contracts, notifying shipment, and making payment arrangements, etc. And in the unfortunate case of arguments, it also provides online dispute resolution services.

此項目開發了雲端應用程式和應用程式接口平台，供中，小，微型企業使用，以應對他們於網上洽談、商業交易，如簽署商業合約，通知、運輸和付款安排等，以及最後如出現分歧時提供爭議解決服務。

Problem addressed 解決方案

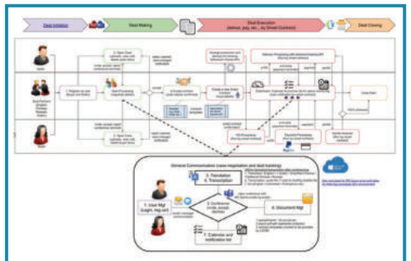
Over the past 10 years, e-commerce of buying and selling goods over the Internet has been developed into a global trend. As the MSMEs start and/or expand their businesses on the Internet, they need more IT-based means and tools to enable their business transactions.

在過去十年，電子商務已經發展成為通過互聯網購買和銷售商品的全球趨勢。隨著中，小，微型企業在互聯網上創建和/或擴展其業務，他們需要更多基於科技的方法和工具來透過互聯網進行業務交易。

Innovation 創新技術

- Smart Contract on Blockchain has great potential in supporting the automation of the business contract execution. All events of conditions and actions can be recorded in Blockchain as non-repudiated registry. Blockchain gives MSMEs the advantage of transacting securely over the open Internet while being protected for confidentiality.
- AI with Deep Computing has advanced translation and transcription to the accuracy comprehensible for transacting parties to communicate in the multi-lingual markets. Business documentations and virtual meeting discussions can be translated and transcribed to the understandable languages for easy communication among transacting parties.
- A novel workflow on training a domain specific model consists of extracting and preparing large amount of paired up sentences from relevant domain corpora.
- 區塊鏈智能合約的新興技術在支援執行業務合同之自動化上擁有巨大的潛力。所有情況和行動都可以成為不可刪改的記錄，並註冊在區塊鏈中。區塊鏈為中，小，微型企業提供了在開放互聯網上安全交易的優勢，同時維護了其機密性。
- 人工智能與深度計算提高了翻譯和轉錄的準確性，使交易各方之間能夠在不同語言的市場進行交流。業務文件和虛擬會議討論可以被翻譯並轉錄為可理解的語言，以便交易方之間進行通訊。
- 嶄新的訓練特定領域模型工作流程，當中包括從不同的相關領域語料庫中擷取和準備大量已配對好的句子。

Key Impact 主要成效



e-Commerce / e-Logistics Transaction Execution on Cloud with Smart Contract, Blockchain and AI Technologies
透過智能合約，區塊鏈和人工智能技術實現電子商貿/電子物流交易執行的雲計算系統

- The technology can enable MSMEs for easy adoption when setting up their Internet channel on the platform with each other during the marketing communications, deal-making, contractual agreement, execution, and settlement phases.
- It provides MSMEs with machine translation / transcription to help expand their business in the global markets, and assist marketers, such as InvestHK, to handle multi-lingual marketing materials.
- 此技術可以讓中，小，微型企業在市場營銷、交易制定、合同協議、執行和結算階段上輕鬆地於平台上互相建立互聯網的渠道。
- 它使中，小，微型企業能夠透過機械翻譯/轉錄，將業務範圍拓展到全球市場，協助投資推廣署等營銷人員處理多國語言的營銷材料。

Research Completion
2023

Applications
- Online businesses for Micro, Small and Medium Enterprises

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 中，小，微型企業互聯網業務交易

商品化機會
- 技術授權許可

Artificial Intelligence for Traffic Survey Based on Drone Videos

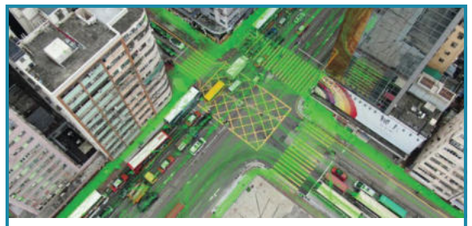
基於航拍視頻的人工智能交通統計工具

Overview 簡介

The artificial intelligence (AI) tools developed by LSCM are able to analyse the traffic flow based on the video clips to classify the vehicle types, track the trajectories, and determine the entry & exit time of the vehicles in a specific area. In addition, the tools calculate the pedestrian counts and flow.

LSCM研發了一套人工智能工具，能夠根據在特定區域內拍攝的影片，將車輛分類、追蹤其軌跡、並確定進出區域的時間。同時，計算區域內行人數量和流向。

Problem addressed 解決方案



Artificial Intelligence for Traffic Survey Based on Drone Videos
基於航拍視頻的人工智能交通統計工具

The traditional way to conduct traffic survey is to deploy workers to the specific areas. However, it may require more resources especially at remote or unreachable areas. The AI tools can analyse traffic data from the videos captured by drones which can facilitate better allocation of resources.

傳統的交通統計需要由工作人員於實地進行，如在偏遠或工作人員難以到達的地區進行統計，便需要使用較多資源。這套人工智能工具可透過航拍的影片收集交通統計數據，以便更有效地分配資源。

Innovation 創新技術

- The effective detection height ranges from 50 to 90 meters above the ground with a top view and 45-degree camera angles. An image stabiliser software component is implemented to reduce the impact of camera vibration caused by strong wind.
- The AI tools are developed to extract traffic data from video clips captured by drones at junctions, interchanges and roads of different configurations with accuracy up to 95%.
- The AI tools provide accurate digital data of a traffic scene and support a one-stop solution to obtain all traffic behaviour parameters.
- 有效探測高度為距離地面50至90米範圍，並支援俯視和45度攝像角度。採用了圖像穩定器軟組件，以減輕強風引致相機震動的影響。
- 這套人工智能工具能從無人機系統於路口、交匯處和道路上拍攝的影片中擷取交通數據，其準確度達到95%。
- 為指定地區提供準確的數據採集，並支援一站式系統以獲取所有交通行為參數。

Key Impact 主要成效

- It can be flexibly deployed in remote or unreachable areas for monitoring road conditions, for example, in the aftermath of inclement weather and during large-scale public events when accessibility may be a problem.
- Provide comprehensive analysis data with less manpower resources.
- Provide high accuracy up to 95%
- 可以於偏遠或難以到達的地區靈活地監測道路狀況，特別在惡劣天氣過後、或於公眾大型活動期間出現路面阻礙時。
- 可以在較少的人力資源下提供全面的數據分析。
- 達至95%的高準確度

Award 獎項

Bronze medal at the Special Edition 2022 Invention Geneva Evaluation Days
2022年日內瓦國際發明展銅獎

Research Completion
2022

Applications
- Traffic Planning
- Traffic Survey
- Vehicle Tracking
- Pedestrian counts

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 交通規劃
- 交通統計
- 車輛追蹤
- 行人流量計算

商品化機會
- 技術授權許可

XRCC - Extended Reality Content Creation Suite

XRCC - 延展實境創作套件

Overview 簡介

In collaboration with the University of Hong Kong, LSCM developed a technology that addresses the important issue of creation of high-quality virtual reality (VR) content for specialised training and operational scenarios in the logistics and service sectors in a fast, manageable, and cost-effective manner. An integrated suite of virtual reality content creation tools, namely, Content Creator Suite, is developed. It provides the capabilities for industrial and business users to produce professional, domain-specific training and operational scenarios in fully interactable environments with minimal time and effort.

LSCM與香港大學攜手合作，研發一個整合式虛擬實境應用開發套件。此虛擬實境應用開發套件(Content Creator Suite)應用頂尖人工智能以及軟件開發技術，適用於各專業領域範疇，方便各業內人士在無需專業軟件開發人員的協助下，簡單高效地製作高質素互動虛擬實境應用程式。用家使用套件內不同模塊的開發工具，可以簡單快速地建構符合其專業應用的複雜虛擬實境互動應用程式，例如操作程序和工業培訓。

Problem addressed 解決方案

A Smart Integrated Suite for Easy and Cost-Effective Virtual Reality Content Creation
整合式智能虛擬實境應用開發套件

The traditional VR content development process is costly and time-consuming which involves the regular communication among different parties, especially for understanding the knowledge from each other, learning about the tools, and adapting the applications to different platforms. Compared to the traditional approach as aforementioned, the Integrated Virtual Reality Content Creator Suite allows the domain-specific experts to easily produce high-quality VR content without the need to understand the underlying technological aspects of VR content creation. More importantly, the Suite can streamline the creation and production process of generic and domain-specific VR content which can be readily deployed in a wide range of VR devices, including immersive CAVE systems.

傳統的虛擬實境應用開發過程成本高、耗時長，並涉及開發者和客戶之間的定期溝通，尤其在了解彼此的知識領域(包括培訓需求和開發軟件的限制)，學習使用虛擬實境工具和編譯到各種虛擬實境設備等方面。與上述傳統方法相比，整合式智能虛擬實境應用開發套件 (Content Creator Suite)可讓各領域的專家輕鬆地製作高質量的虛擬實境應用程式，而無需了解虛擬實境應用開發的技術層面。更重要的是，此開發套件提供精簡的應用開發流程，極大程度簡化製作通用和特定領域虛擬實境解決方案的過程。與此同時，開發套件製作的應用程式易於應用到各種虛擬實景設備上，包括沉浸式全自動化虛擬實境系統(Immersive CAVE systems)。

Innovation 創新技術

- An integrated suite for virtual reality content creation providing a holistic one-stop approach in creation and testing of interactable virtual reality contents, with a simple drag-and-drop user interface that enables the user to build and play VR contents without the need to write a single line of code or possess the background knowledge to handle and manipulate the various types of source materials.
- The solution features artificial intelligence-powered VR content creation, in which the user is no longer limited to access the content provided in the tools' content library (i.e. 3D models) and the user can also create VR content of various levels of details using the methodologies included in the resources manager module.
- It supports a range of popular and unconventional, or even customised VR hardware systems.
- 用於虛擬實境內容創建的集成套件提供創建和測試互動虛擬實境內容的一站式整合方案。使用者只需在用戶界面上簡單的拖放虛擬物件，即可構建和執行虛擬實境的內容，以及處理和操作各種類型的VR資源，而無需編寫程式或擁有背景知識。
- 虛擬實境應用開發套件的解決方案以人工智能驅動的內容創建為特色，用家可以使用工具內容庫中提供的立體模型庫(3D content library)及資源管理(Resources Manager Module)的預設方案。換言之，用家可以因應個別應用需求而隨意建立及調節程式的複雜程度。
- 此開發套件支援各種普及、創新，以至定制的虛擬實境硬件系統。

Key Impact 主要成效

- It provides the following flexibility of content creation to various domain users in the industry even if they are not professional VR content developers,
  - User-friendly VR content creation tool
  - Ease for customisation and modification of VR contents
  - Short development time frame
  - Cost-effective VR content creation solutions
- 即使行業內的各個領域用戶非專業虛擬實境應用開發者，此虛擬實境應用開發套件提供創作的靈活性和自由，
  - 易於使用的開發套件
  - 易於定制和修改虛擬實境應用內容
  - 開發時間相對短
  - 高性價比的虛擬實境應用開發套件及創作解決方案

Award 獎項

Silver Award at The Edison Awards 2025

Bronze Medal at the 4th Asia Exhibition of Innovations and Inventions Hong Kong in 2024

2025年愛迪生獎 銀獎

2024年第4屆亞洲創新發明展覽會 — 香港 銅獎

Research Completion
2022

Applications
- Develop reconfigurable domain-specific scenarios for training, ability/performance assessment

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 為培訓、能力表現評估開發可重構的特定領域場景

商品化機會
- 技術授權許可

Neural Machine Translation Engine

神經機器翻譯引擎

Overview 簡介

In this project, an indigenous neural machine translation engine is developed, which can be owned by individual organisations to facilitate translation in full confidentiality. The organisation is able to have full control of the data without relying on external parties, which minimises the chance of data leakage to other parties. The engine also addresses domain-focused translation, which aims to improve the accuracy of the translation.

此項目開發了一個可讓機構獨立擁有的本地神經機械翻譯引擎，它可確保翻譯的資料能完全保密。機構能完全控制數據的使用而不需依賴外界的協助，大大減少數據外洩的機會。此引擎更能處理特定領域翻譯，提高翻譯的準確性。

Problem addressed 解決方案

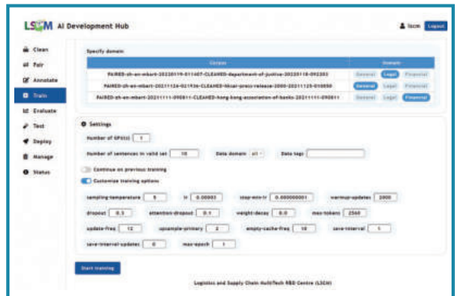
Many document translations in business and legal context require confidentiality and accuracy. Although public translation services are available, they are not suitable for translating confidential documents. Moreover, most public translation services aim towards general documents and do not meet the accuracy requirement for business and legal purposes.

許多商業和法律文件的翻譯都需要保密和準確。雖然坊間亦有公共的翻譯服務，但並不適用於翻譯需要保密的文件。此外，大多數公共翻譯服務針對的是一般文件，並不符合商業和法律領域所需的準確性。

Innovation 創新技術

- A machine learning development platform and an extended domain-focused translation methodology are used to take control of the confidential data and models for future development.
- The platform supports full lifecycle of AI development, from ingesting and preparing data to developing, training and deployment of AI models, and it works with various AI algorithms, ranging from the traditional SVM and regressions to the cutting-edge technologies of deep learning.
- A novel workflow on training a domain specific model consists of extracting and preparing large amount of paired up sentences from different domain corpus.
- 透過使用以機械學習的開發平台和以特定領域翻譯為中心的延伸翻譯方法，控制機密數據和模型，以供將來再發展之用。
- 該平台支援人工智能開發的整個生命週期：從頡取和準備數據到開發、訓練和應用人工智能模型，並與各種人工智能算法一起運作；支援傳統的向量迴歸，以至尖端的深度學習技術。
- 嶄新的訓練特定領域模型工作流程，當中包括從不同領域語料庫中頡取和準備大量的配對句子。

Key Impact 主要成效



Neural Machine Translation Engine - Confidential Documents with Domain Focus
應用於專業領域機密文件的神經機器翻譯引擎

- Machine Learning Development Environment enables machine learning developers, and data engineers to move their machine learning projects easily, quickly, and cost-effectively from conception to production and deployment.
- A trained translation engine can be utilised not only for common knowledge translation, but also for domain-specific information translation.
- 機械學習的開發環境使機械學習開發人員和數據工程師能夠輕鬆、快速並具經濟效益地將他們的機械學習項目從概念轉化到生產和應用上。
- 這個經訓練的翻譯引擎，不僅可以應用於一般翻譯上，還可以應用於特定領域翻譯上。

Research Completion
2022

Applications

- International legal service technology service providers
- Organisations which involve in confidential data and plan to develop their own AI systems

Commercialisation opportunities

- Technology licensing

完成研究年份
2022

應用範疇

- 國際法律服務科技服務供應商
- 擁有機密數據，並計劃開發自己的人工智能系統的機構

商品化機會

- 技術授權許可

Next Generation End-to-End Healthcare Community Support System

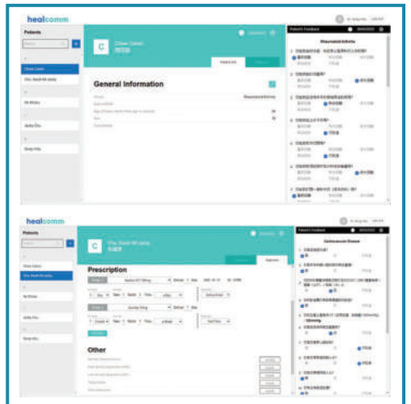
新一代端到端醫療保健社區支援系統

Overview 簡介

The system is a secure healthcare blockchain and data exchange platform that supports information exchange among stakeholders with corresponding web interface for gathering different user inputs and generating outputs. It facilitates secure and privacy-conscious information exchange among various stakeholders to provide personalised healthcare services.

此系統是一個安全的醫療保健區塊鏈和數據交換平台，提供相應的網頁界面以收集和輸出不同用戶的資料，促進各方之間既安全又具私隱保障的資料交換，以提供個人化的醫療保健服務。

Problem addressed 解決方案



Next Generation End-to-End Healthcare Community Support System
新一代端到端醫療保健社區支援系統

The limitation of traditional healthcare system is that information cannot be securely shared among different parties. It is difficult to access a patient's previous medical records by different doctors or specialists for treatment purposes. It is also difficult for pharmaceutical companies to gather data related to their drugs for analysis. This system is a secure healthcare blockchain and data exchange platform that supports information exchange among different parties.

傳統的醫療保健系統未必能讓相關人士安全地分享資料，令不同的醫生或醫療人員很難查閱病人的病歷從而提供治療，製藥公司亦較難收集數據來分析藥物成效。而這個系統是一個保安度高的醫療保健區塊鏈和數據交換平台，支援各方之間的資料交換。

Innovation 創新技術

- A permissioned blockchain solution is developed to store the health records and ensure that the records are only accessible by authorised individuals. The data is stored in a distributed manner with immutable audit history.
- Medical mark-up language (MML) is adopted to record medical information and exchange it among different parties electronically.
- A transpiler is developed to transpile the medical smart contract language to the blockchain specific smart contract language for deployment in the blockchain. Even a layman can use it easily without any problems.
- 這個區塊鏈解決方案能確保病人的健康記錄只能被獲授權的人士擷取，並把此類數據以分佈式和具不可變更的審查追蹤方式來儲存。
- 醫療標記語言(MML)將用於記錄醫療資料，並讓各方以電子方式交換資料。
- 轉譯器能將醫療智能合約語言轉譯為區塊鏈特定的智能合約語言，以應用到區塊鏈上。一般人使用時都不會遇上困難。

Key Impact 主要成效

- The technology will reduce the time for the development and standardising the coding pattern of healthcare blockchain.
- The technology is able to alleviate the increasing demand for teleconsultation during the pandemic period.
- Patients can access care services in a more convenient and efficient manner.
- With the feedbacks from patients and doctors, pharmaceutical companies can share additional information on their medicine through data analysis.
- Doctors can better monitor their patients and provide more personalised care service.
- 此技術將縮減醫療區塊鏈的開發時間和把編碼模式標準化的時間。
- 此技術解決了於疫情期間對遠程會診日益增加的需求。
- 病人可以更方便和更高效地獲得護理服務。
- 透過獲得病人和醫生的反饋，製藥公司可以透過數據分析以分享有關其藥物的其他資訊。
- 醫生可以更方便地監察病人的情況，並向病人提供更個人化的護理服務。

Award 獎項

Bronze medal at Special Edition 2022 Invention Geneva Evaluation Days
2022年日內瓦國際發明展銅獎

Research Completion
2022

Applications
- Pharmaceutical companies
- Medical group

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 製藥公司
- 醫療團體

商品化機會
- 技術授權許可

Digital Supply Chain Infrastructure Supporting Vaccination Programme

疫苗供應鏈基礎設施

Overview 簡介

This digital infrastructure supports the doctors, frontline medical practitioners, logistics service providers and policy makers to make the best use of vaccine resources for the whole community of Hong Kong to receive vaccination.

此數碼基礎設施支援醫生、前線醫護人員、物流服務人員和決策者，最有效地善用疫苗資源，為全港市民接種疫苗。

Problem addressed 解決方案

Digital supply chain infrastructure supporting vaccination programme
疫苗供應鏈基礎設施

To cope with the ad hoc demand in vaccine ordering and dispensing, the e-ordering system encompasses the adoption of barcodes and other technologies to enable the real-time tracking of the vaccine delivery. A central management control system is developed to facilitate the central management in collecting the updated information on the usage of vaccines and minimising wastage as far as possible.

為迅速處理疫苗訂購和分發的突發需求，電子訂購系統採用條形碼和其他技術，以實時追蹤疫苗的運送。而中央管理控制系統則收集有關疫苗使用的最新訊息，減少浪費。

Innovation 創新技術

- The digital infrastructure is powered by technologies such as IoT, Cloud on-demand service-based, data interoperability, E-lock secured logistics, data analytics and data visualisation.
- Vaccines delivery is secured and tracked by E-lock technology. The logistics status is tracked and monitored in real time. Only authorised staff can unlock the delivery truck at the destination.
- Medical staff can refer to the system for the quantity of vaccines that need to be diluted to avoid wastage. All vaccine transactions in the vaccination centers are also digitally logged.
- 此數碼基礎設施採用了物聯網、雲端按需服務、數據互操作性、電子關鎖安全物流、數據分析和數據可視化等技術。
- 疫苗運送由電子關鎖技術進行實時追蹤及監察。只有經授權的工作人員才能在目的地解鎖運送疫苗的貨車。
- 醫務人員可以從系統了解需要稀釋的疫苗份量，避免浪費。疫苗接種中心內的所有疫苗處理均有電子記錄。

Key Impact 主要成效

- It is scalable and able to support community-scale operations in Hong Kong.
- It harnesses professional expertise of the logistics trade and industry for the necessary technical support for the relevant enhancement of logistics and infrastructure.
- 此基礎設施具可擴展性，可以支援全港性規模的計劃/工作。
- 它運用了物流貿易和工業上的專業知識，為提升相關的物流和基礎設施提供了必要的技術支援。

Award 獎項

Outstanding Real-time E-lock Tracking System for Vaccine Delivery in Smart Living Partnership Awards 2022

2022智慧生活夥伴大獎 — 傑出實時追蹤疫苗運送電子鎖系統

Research Completion
2022

Applications
- Tracking of vaccine delivery
- Item and vaccine transaction logging
- Inventory management

Patent Applications
- E-Lock US16/295.187
- E-Lock CN 20191022 8114.4
- E-Lock HK19120630.9
- E-Lock HK42020620196.0

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 追蹤疫苗運送
- 物品和疫苗交收記錄
- 庫存管理

專利申請
- E-Lock US16/295.187
- E-Lock CN 20191022 8114.4
- E-Lock HK19120630.9
- E-Lock HK42020620196.0

商品化機會
- 技術授權許可

Air Cargo Transit Security System

空運中轉保安系統

Overview 簡介

LSCM develops a security monitoring technology using open flatbed trailers for transporting security screened and packed air cargoes from an off-airport screening facility to the airport. By doing so, the operation burden at the Airport Cargo Terminal can be reduced.

LSCM把保安監控功能嵌入平板拖車中，使之作為運輸和物流服務的一部分，讓空運貨物可在非機場範圍進行檢查後，再運送到機場貨運站內，以減輕機場貨運站在運作上的負擔。

Problem addressed 解決方案

In response to the requirements of the International Civil Aviation Organisation for the safety inspection of all air cargoes, this project develops a security monitoring and management solution based on video analysis, which enables an open-top flatbed trailer to provide secured transportation between two premises in which the safety inspection is conducted. It provides the shipping companies with an alternative to fixing a protective net on each air cargo pallet, enabling the industry to save time and operational cost.

因應國際民航組織對所有空運貨物進行安全檢查的要求，此項目開發一個基於影像分析的保安監控和管理系統，加強平板拖車在兩個需要進行安檢的場地之間的運輸保安，為貨運公司除了在每個貨運集裝板上放置保護網以外提供另一個選擇，省卻時間和營運成本。

Innovation 創新技術

- A set of camera modules is designed and developed for secured installation in an open-top flatbed trailer, and provides full visual coverage of all 5 open sides (4 lateral and top sides).
- A video analytics intrusion detection module is developed by using deep learning methods for performing onboard intrusion detection.
- A management console module is developed to let truck drivers manage the intrusion monitoring process during road transportation and communicate with online intrusion monitoring service regarding the truck location and any detected intrusion incidents.
- 攝錄機模組可穩妥地安裝在平板拖車上，以提供一共有五個開側(四個側面和一個頂部)的完整視線覆蓋。
- 使用深度學習方法開發的影像分析入侵檢測模組，適用於進行檢測。
- 管理控制台模組可讓運輸車司機在運輸過程中管理保安監控過程，及與線上保安監控服務聯絡，通報有關運輸車的位置和任何檢測到的異常情況。

Key Impact 主要成效

Air Cargo Transit Security System
空運中轉保安系統

- Help monitor the security of road transportation from a secured off-airport screening and packing facility to the airport.
- Save the time and cost for putting protective net on each air cargo pallet.
- 協助監控從非機場範圍的安檢地點和包裝場地與機場之間的陸路運輸保安。
- 省卻為每個空運貨物托盤安裝保護網的時間和成本。

Research Completion
2021

Applications
- Logistics & warehouse management
- Security screening for air cargoes

Patent Applications
- US 16/823,579
- CN 2020 1103 4443.4
- HK 32020004572.4

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 物流和倉庫管理
- 空運貨物安全檢查

專利申請
- US 16/823,579
- CN 2020 1103 4443.4
- HK 32020004572.4

商品化機會
- 技術授權許可

Food Safety

食品安全

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM sets up an innovative and comprehensive big data-enabled collaborative database for the detection of unknown contaminants. The big data will be utilised by the newly developed innovative algorithms and chemometric protocols to create an alert system for unknown contaminants.

本項目與香港理工大學合作，透過大數據技術建立非靶向污染物檢測協作數據庫。透過被儲存的數據，以新研發的演算法和化學計量法建立非靶向污染物預警系統。

Problem addressed 解決方案

This project gathers a vast amount of existing data in different proprietary formats from the dairy industry, covering mainly the regions of Chinese Mainland and Europe, and establishes protocols to convert such data to standardised reference chemical fingerprints with tolerance levels.

此項目把企業現有涵蓋中國內地和歐洲地區的不同類型原始數據標準化，制訂可供參考的化學指紋，使用非靶向方法檢測樣本，並與數據庫進行比對。

Innovation 創新技術

- A proprietary standardised format to represent all the testing results that come from various analytic instruments and reporting formats is developed.
- Data of different milk ingredients and products such as different breeds, geographic locations, feeds, ages, seasonal variations and so on, will be gathered from the industry and stored in a collaborative database. The data includes all “pass” and “fail” results generated.
- The analytic tool is developed based on a non-targeted methodology so that prior knowledge of the contaminants is not required.
- 此項目研發專用的標準化格式，用於表述所有來自不同分析工具和用上不同報告格式的檢測結果。
- 項目利用從業界合作夥伴收集的數據，例如代表不同牛奶成分和不同品種、地理位置、飼料、年齡、季節變化的產品數據，儲存到協作數據庫中。這些數據包含所有「合格」和「不合格」的檢驗結果。
- 由於此分析工具屬非目標性，因此不需要預先備有污染物的相關資料。

Key Impact 主要成效

Big data-enabled Collaborative Database for Non targeted Contaminants Detection
基於大數據技術的非靶向污染物檢測協作數據庫

- Non-targeted methodology and database can effectively identify any anomalies arise from potential contaminants or adulterants without prior knowledge.
- Immediate and appropriate measures can be taken
- 非針對性方法和數據庫可以有效地識別由潛在污染物或摻假物引起的任何樣本異常，而無需預先備有相關資料。
- 可以立即採取適當的應對措施

Research Completion
2021

Applications
- Tackling food fraud
- Authenticating food items

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 打擊食品假冒
- 認證食品

商品化機會
- 技術授權許可

Big Data-Driven Airport Resource Management Engine

基於大數據的機場資源管理引擎

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM developed a Big Data-Driven Airport Resource Management (BigARM) Engine to provide support for efficient and smart airport resource management. The application can balance the usage of reclaim belts in the Hong Kong International Airport and reduce the baggage collection time.

LSCM與香港理工大學合作，開發了由大數據驅動的機場資源管理(BigARM)引擎，旨在為高效和智能機場資源管理提供支援。它可以平衡香港國際機場之輸送帶的負荷及縮短提取行李的時間。

Problem addressed 解決方案

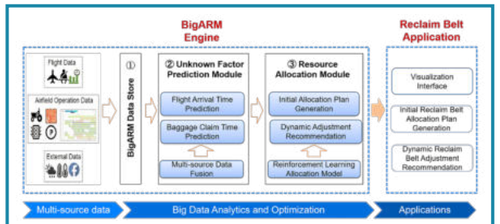
It reduces delivery stoppage caused by reclaim belt congestion, and thereby enabling speedy baggage collection by the passengers. This project utilises BigARM to work out the optimal allocation of reclaim belts to arrival flights with the load of incoming baggage spreading evenly among the reclaim belts at all times.

減少因輸送帶堵塞而停止派送行李的情況發生，以及縮短提取行李的時間。BigARM利用航班數據及地面資訊估計航班抵達時間、行李數量及乘客抵達行李認領大堂的時間，平均地分配行李至各抵達航班的行李輸送帶上。

Innovation 創新技術

- The big data related to airport resource management is heterogeneous. They are stored in SQL and NoSQL databases based on their structures, and feature learning methods are applied to extract useful features for further analysis.
- Feedforward neural network is used to make prediction on unknown factors and detect emergency events; optimal allocation and reinforcement learning algorithms are devised to generate intelligent resource allocation plans.
- Application tools including visualisation tools and analytic tools are used to show statistics and analytic results on reclaim belt allocation at the Hong Kong International Airport.
- 由於與機場資源管理相關的大數據都是不同的，所以這些數據會按它們的結構存儲在SQL和NoSQL數據庫中，然後透過深度學習提取有用的功能以作進一步分析。
- 這技術採用前饋神經網絡，對未知因素進行預測，並檢測緊急事故，設計出最佳的分配和強化學習的計算法，從而作出智能資源分配計劃。
- 這項目採用了具可視化和分析功能的應用工具，能顯示香港國際機場行李輸送帶的分配統計數據和分析結果。

Key Impact 主要成效



Big Data-Driven Airport Resources Management (BigARM) Engine and Application Tools
基於大數據的機場資源管理引擎及應用工具

- Improve the dynamic adjustment of resource allocation plan by exploiting hidden patterns from historical airport big data to make a more accurate, informed and smart resource allocation plans
- 提升資源配置方案的動態調整，利用大數據找出機場的運作模式，制定更精準、更清晰、更智能的資源配置方案

Research Completion
2021

Applications
- Reclaim Belt Allocation and loading balance
- Resource management in Airport and other industries, such as logistics and transportation

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 平衡行李輸送帶的分配和負載
- 機場和其他行業的資源管理，例如物流和運輸

商品化機會
- 技術授權許可

Smart Traffic Control System

智能交通控制系統

Overview 簡介

LSCM developed this low-cost device that can be easily installed and built upon an existing traffic control system and is especially useful in areas where the roads cannot be widened, and that a smart traffic control device is needed to alleviate traffic congestion.

這個LSCM研發的低成本系統易於安裝及應用於現有的交通管制系統，有助紓緩路面交通，尤其適用於無法擴闊的道路，以協助疏導車輛。

Problem addressed 解決方案

Congestion problems often occur in Tai Tam Road (Dam Section) when large vehicles pass through it. Since the dam is a declared monument, widening that section of the road is not allowed. Therefore, LSCM utilises video analytics technology to identify the types of vehicles and analyse the traffic flow to control the traffic lights and shorten the traffic queue.

當大型車輛使用大潭道水壩段時經常出現擠塞問題。鑑於水壩是法定古蹟，路面不可擴闊。因此，LSCM應用影像分析技術來分辨車輛的種類和計算車輛的流量，從而控制交通燈的運作及疏導車輛。

Innovation 創新技術

- The system uses data from 8 traffic detectors to compute the length of vehicle queues on both sides of the Dam and adjust the duration of green traffic light signals to reduce overall delays in real time.
- The system can generate detailed traffic reports for enhancing the transportation system in the future.
- 系統使用來自8個探測器的數據來計算大壩兩側之車龍的長度，從而調節綠燈訊號的時間，以減少路面擠塞情況。
- 系統可提供詳細的交通報告，以便將來改善交通系統。

Key Impact 主要成效

Smart Traffic Control System
智能交通控制系統

- Collect real-time traffic flow data of each side of Tai Tam Road and automatically allocates the optimal duration of green traffic signal to reduce the vehicles' waiting time.
- The system has been implemented in Tai Tam Road (Dam Section) since August 2018 and has been proven to be twice as effective as traditional traffic lights in terms of time-saving.
- 實時收集大潭道兩側的交通流量數據，並自動分配最合適的綠燈時間，以減少車輛等候時間。
- 於2018年8月起在大潭道(水壩段)使用。跟傳統交通訊號燈相比，證實能節省兩倍的車輛等候時間。

Award 獎項

Silver medal at the 47th International Exhibition of Inventions Geneva in 2019
Silver Medal at the 2nd Asia Exhibition of Innovations and Inventions Hong Kong in 2019
2019年第47屆日內瓦國際發明展銀獎
2019年第2屆亞洲創新發明展覽會 — 香港 銀獎

Research Completion
2021

Applications
- Smart Traffic Lights

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 智能交通燈

商品化機會
- 技術授權許可

E-Arbitration/E-Mediation Cloud Services Platform

電子仲裁/調解雲服務平台

Overview 簡介

LSCM has developed an e-Arbitration/e-Mediation Cloud Services platform for enterprises to handle disputes through online arbitration and mediation. AI Machine Translation technology is used to provide domain-specific language translation service. Continuous Re-authentication and Object Policy technology is developed to protect against unauthorised access at logged on computers.

LSCM研發的電子仲裁/調解雲服務平台，讓企業透過網上仲裁和調解處理糾紛。平台利用人工智能機械翻譯技術，提供特定領域語言翻譯服務。而連續重新認證和對象策略技術，可防止資料在已登入的電腦上被盜取。

Problem addressed 解決方案

It is difficult for enterprises in different regions to resolve disputes face-to-face. This platform enables arbitration and mediation to be conducted online in a more convenient and less costly way.

位於不同地域的企業難以面對面就爭議進行商討，而此平台便可以方便企業於網上進行仲裁和調解，節省時間及金錢。

Innovation 創新技術

- Video Conferencing function is provided for virtual face-to-face meetings and hearings between the claimant, the respondent and the arbitrator, and for tri-parties meetings as well. The final decision will be stored securely in the platform and available for downloading by participating parties.
- It enables secure collaboration group to be established among the claimant, the respondent and the arbitrator to ensure secured and efficient communication and document sharing among the participating parties. All documents uploaded to the platform are encrypted before transmission over the Internet and stored in the system with access control.
- A domain-specific AI machine translation system which can translate the legal documents accurately for arbitration or mediation among the Belt and Road countries is developed for easy communication among different parties.
- 此平台為申訴人、答辯人和仲裁人之間的虛擬面談和聽證會，以及三方同時出席的會議提供視像會議服務。而最終的裁定將安全地存儲在平台中，供各參與者下載。
- 平台讓申訴人、答辯人和仲裁人建立針對每個案件的安全協作小組，以確保參與方之間可安全並快捷地溝通和共享文件。上傳至平台的所有文件在透過互聯網傳送前都會經過加密，並安全地存儲在系統中。
- 此項目開發了針對特定領域的人工智能機械翻譯系統，可以準確地針對「一帶一路」沿線國家之間的仲裁或調解法律文件進行翻譯，從而讓各方之間的交流變得更簡易。

Key Impact 主要成效

e-Arbitration / e-Mediation Cloud Services Platform
電子仲裁/調解雲服務平台

- Facilitate Hong Kong's development as a dispute resolution hub and create more opportunities for the industry.
- Improve translation accuracy for specific industries
- Enhance internet transaction security
- 推動香港發展成為爭議解決中心，為業界拓展商機。
- 提高特定行業的翻譯準確性
- 增強互聯網交易的安全性

Award 獎項

Bronze medal at the Special Edition 2022 Invention Geneva Evaluation Days
2022年日內瓦國際發明展銅獎

Research Completion
2020

Applications
- Arbitration, Mediation

Commercialisation opportunities
- Technology licensing

完成研究年份
2020

應用範疇
- 仲裁，調解

商品化機會
- 技術授權許可

HK-Zhuhai Trade Facilitation Platform

香港—珠海貿易便利平台

Overview 簡介

This information service platform connects industries in Hong Kong with the Zhuhai E-Port for handling import and export trade declaration, as well as supports the industries to explore the markets along the Belt and Road.

這個平台是一個連接香港業界與珠海電子口岸的資訊服務平台，便利進出口貿易申報，協助從事貿易和物流的業界開拓「一帶一路」市場。

Problem addressed 解決方案

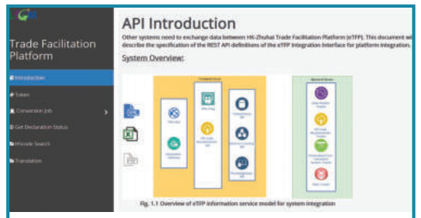
Trading between different regions often involves complex customs declaration for trade and logistics, and the processing time is long. This platform adopts the latest AI technology and big data analytics to provide platform users with the necessary tools to facilitate their information to deal with customs declaration.

各地之間的貿易清關程序一般涉及繁複的貿易和物流申報流程，需要較長的處理時間。此平台利用最新的人工智能技術和大數據分析，為使用者提供有效的工具及資訊，便利報關工作。

Innovation 創新技術

- The platform system leverages AI and big data analytics technologies to rank and identify a list of suitable HS codes, the associated tax rates and permits required. The users can then select an appropriate HS code conveniently.
- The platform lets users fill in the information in one language, and the domain-specific translation engine will translate the information into the relevant languages accurately using the specific wordings for customs declaration and trade.
- The platform establishes a secured data channel for information exchange between Zhuhai E-Port and the authorised companies, handles the conversion and workflow of multiple forms, and streamlines the data preparation for customs declaration in Hong Kong and other regions.
- 平台系統利用人工智能和大數據分析技術來排列和識別合適的HS代碼列表，以及相關的稅率和許可證，方便使用者選擇適當的HS代碼。
- 平台允許使用者以單一語言填寫資料，然後利用針對特定領域的翻譯引擎將海關申報和交易的專門措辭準確地翻譯為相關語言。
- 平台為珠海電子口岸與獲授權公司之間的資訊交流建立安全的數據通道，處理不同表格的轉換及流程，便利香港和不同地區的報關準備工作。

Key Impact 主要成效



HK-Zhuhai Trade Facilitation Platform
香港—珠海貿易便利平台

- Facilitate importers, exporters and forwarders in handling trade and logistics between the Chinese Mainland and ASEAN markets via Hong Kong, with the vision of expanding to the Belt and Road market and global market.
- Overcome the challenges of the complexity when dealing with customs declaration for trade and logistics.
- 協助進口商、出口商和貨運代理處理中國內地和東盟市場之間經由香港的貿易和物流，並發展至「一帶一路」市場及環球市場。
- 便利個別清關程序中繁複的貿易和物流申報流程。

Award 獎項

Smart Living Partnership Awards 2021-Outstanding One-stop Trade Facilitation Platform
2021智慧生活夥伴大獎 — 傑出一站式貿易便利平台

Research Completion
2020

Applications
- Trade facilitation between the Greater Bay Area and ASEAN Region

Commercialisation opportunities
- Technology licensing

完成研究年份
2020

應用範疇
- 促進大灣區與東盟區域之間的貿易

商品化機會
- 技術授權許可

Next InsurChain

劃時代保險鏈

Overview 簡介

In collaboration with Next InsurTech Limited, LSCM developed the "Next InsurChain" which utilises blockchain technology for the efficient sharing and tracking of insurance policies among different parties in the insurance industry with permission, while enabling proper access control and privacy protection of the shared information.

LSCM與相信保險科技有限公司合作研發「劃時代保險鏈」。系統利用區塊鏈技術，允許保險業內各方之間在獲得許可的情況下共享和追蹤保單資料，同時為共享資料提供查閱權限和私隱保護。

Problem addressed 解決方案

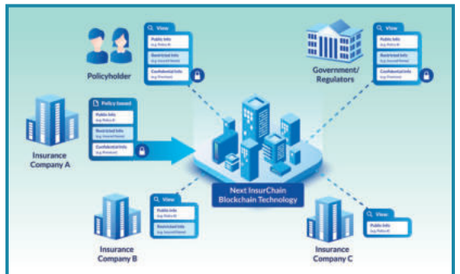
This solution helps tackle the issues of fake insurance policies and fraudulent claims. It can also enhance the efficiency of estimating insurance quotes and handling claims. The policy information is classified in three levels of access, namely "public", "restricted" and "confidential". The design mechanism of Next InsurChain allows all parties to access the public information.

這系統有助解決偽造保單及索賠欺詐等問題，亦能提升保單報價和索賠處理的效率。它為每份保單資料分為「公開」、「受限」和「機密」這三個級別的資料查閱權限，而劃時代保險鏈的設計機制允許各方查閱公開的資料。

Innovation 創新技術

- With the permission of the policyholder, the insurance company can share the restricted information with other insurance companies and the Insurance Regulatory Authority (regulator), while the insured can have full access to the policy details of his own.
- The insurance policy information and claim records stored on the blockchain are distributed, traceable and immutable, which helps prevent false insurance policies, trace claims records, and estimate policy quotations, etc.
- 在投保人的許可下，保險公司可以與其他保險公司和保險業監管局(監管機構)分享受限制的資料，而受保人可以查閱自己保單的所有資料。
- 區塊鏈上存儲的保單資料以及索償記錄是分佈式、可追蹤和不可刪改的；有助防範虛假保單，追溯索償記錄，為保單報價等。

Key Impact 主要成效



Next InsurChain 劃時代保險鏈

- Claims documents can be privately shared by insurance companies, so the claims can be handled more efficiently.
- Traceable policies on blockchain can eliminate unlicensed selling.
- Reduce operation cost and credit risks.
- 保險公司可以共享索賠文件，因此可以更快捷地處理索賠。
- 將保單儲存在區塊鏈上可以防止未經許可的銷售。
- 降低營運成本和信用風險 。

Award 獎項

Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days
2021年日內瓦國際發明展銀獎

Research Completion
2020

Applications
- Insurance policies validation and checking

完成研究年份
2020

應用範疇
- 保單驗證和檢查

iPark : Core Technologies of Intelligent E-Commerce Logistics Parks

智慧電商物流園物聯網

Overview 簡介

LSCM and the University of Hong Kong have developed iPark to enhance the logistics services to meet the growth of e-Commerce.

LSCM和香港大學研發的智慧電商物流園區(iPark)旨在改善物流服務，從而應對電子商貿的發展。

Problem addressed 解決方案

E-Commerce has been developing exponentially in the Greater China region in recent years, while logistics is the bottleneck of the development. Traditional logistics operations are no longer able to cope with the challenges, such as long order fulfilment time, low utilisation in space and huge fluctuation in demands.

The project carried out several pilot projects in Hong Kong and Chinese Mainland. One of them is a private platform for leading enterprises with operations in the Greater China Region. And the other is a public platform that is shared by participating Hong Kong SMEs including manufacturers, logistics service providers, warehouse service providers and retailers. Eventually, the platform will be "transplanted" to logistics and industrial parks.

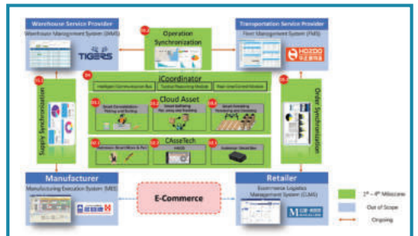
近年，電子商貿在大中華區迅速增長，然而物流卻成為限制其發展的樽頸。傳統的物流管理模式，未能應付電子商貿爆炸性增長所帶來的挑戰，導致訂單處理時間漫長及倉庫使用率偏低的問題。

本項目將會在香港和中國內地開展多個試點項目，其一是建立面向大中華地區的大型綜合性企業的私有平台；其二是建立一個面向香港中小企業的公共服務平台，包括製造商、物流服務供應商、倉儲服務供應商和零售商。最終，平台將會「移植」到物流園區。

Innovation 創新技術

- Cloud Asset Technologies is used for real-time location acquisition of assets and the collection of necessary sensing data in the e-Commerce logistics parks. It can improve project scheduling efficiency, reduce the searching time cost of manpower, help enterprises to track assets, and assist them in monitoring, production process and logistics process tracking. It also plays a role in product management.
- Smart buffering in logistics park defines the concept of operational scenario to transport and store products in the distribution centre. It contains three main components, which are cloud forklifts, cloud pallets and cloud storage units. It makes the physical assets smart because they are perceived by others and they can perceive their own surroundings.
- iCoordinator coordinates with mGOS according to the requirements of iSync Services. Then, the operators wearing smart ring can pick the materials with mobile consolidation station. The operators can finish multi-orders in one picking route according to the hints on the smart tablets and the light tags on the cloud storage unit.
- 雲資產技術適用於實時獲取物資位置以及在電子商貿物流園區收集必要的感知數據。該服務能提高項目進度及效率，減少人力搜索的時間成本，協助企業在監控、生產、物流追蹤過程和在管理產品方面發揮作用。
- 物流園區的智能緩存定義是指在配送中心運輸和存儲產品的運作場景概念。智能緩存包含三個主要組件，即雲叉車，雲托盤和雲存儲單元。它能被他人感知，並且亦能感知附近的環境。
- iCoordinator將根iSync Services的要求與mGOS協調。隨後，已佩戴智能指環的操作員可以在流動整合站挑選材料。他們也可以根據智能平板上的提示及雲存儲單元上的燈標一次過完成多個訂單。

Key Impact 主要成效



iPark : Core Technologies of Intelligent E-Commerce Logistics Parks
智慧電商物流園區物聯網

- Improve the quality, reliability and efficiency of coordination throughout the whole order fulfilment process
- Reduce order processing time along the whole supply chain
- 提高整個訂單處理過程中協調的質量、可靠性和效率
- 縮短整個供應鏈的訂單處理時間

Research Completion
2019

Applications
- Logistics & Warehouse Management

Patent Applications
- CN 202023338130.6
- CN 202023338283.0

Commercialisation opportunities
- Technology licensing

完成研究年份
2019

應用範疇
- 物流和倉庫管理

專利申請
- CN 202023338130.6
- CN 202023338283.0

商品化機會
- 技術授權許可

RFID Parcel Locker

無線射頻識別包裹儲物櫃

Overview 簡介

The first generation of iPostal station was released in May 2016. The 2nd generation of iPostal station is installed with RFID antenna, which helps accurately identify the right parcel for the right locker. The infra-Red sensor is installed inside each locker to ensure that the parcel is kept safely.

第一代「智郵站」於2016年5月開始推出。第二代的智郵站安裝了RFID天線以準確地識別應放置在不同儲物櫃的正確包裹。每個儲物櫃內均安裝了紅外線感應器，以確保包裹的安全。

Problem addressed 解決方案

As a system for providing lockers in the community, it offers flexibility to the public in collecting large-sized mails at their convenience. The 2nd generation of iPostal station is RFID-enabled, which facilitates more secured mail collection services in Hong Kong.

此系統為社區提供儲物櫃服務，為市民接收大型郵件時提高靈活性。第二代的「智郵站」具備RFID功能，從而在香港提供更安全的郵件收集服務。

Innovation 創新技術

RFID-enabled parcel locker system
無線射頻識別包裹儲物櫃系統

- RFID antenna is installed to accurately identify the right parcel for the right locker. The Infrared sensor is installed inside each locker to ensure that the parcel is kept safely.
- 儲物櫃安裝了RFID天線，可準確識別包裹應放置在哪一個儲物櫃內。此外，紅外線傳感器安裝在每個儲物櫃內，以確保包裹的安全。

Key Impact 主要成效

- Currently, Hongkong Post has deployed around 12 of the iPostal stations at various locations within Hong Kong. Promulgation of the new generation of RFID–enabled iPostal Stations by Hongkong Post, and with the assistance of the new funding program from ITB, the system will allow Hongkong Post to better serve the general public.
- The system streamlines the postman's working procedures. The parcel would be automatically identified by the RFID system and assigned to the exact locker number.
- 目前，香港郵政已在香港各區設置了約12個「智郵站」。在創新及科技局的資助計劃協助下，新一代具無線射頻識別功能的「智郵站」讓香港郵政更有效地為廣大市民服務。
- 此系統簡化了郵遞員的工作流程。RFID系統會把包裹自動識別到準確的箱號。

Award 獎項

The 2nd generation of RFID-enabled Parcel Locker System has won the Gold Medal at the 45th International Exhibition of Inventions Geneva in 2017.

第二代的無線射頻識別包裹儲物櫃系統在2017年舉行的第45屆日內瓦國際發明展榮獲金獎。

Research Completion
2017

Applications
- Secured Self-serve parcel retrieval system

Patent Applications
- US 15/780,661
- CN 2016 8008 5829.3
- HK 19122116

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 安全的自助包裹檢索系統

專利申請
- US 15/780,661
- CN 2016 8008 5829.3
- HK 19122116

商品化機會
- 技術授權許可

Blockchain enabled e-Cheque App

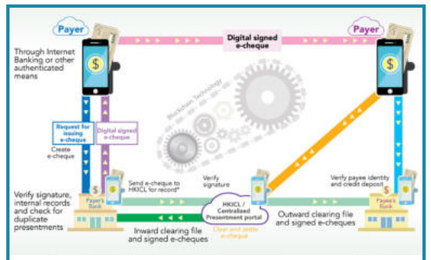
基於區塊鏈的電子支票應用程式

Overview 簡介

This e-Cheque Wallet application provides a more convenient platform for e-Cheque transactions, and facilitates new business models and entrepreneurship in e-Commerce/e-Logistics.

此電子支票錢包應用程式為電子支票交易提供更方便的平台，並促進電子商務/電子物流的新業務模式和創業機會。

Problem addressed 解決方案



Blockchain enabled e-Cheque App
基於區塊鏈的電子支票應用程式

The application adopted Bitcoin technologies to achieve the objectives of duplicate prevention and traceability for e-Cheque transaction without a centralised repository. In e-Cheque transaction, the transfer of e-Cheque from a payer to a payee shares many similar characteristics of payment by Bitcoin. Utilising Bitcoin technology can fulfil the traceability need of e-Cheque.

此項目採用比特幣技術以解決電子支票交易過程中因沒有中央存儲庫而產生的重複使用和不可追溯的問題。電子支票從付款人到收款人的轉移與比特幣支付有著許多相似的特徵，採用比特幣技術可滿足電子支票的可追溯性需求。

Innovation 創新技術

- In contrast to most e-Wallets that use a traditional centralised ledger, this e-Cheque app utilises the Blockchain technology which provides a safe and reliable system to eradicate replicated and counterfeit cheques and strengthen corporates' confidence in e-Cheques.
- With the help of file encryption and digital signature techniques, authenticity of the digital assets is guaranteed. Each digital asset is uniquely identified on the Blockchain, so the owner cannot resend the same digital asset to more than one recipient.
- 有別於其他以中央記帳方式記錄交易的電子錢包，此電子支票應用程式利用區塊鏈技術，提供一個更安全可靠的系統，杜絕重複及偽冒支票，增強企業使用電子支票的信心。
- 使用文件加密和電子簽名技術，確保電子資產的真確性。由於每項電子資產均被區塊鏈獨立標識，因此發票人無法將相同的電子資產發送給多於一個收件人。

Key Impact 主要成效

- If a distributed environment is without a centralised repository, e-Cheques could be transferred from "wallet" to "wallet". With this project, every transaction are stored on blockchain, transaction immutability, prevention of duplication and traceability/forensics are achieved.
- It offers trusted and speedy delivery of e-cheques. Issuers may issue digital assets and have them delivered to thousands of recipients in real time.
- 在沒有中央存儲庫的分佈式環境中，電子支票可以從一個「錢包」轉移到另一個「錢包」。而此項目將每筆交易都存儲在區塊鏈上，令交易不能更改、防止重複兌現和可追溯/取證。
- 提供可靠和快速的電子支票交付。發票人可以發行電子資產，並實時地交付給眾多的收件人。

Award 獎項

Silver medal at the 45th International Exhibition of Inventions Geneva in 2017

2017年第45屆日內瓦國際發明展銀獎

Research Completion
2017

Applications
- Blockchian enabled e-Cheque wallet

Patent Applications
- HK 18102860.3
- HK 62020002528.1

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 應用區塊鏈技術的電子支票錢包

專利申請
- HK 18102860.3
- HK 62020002528.1

商品化機會
- 技術授權許可

A Virtual Reality Training System for Strategic Operations

虛擬實境培訓系統

Overview 簡介

In collaboration with the University of Hong Kong, LSCM developed a virtual reality (VR) training system which allows users to conduct training in a fully immersive CAVE-like VR environment. This VR Training System for Hong Kong professionals gives users the opportunity to experience the life-like scenarios of complex operations and interact dynamically with such an environment in a controlled space. Activities are recorded, and behaviour is analysed as it develops in real time.

LSCM與香港大學攜手合作，開發了一個沉浸式的虛擬實境培訓系統，讓專業人士體驗到像真的場景及複雜的操作，並跟動態的環境互動，系統會把他們的活動記錄下來，然後作出實時分析。

Problem addressed 解決方案

A Virtual Reality (VR) System for Strategic Operation Training
虛擬實境系統之應用—策略及實踐培訓

It delivers a novel and cost-effective solution for the training and evaluation of professionals in decision making and high-order skills.

系統為高級管理和技術人員提供新穎及具成本效益的培訓，並可評估專業人員在決策及高階技能方面的能力。

Innovation 創新技術

- The virtual reality-empowered system capitalises the virtual reality technology with artificial intelligence methods to deliver an integrated system to create a cost-effective, versatile and reconfigurable, interactive and immersive training environment to support evidence and discovery-based training in operation planning and decision making.
- It transmits life-like scenarios of complex operations through visualisation and dynamic interaction, while users' activities and behaviour are recorded and analysed.
- 將虛擬實境技術與人工智能結合，提供一個集成系統，創建一個多功能和可重組的互動式和沉浸式培訓環境，支援實證訓練和發現式訓練，培訓使用者作出規劃和決策。
- 讓培訓者在像真的場景內體驗複雜的操作，並與動態的環境互動。系統會把他們的活動記錄下來，然後作出分析。

Key Impact 主要成效

- The system is able to train high-level management and technical professionals to make strategic decisions during critical operations in a timely manner.
- 系統能培訓高級管理和技術人員作出適時及關鍵性的決策。

Award 獎項

Silver Medal in the 47th International Exhibition of Inventions Geneva in 2019
2019年第47屆日內瓦國際發明展 銀獎

Research Completion
2016

Applications
- Operation training
- Skill profiling for management and technical professionals in logistics and services sectors

Commercialisation opportunities
- Technology licensing

完成研究年份
2016

應用範疇
- 培訓
- 對物流和服務行業的管理和技術專業人員作技能分析

商品化機會
- 技術授權許可

Sensing Technologies for Real-time Environmental Monitoring

基於傳感器網絡之實時環境監測技術

Overview 簡介

In collaboration with the Chinese University of Hong Kong, LSCM developed a RFID-Enabled Sensing Technologies that provide continuous monitoring of ambient statuses surrounding environment sensitive items like cultural artifacts, food and drugs during exhibition, storage, and transportation through pluggable, wireless and battery-powered sensors for preservation management. The technologies also support real-time indoor condition monitoring such as lux, UV, vibration, temperature, and relative humidity for facility management.

本中心與香港中文大學攜手合作，開發了無線射頻識別傳感技術，運用插件式、以電池供電的無線傳感器，在展覽、存儲和運輸過程中，為對週邊環境敏感的物品，如文物、食品和藥物，持續監控環境狀況，以支援物品的保存及管理。此技術亦支援實時室內環境狀態監測，包括光照、紫外線、震動、溫度和相對濕度，以便進行設施管理。

Problem addressed 解決方案

The sensing system consists of coin-sized pluggable sensor modules, the RFID communication modules, as well as wireless coordinators for transmitting RFID and sensor data. The system includes 24-hour sensing capability of measuring temperature, relative humidity, vibration, ultraviolet (UV), and illuminance (lux) for preserving valuable artifacts and goods. If the data deviates from the individually customisable range of allowable conditions, the system will alert the user accordingly.

傳感系統由硬幣般大小可插件式傳感器、無線射頻識別通訊系統、以及用於發送無線射頻識別訊號和數據的無線協調系統組成，可24小時監控個別展櫃珍貴文物的溫度、相對濕度、震動、光照及紫外線。如果數據偏離個別展品預設的允許範圍時，系統將會發出警報。

Innovation 創新技術

- The system makes use of license free wireless spectrum. Up to five external sensor modules can be plugged into an active RFID communication tag for logging and wirelessly transmitting data and commands.
- The small-sized pluggable sensor provides flexibility for exhibition designers to balance the exhibition aesthetic and the need for monitoring environment without blocking or drawing attention away from artifacts.
- The power consumption of sensors and wireless transmission is low so that the battery can last for about six months operating in either online real-time monitoring mode or offline data logging transit mode.
- 系統使用免費的無線頻譜，並可連接多達五個傳感器到有源無線射頻識別通訊標籤，從而發送數據和指令。
- 這部體積細小、插件式傳感器，讓展覽設計師既可兼顧展品的美觀性，又可在不阻礙觀眾觀賞展品的情況下監測環境。
- 傳感器的耗電量少，無論是使用在線實時運作模式，或者是離線數據記錄運作模式，電池都可用上約半年左右。

Key Impact 主要成效

RFID-Enabled Sensing Technologies for Real-time Environmental Monitoring and Facility Management
應用於實時環境監測及設施管理的無線射頻識別(RFID)傳感技術

- The plug-and-play external sensor and utility modules with active RFID tags provide a new base technology to give rise to a new active RFID products or an enhancement to existing active RFID devices.
- The enhanced network routing algorithm leverages on existing ZigBee protocol to deal with communication bottlenecks in the physical layer.
- 即插即用的外部傳感器和帶有有源RFID標籤的實用模組提供了一種新的基礎技術，用以產生新的有源RFID產品或加強現有有源RFID設備。
- 增強型網絡路由演算法利用現有的ZigBee協議來解決物理層的通訊樽頸。

Research Completion
2015

Applications
- IoT Sensor System for facility management

Commercialisation opportunities
- Technology licensing

完成研究年份
2015

應用範疇
- 用於設施管理的物聯網傳感器系統

商品化機會
- 技術授權許可

Product Authentication

產品驗證技術

Overview 簡介

LSCM Authen√Tick® is the Centre's proprietary product authentication technology, which enables users along the supply chain to securely verify the authenticity of goods in order to provide assurances of product genuineness from the point of certified manufacturers to the point of retail.

LSCM「認」真「析」貨®系統是本中心已註冊的產品驗證技術，協助供應鏈業界用戶安全地驗證產品，由生產地至零售點，確保產品的真確性。

Problem addressed 解決方案

Product Authentication technology avoids the pitfalls of conventional anti-counterfeiting methods and provides a reliable and trusted authentication platform that can authenticate product labels using third-party operated readers and retain its integrity even when relying on unsecured data transmission on the Internet, enabling seamless integration into existing user infrastructure.

產品驗證技術減少傳統防偽方法的漏洞，提供一個可信賴的驗證平台，不但可透過第三方經營的閱讀器作驗證，即使在互聯網內傳送資訊亦能確保訊息的真確性，而且可以無縫地結合用戶現有的系統。

Innovation 創新技術

- The robustness of the LSCM Authen√Tick® system allows it to work in tandem with different authentication mediums, including but not limited to QR Code, UHF RFID and NFC technologies, which are bundled in the product authentication system.
- The operation of the system is consumer-friendly. Merchants can set up an authentication point at the retail point. When a NFC mobile phone is installed with the authentication app, it will become a personal mobile authentication station.
- The system will update its complex coding scheme continuously so as to effectively identify the counterfeit products in the market. The information will be encrypted after authentication, and released through registered authentication stations.
- LSCM「認」真「析」貨®系統可透過不同媒介進行驗證，包括二維碼、超高頻無線射頻識別(UHF RFID)及近場通訊技術(NFC)等。
- 此系統的操作十分簡便。商戶可在零售點設立驗證站。當NFC手機上安裝驗證應用程式後，它便成為流動的驗證站。
- 系統會不斷更新其複雜的編碼方案，從而有效地辨別市場上的偽冒產品。而這些經驗證的資訊亦會被加密處理，並由已註冊的驗證站發放。

Key Impact 主要成效

Product Authentication at Retail Points – Infrastructure and Systems
應用於零售業的產品核證技術 — 網絡基建與應用系統

- Consumers can conveniently check the product authenticity through a mobile app
- A new way to effectively identify counterfeit products
- Quality assurance along the supply chain
- 消費者可以透過流動應用程式方便地檢查產品的真偽
- 有效識別假冒產品的新方法
- 保障整個供應鏈的質量

Research Completion
2013

Applications
- Product Authenticity Verification

Patent Applications
- CN 2013 8008 0974.9
- HK 17101312
- TW 103107867

Commercialisation opportunities
- Technology licensing

完成研究年份
2013

應用範疇
- 產品真偽驗證

專利申請
- CN 2013 8008 0974.9
- HK 17101312
- TW 103107867

商品化機會
- 技術授權許可

E-lock

電子關鎖

Overview 簡介

The IoT Cross Boundary Fast-Clearance developed by LSCM interconnects the Hong Kong Custom's Intermodal Transshipment Facilitation Scheme (ITFS) with the Speedy Customs Clearance System (SCC) of the Mainland Custom. With the official launch of the 'Single E-lock Scheme' in late March 2016, the customs clearance between Hong Kong and Guangdong becomes more convenient and efficient.

由LSCM開發的物聯網跨境快捷通道，將香港海關的「多模式聯運轉運貨物便利計劃」與內地海關的「跨境快速通關」連接。隨著2016年3月下旬正式推出的「跨境一鎖」計劃，香港與廣東之間的通關變得更加方便快捷。

Problem addressed 解決方案

IoT Cross-Boundary Fast-Clearance Security Application
物聯網跨境快捷通道應用程式

This projects aims at reducing duplicate inspection on the same shipment by both Customs authorities at the boundary in Hong Kong and in Chinese Mainland, which helps to streamline the clearance process and expedite the flow of transhipment cargoes. It enhances the efficiency of cross-border custom clearance across multiple jurisdictions, while maintaining tight security and control.

項目旨在減少同一批貨物在中港兩地入境及出境時被海關重複檢查的機會，簡化清關手續，以提升跨境清關速度和效率，同時保持嚴格的保安和控制。

Innovation 創新技術

- The system enables real-time GPS tracking and monitoring. It also offers unique security token control.
- This single locking device (E-lock) supports the execution of multiple jurisdictions, as well as independent locking control across jurisdictions
- 此系統使用GPS實時追蹤和監控。它還提供獨有的保安編碼器監控。
- 跨境一鎖設備(E-lock)既適用於多個司法管轄區域，又能在每個區域獨立地鎖定監控。

Key Impact 主要成效

- Since the trial of the"Intermodal Transshipment Facilitation Scheme" (ITFS) from 2012 and "Single E-lock scheme" (SELS) from 2016, it has been extended to 65 clearance points in Guangdong Province, 4 in Hunan Province, 7 in Fujian Province, 4 in Macao and the 13 clearance points in Hong Kong, over 1,000 express intermodal transportation routes are offered. Up to August 2025, more than 8.1 million cargo shipments have been handled under SELS, while over 89.4 million cargo shipments have been handled under ITFS.
- 自2012年推出「多模式聯運轉運貨物便利計劃」(ITFS)，並於2016年推行「跨境一鎖計劃」(SELS)，到目前為止此計劃在內地廣東省共有65個清關點，4個位於湖南省，7個位於福建省及4個位於澳門，加上香港13個清關點，共提供超過1,000條聯運快線。截至2025年8月，SELS共處理超過810萬票貨物，而ITFS共處理超過8940萬票貨物。

Award 獎項

Silver Medal at the 45th International Exhibition of Inventions Geneva in 2017
2017年第45屆日內瓦國際發明展銀獎

Research Completion
2012

Applications
- Boundary custom clearance and logistics

Patent Applications
- US 16/295.187
- CN 20191022 8114.4
- HK 19120630.9
- HK 42020620196.0

Commercialisation opportunities
- Technology licensing

完成研究年份
2012

應用範疇
- 邊境清關和物流

專利申請
- US 16/295.187
- CN 20191022 8114.4
- HK 19120630.9
- HK 42020620196.0

商品化機會
- 技術授權許可

Baggage Trolley Availability Monitoring System

行李車供應監控系統

Overview 簡介

LSCM developed the Trolley Availability Monitoring System. It can disseminate updated information of trolley availability status via a mobile application to frontline staff. It helps ensure that sufficient trolleys are available to passengers at the Baggage Reclaim Hall.

LSCM研發的行李車監控系統透過流動應用程式，向前線人員發放行李車供應狀態的最新資訊，以確保於行李認領大堂內有足夠的行李車可供旅客使用。

Problem addressed 解決方案

To ensure sufficient number of trolleys are available to the passengers and enhance the quality of passenger services at the Hong Kong International Airport, the Trolley Availability Monitoring System will immediately notify the frontline staff via the Trolleys mobile app when the quantity of trolley in any pick-up points drops below the pre-set level. The real-time quantity intelligence enables the frontline staff to effectively replenish the trolleys.

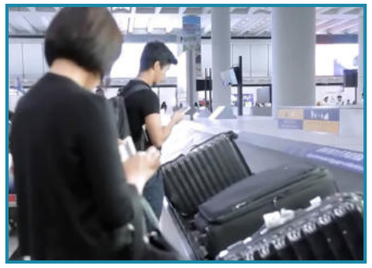
為確保供旅客使用的行李車數量充足，從而提升香港國際機場客戶服務的質素。當任何領取點的行李車數量低於預設水平時，行李車供應監控系統便會透過手機應用程式即時通知前線人員。系統能提供實時行李車數量資料，有助員工盡快補充行李車。

Innovation 創新技術

Video Analytics for Resources Management
資源管理影像分析

- Machine learning-based image object detection system modules for various types of resources such as baggage trolleys.
- Video processing infrastructure and system using object detection modules.
- Resources monitoring and management system with mobile notifications.
- 基於機械學習的影像目標物件檢測系統組件，應用於檢測不同類型的物資，如行李車。
- 應用目標物件檢測系統模組的視頻處理基礎架構和系統。
- 資源監控和管理系統，並備有手機通報功能。

Key Impact 主要成效



- Through the continuously collected image data, the system applies corresponding machine learning technique and achieves a detection accuracy rate at about 92%. It has also been automatically computing numbers of trolleys over all 18 pick-up points in real time for the entire Baggage Reclaim Hall.
- The system does not require any equipment installation on any baggage trolley, which saves the corresponding installation procedures as well as long-term maintenance management.
- 系統利用不斷收集所得的圖像數據，進行遞進式的機械學習，行李車偵測準確度達至92%；在整個行李認領大堂內，實時為總共18個行李車領取點自動點算行李車的數目。
- 這監察系統並不需要在行李車上安裝任何設備，可省卻相關的安裝工序，以及所需的長遠維修管理。

Award 獎項

Gold Medal at the 46th International Exhibition of Inventions Geneva in 2018
2018年第46屆日內瓦國際發明展金獎

Research Completion
2012

Applications
- Trolley or asset management

Commercialisation opportunities
- Technology licensing

完成研究年份
2012

應用範疇
- 行李車或物資管理

商品化機會
- 技術授權許可

Assistive Technologies for Traditional Chinese Medicine Tele-Practice

傳統中醫遠程診療之輔助技術

Overview 簡介

The project aims to develop assistive technologies for Traditional Chinese Medicine (TCM) Tele-Practice. By applying infrared technology, signal processing, and mechanical engineering technologies, the system enables Chinese medicine practitioners (CMPs) to remotely palpate the patient's pulse.

此項目旨在研發傳統中醫遠程診療輔助技術，透過應用先進的紅外線技術、訊號處理和機械工程技術，系統可協助中醫師遠距離地進行脈診，提供遠程診療服務。

Problem addressed 解決方案

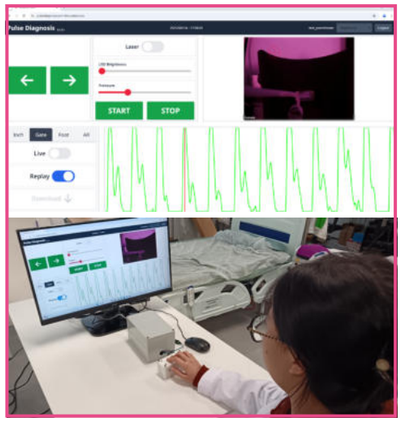
Since the COVID-19 pandemic, telemedicine has been widely adopted. However, TCM Tele-Practice remains underdeveloped, as standard video conferencing tools cannot effectively replicate critical diagnostic techniques such as palpation. To tackle this technical problem, LSCM has developed an innovative assistive technology for TCM Tele-Practice which incorporates novel pulse sensing and pulse regeneration devices.

自新冠疫情以來，遠程醫療已獲廣泛應用。然而，一般視像會議工具無法有效地複製把脈等重要診斷資訊，令中醫遠程診療發展滯後。因此，LSCM研發了創新的中醫遠程診療輔助技術，結合創新的脈象感測與脈象再生設備，為遠程中醫診療提供技術突破。

Innovation 創新技術

- A novel radial artery visualisation device to indicate the suitable acupoints.
- A dynamic force control mechanism is incorporated to apply the required pressure levels for sensing.
- A pulse regeneration device to replicate the patient's pulse with high intraclass correlation coefficient.
- 創新的橈動脈顯像裝置，為穴位進行定位。
- 結合動態壓力調控機制， 精準地施加測量脈象時所需的壓力。
- 脈象再生設備經非線性算法將數碼脈象訊息再生成為機械振動，準確地複製病人的脈博。

Key Impact 主要成效



- Enable the provision of TCM services without geographical boundary, providing convenient access to TCM services for the elderly and people with mobility issues in remote areas.
- Enable more citizens to access high-quality TCM services continuously.
- 突破地域限制，為居住在偏遠地區的長者和行動不便的人士提供便捷的中醫診療服務
- 讓更多市民可享受持續和優質的中醫診療服務

Award 獎項

Silver Medal in the 50th International Exhibition of Inventions Geneva in 2025
2025年第50屆日內瓦國際發明展銀獎

Research Completion
2025

Applications
- Traditional Chinese Medicine clinical services

Commercialisation opportunities
- Technology licensing

完成研究年份
2025

應用範疇
- 傳統中醫應診服務

商品化機會
- 技術授權許可

Strategic Video Analytics for Tracking Cyclists in Track Cycling Race from Dynamic Pan-Tilt-Zoom Scenes

透過動態雲台縮放場景功能對場地單車賽中選手的追蹤視頻進行策略分析

Overview 簡介

To help the industry further promote sports development in Hong Kong through enhancing professionalism in the sports sector and developing sports as an industry, LSCM developed a digitalised system for analysing track cycling race data from the pan-tilt-zoom (PTZ) filmed videos. This paves the way for reinforcing data-driven sports analytics to support the Hong Kong Cycling Team to devise training and games strategies.

為協助業界提升本地體育界的專業水平及推動體育產業化，進一步促進香港體育發展，LSCM研發了一套應用雲台變焦拍攝的賽道單車比賽視頻數字化系統。此系統為深化數據驅動的體育分析鋪路，以支援香港單車隊製定訓練和比賽策略。

Problem addressed 解決方案

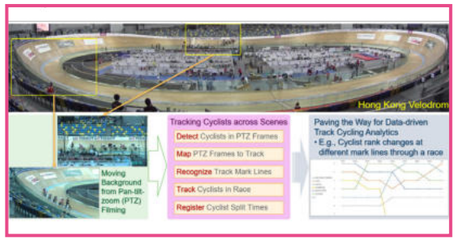
Tracking moving cyclists from a movable pan-tilt-zoom (PTZ) camera is always a challenge as the foreground focal objects and background elements will move uncoordinatedly due to camera displacement and optical zooming. Besides, the shapes of cyclists while circling in the oval racetrack will change when viewing from different angles at a filming spot. And some cyclists may be partially or fully blocked by other cyclists and even being absent from the visual scene. All of these factors increase the complexity of tracking cyclists throughout a race. Therefore, a set of R&D elements in machine learning, computer vision, and information science are devised to collectively solve these complex issues in a systematic manner. By analysing cyclists' interactions during a game, it provides insights for strategising game plans.

使用移動的雲台變焦(PTZ)攝影機追蹤移動中的單車手往往是一項挑戰。皆因受到攝影機位移和光學變焦的影響，前景焦點物體和背景元素亦會出現不協調的移動。此外，從拍攝點的不同角度觀看時，於環繞橢圓形賽道騎行的單車手的形態也會改變。此外，一些單車手亦會被其他選手遮擋部份或完全遮檔，甚至不在視線範圍以內。這些因素皆增加了於比賽中追蹤單車手的複雜性。為了有系統地解決這些複雜的問題，LSCM研發了一套融合機器學習、電腦視覺與訊息科學的方案，透過分析單車手於比賽時的互動，協助制定比賽策略。

Innovation 創新技術

- A video analytics (VA) detector of cyclists from multiple view angles.
- Determine track-based positions of all dynamic PTZ frames for recognising the global track-based viewing orientation and mark lines (Finish Line, 50m Line & 150m Line) in relevant frames.
- To track detected cyclists with motion sequences in moving background across multiple PTZ frames.
- To derive track-based spatiotemporal data for all cyclists on the entire racetrack for establishing the ground to enable data-driven analysis such as interactive dynamics among cyclists in a race.
- 以多角度偵測單車手的視頻分析 (VA) 檢測器。
- 確定所有動態PTZ框架基於賽道的位置，以識別全局賽道的觀看方向，並在相關框架中標記關鍵線（終點線、50米線和150米線）。
- 以多個PTZ框架追蹤於移動背景中已有移動序列的單車手。
- 提取賽道上所有單車手的時空數據，就單車手於比賽之間的互動進行以數據驅動的分析。

Key Impact 主要成效



- Using a movable PTZ camera to track moving objects instead of using a conventional camera may create more opportunities for the related research and development work to apply video analytics over visual content from drones or other PTZ applications. This is particularly applicable for the transportation, manufacturing, logistics, surveillance, as well as sports industries.
- 對比一般固定攝影機，使用可移動的PTZ攝影機追蹤移動對象，為相關研發工作帶來更多機會，可將視頻分析應用於無人機或其他PTZ應用程式的影像內容，尤其適用於運輸、製造、物流、監控以及運動行業。

Research Completion
2024

Applications
- Sports competition analysis

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 體育賽事分析

商品化機會
- 技術授權許可

Vision-based Badminton Match Analysis

羽毛球比賽視頻分析技術

Overview 簡介

In collaboration with The Hong Kong Polytechnic University, LSCM developed a set of vision-based content and motion analytic technologies for supporting badminton match analysis. This highly efficient automated video analysis tool for badminton matches is essential for capturing the latest strategised dynamics of all potential opponents in a tournament. Such analysis will then assist Hong Kong coaching team and elite badminton athletes to devise the most appropriate game strategy for each of the upcoming matches in the tournaments.

LSCM與香港理工大學合作，研發了基於視頻內容和動態活動的分析技術以加強羽毛球賽事策略分析。這種高效而自動化的羽毛球賽事視頻分析工具對於捕捉對手於比賽中運用的最新策略動態是非常重要的。此分析技術將支援香港教練團隊和頂尖羽毛球運動員為即將舉行的比賽制定最適合的策略。

Problem addressed 解決方案

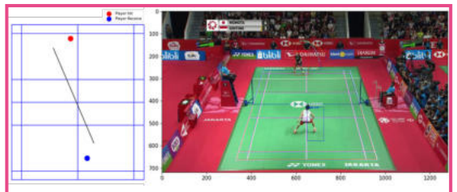
The current practice of video analysis is to manually collect the technical statistics from videos of badminton matches in a tournament. However, the manual capturing of needed statistics from video recording is labor-intensive and time-consuming. Therefore, the analysis of technical characteristics can only be conducted on a few strategically selected top-ranked opponents.

目前分析羽毛球比賽視頻的做法是從比賽賽事的影片中以人手方式收集技術統計數據，但此做法需要大量人手和時間。因此，只能選擇性地挑選數位排名較高的對手進行技術分析。

Innovation 創新技術

- A data-driven badminton match analysis to enable efficient technical statistics analysis
- Fast analysis of opponent's technical characteristics
- A data-driven evaluation of athlete performance and conditions
- 運用數據分析羽毛球賽事以進行高效的技術統計數據分析
- 快速分析對手的技術特點
- 運用數據評估運動員的表現和狀態

Key Impact 主要成效



Highly efficient automated video analysis tool for badminton matches
高效而自動化的羽毛球賽事視頻分析工具

- All players can conduct the same technique statistics analysis for any tournament preparation.
- The game technique statistics from every competition video facilitates technique improvement development plan and formulation of game strategy for each upcoming tournament.
- 所有選手可以對任何比賽進行相同的技術統計數據分析作為賽前準備。
- 每場賽事影片之技術統計數據有助選手制定技術改進計劃，並為即將舉行的每場比賽制定比賽策略。

Research Completion
2024

Applications
- Sports competition analysis

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 體育賽事分析

商品化機會
- 技術授權許可

Tele-Practice Platform System

遠程復康訓練平台系統

Overview 簡介

LSCM developed an IoT sensor infrastructure technology that enables data acquisition from tele-practice devices and provides a platform for integrating different tele-practice solutions.

LSCM研發的物聯網傳感器基礎設施技術，可以從遠程復康訓練設備獲取數據，並為不同的遠程復康訓練方案提供一個整合平台。

Problem addressed 解決方案

Due to the COVID-19 pandemic, many physical and mental healthcare services were suspended which made the service users unable to access the needed services in person. The tele-practice platform enables different tele-practice service providers, NGOs and therapists to connect and collaborate with each other in delivering the rehabilitation services to the people in need.

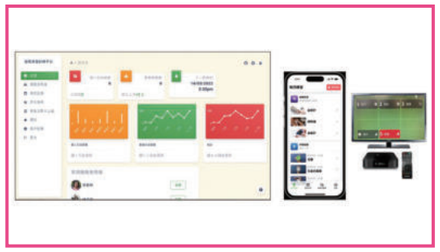
不少保健護理中心因為新冠疫情原因而暫停開放，使很多病人未能得到所需的護理服務。這個平台系統讓不同的遠程服務供應商、非牟利團體和治療師聯繫和協作，為病人提供有需要的復康訓練服務。

Innovation 創新技術

Tele-practice Platform System
遠程復康訓練平台系統

- The tele-practice platform system is a cloud-based system. Different system users can access the system through the secured web portal. It is designed to support different kinds of tele-practice solution devices with services available in the market.
- The IoT platform infrastructure for Tele-practice Applications is able to provide secured centralised user account management service for different user authentication, resources authorisation and data access control. The service users' personal data privacy is protected according to the guidelines issued by the Office of the Privacy Commissioner for Personal Data.
- The platform will integrate different kinds of vital sign monitoring devices to enable the therapists to provide a more comprehensive assessment and monitoring of the service users.
- 遠程復康訓練平台是一個雲端系統。不同的用戶可以透過安全的門戶網站跟系統連繫。它支援市場上不同類型的遠程復康訓練服務方案的設備。
- 此物聯網平台基礎設施將為不同類別的用戶提供由中央帳戶管理的身份驗證、資源授權和數據擷取服務。使用者的個人資料均會受個人資料私隱專員公署發出的指引保障。
- 平台將整合不同類型的生命體徵監測設備，方便治療師為用戶提供更全面的評估和監測。

Key Impact 主要成效



- Service users can receive care services remotely, which is more accessible and convenient than face-to-face care services.
- Connecting different tele-practice service providers for the delivery of rehabilitation services.
- Provision of services without geographical boundary.
- 服務使用者可以獲得遠程護理服務，比面對面的護理服務更易於安排。
- 將不同的遠程復康服務提供者連繫，以提供完整的復康訓練服務。
- 可提供不受地域限制的服務。

Award 獎項

Bronze Medal at the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023
Bronze Medal at the Special Edition 2022 Invention Geneva Evaluation Days
2023年第3屆亞洲創新發明展覽會 — 香港 銅獎
2022年日內瓦國際發明展銅獎

Research Completion
2024

Applications
- A collaborative platform for different service providers to deliver their tele-practice services for service users

Patent Applications
- HK 3202 4085 074.5

Commercialisation opportunities
- Technology licensing

完成研究年份
2024

應用範疇
- 為服務使用者提供不同遠程復康訓練服務的協作平台

專利申請
- HK 3202 4085 074.5

商品化機會
- 技術授權許可

3D LiDAR Technology for In-Bed Monitoring Applications

用於床內檢測的3D光學測距傳感器技術

Overview 簡介

LSCM has developed cutting-edge three-dimension (3D) Light Detection and Ranging sensors (LiDAR) and related Artificial Intelligence (AI) technologies for in-bed monitoring, such as posture detection, movement analysis and object detection, etc.

LSCM研發了嶄新的三維(3D)光學測距傳感器(LiDAR)和相關的人工智能(AI)技術，用於床內監測，例如姿勢檢測、動作分析和物件檢測等。

Problem addressed 解決方案

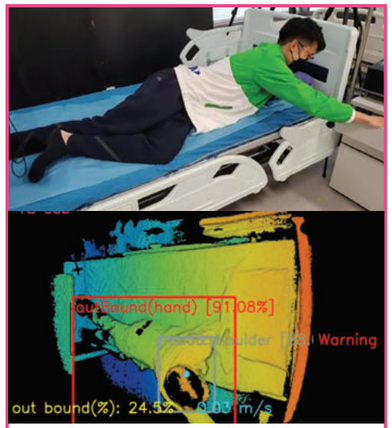
LSCM has developed 3D LiDAR and related AI technologies for In-Bed monitoring applications. The technologies can be utilised to estimate client's postures and detect abnormal conditions. Object monitoring and detection nowadays mainly rely on Red-Green-Blue (RGB) cameras. Captured images are processed to extract objects' location, movement, and status. Nevertheless, RGB cameras are sensitive to ambient conditions and/or lack of 3D spatial information. Instead, the technologies LSCM developed provide centimetre-level 3D spatial information under different ambient conditions and a higher degree of freedom of computer processing. Together with advanced AI algorithms, clients' posture, location, movement direction and speed can then be analysed and extracted accurately, which provides real-time information for the caregivers.

LSCM研發了應用於床內監測的3D LiDAR和相關AI技術。這些技術可評估使用者的姿勢並檢測異常情況。現時坊間的監測和檢測技術，主要依靠紅綠藍(RGB)相機處理拍攝到的圖像，以提取使用者的位置、動作和狀態。然而，RGB相機對環境敏感，同時缺乏3D空間資訊。而LSCM研發的技術在不同的環境下亦提供厘米級的3D空間資訊和更靈活的運算。結合先進的AI演算法，可以準確地分析和提取使用者的姿勢、位置、動作方向和速度，為護理人員提供重要的實時資訊。

Innovation 創新技術

- A hardware system to extract centi-metre-level 3D spatial information.
- Signal processing techniques to extract clients' location, movement, and status information.
- AI methods to detect the clients' posture and condition.
- Sensor and AI technologies to detect the conditions of the bed and other furniture conditions.
- Real-time information for caregivers' immediate action.
- Clients' data will be analysed to generate their own profile and daily activity level, this can be a useful health indicator.
- 提取厘米級3D空間訊息的硬件系統。
- 提取使用者的位置、移動和狀態訊息的訊號處理技術。
- 檢測使用者的姿勢和狀況的人工智能方法。
- 檢測床欄杆和其他家具狀況的傳感器和人工智能技術。
- 實時訊息可讓護理人員立即採取行動。
- 分析使用者的數據以建立他們的個人記錄和日常活動水平，作為一個有用的健康指標。

Key Impact 主要成效



Real-Time In-bed Posture, Movement and Spatial Analysis
使用3D LiDAR進行實時床內姿勢、動作和空間分析

- A privacy-protected in-bed monitoring system
- Insensitive to the ambient conditions.
- Real-time status update for caretakers' immediate action and efficient management.
- Other than hospitals and elderly homes, the technologies can also be applied to elderly people living alone. This aligns with the HKSAR Government's "Ageing-in-Place" Scheme.
- Cloud storage and analysis possible.
- 5G communication possible for reliable monitoring.
- 高私隱度的床內監控系統。
- 對環境條件不敏感。
- 為看護人員提供實時狀態更新，協助他們進行更有效的即時行動和管理。
- 這些技術不僅可以應用於醫院、長者院舍，還適用於獨居長者，配合香港特區政府的「居家安老」計劃。
- 可作雲端儲存和分析。
- 可使用5G作實時和可靠的監控。

Research Completion
2023

Applications
- In-bed monitoring for hospitals and elderly homes
- Monitoring system for the elderly people living alone
- Consumer health-care applications

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 醫院和長者院舍的床內監測
- 獨居長者監控系統
- 保健系統應用

商品化機會
- 技術授權許可

"StayHomeSafe" Home Quarantine Support Solution

「居安抗疫」家居檢疫方案

Overview 簡介

"StayHomeSafe" System, consisting of an electronic wristband and a monitoring system, facilitates the compulsory home quarantine arrangement implemented by the Hong Kong SAR Government to combat COVID-19.

「居安抗疫」之電子手環及監察系統支援香港特區政府為應對2019冠狀病毒病而實施的強制家居檢疫措施。

Problem addressed 解決方案

"StayHomeSafe" Home Quarantine Support Solution
支援香港家居檢疫措施的「居安抗疫」電子手環及監察系統

The Hong Kong SAR Government implemented the home quarantine arrangement and the relevant departments needed to ensure the quarantined person's presence in the designated quarantine premises. By installing a tracking device in the premises and pairing it with an e-wristband worn by the quarantined person, the system monitors the tracking device remotely on the received signals emitted from the e-wristband. If there are any abnormalities, the system will send out alerts.

香港特區政府推行家居檢疫措施，相關部門需要確保檢疫人士身處於指定的檢疫地點。系統透過在檢疫地點安裝追蹤裝置，並配對檢疫人士佩戴的電子手環，利用追蹤裝置及電子手環發出的訊號，進行遠距離監測。如偵測到任何異常情況，系統會發出警報。

Innovation 創新技術

- The electronic wristband can be worn as a normal wristwatch. By employing active tamper detection, the electronic wristband will send out signals to the base station when it is being tampered.
- The Controller can access the Home Quarantine Monitoring System through Internet or a specified network to view the quarantined person's status. When there are any abnormalities, the system will alert the related departments to take necessary actions.
- 電子手環的佩戴方式跟普通手錶無異。採用主動檢測模式，手環一旦被蓄意破壞，便會向基站發送訊號。
- 相關人員可以透過互聯網或指定網絡管理電子手環及監測系統，查看檢疫人士的狀態。當出現異常情況時，系統便會通知相關部門，以作出相應行動。

Key Impact 主要成效

- Support the on-going anti-COVID-19 work in Hong Kong
- 持續支援香港應對2019冠狀病毒病的防疫工作

Award 獎項

Gold Medal in the Special Edition 2021 Inventions Geneva Evaluation Days

Outstanding Electronic Wristband and Monitoring System for Home Quarantine in Smart Living Partnership Award 2021

Merit Awards in the Inclusion category (General) and Technology category (IoT) in the Asia Pacific Information and Communications Technology Alliance (APICTA) Awards 2020-21

Outstanding Tracking and Surveillance Award in the Pandemic Innovative Digital Solution Awards 2020

2021年日內瓦國際發明展金獎

2021智慧生活夥伴大獎 — 傑出家居檢疫電子手環及監察系統

2020-21年亞太資訊及通訊科技大獎 — 社區共融類別(一般)優異獎及科技類別(物聯網)優異獎

2020年抗疫創新數碼方案獎 — 傑出追蹤與監測類別獎

Research Completion
2021

Applications
- Tamper detection electronic wristbands for hospitals
- Information exchange and tracking
- Workflow integration and monitoring for operation

Patent Applications
- US 16/791,092
- CN 2019 1022 8114.4
- HK 32020002776.3

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 電子手環可應用於醫院，並防止蓄意破壞
- 資訊交流和追蹤
- 監控和整合工作及運作流程

專利申請
- US 16/791,092
- CN 2019 1022 8114.4
- HK 32020002776.3

商品化機會
- 技術授權許可

Service Logging and Information Kiosk System

服務記錄及資訊查詢系統

Overview 簡介

The project develops the service logging and information kiosk software system which provides assisting functions to elderly service professionals as well as providing useful information to the elderly members in elderly homes, district centres and rehabilitation centres.

此項目旨在研發服務記錄及資訊管理軟件系統，為長者護理專業人員提供協助，並為長者院舍、地區中心和復康中心的長者提供有用的資訊。

Problem addressed 解決方案

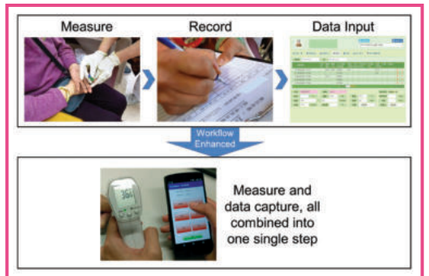
Nowadays, the demand for elderly service professionals in elderly homes, district centres and rehabilitation centres is high. Besides the basic care and rehabilitation services provided to the elderly, the elderly service professionals also need to perform a lot of paperwork every day. The public also expects the service providers to take care of the elderly in other areas, such as providing useful information to the elderly, as well as allowing them to handle some self-service tasks in order to maintain their self-reliance ability. Moreover, in order to alleviate the workload of the elderly service professionals, it is helpful to utilise computerised systems and equipment to facilitate their daily routine work, such as taking body temperature for the elderly and making record of it. The Service Logging and Information Kiosk System provides the solution to these issues.

現時，長者院舍、社區中心和復康中心對於護理專業人員有很高的需求。除了為長者提供基本的護理和復康服務外，護理專業人員每天還需要處理大量文書工作。公眾亦期望服務提供者在其他方面亦能照顧到長者，例如為長者提供有用的資訊，以及讓長者進行一些自助服務，以維持他們的自理能力。為了減輕護理專業人員的工作量，可善用電腦化系統和設備，以協助他們的日常工作，例如為長者量度和記錄體溫。而服務記錄及資訊查詢系統則為這些問題提供了解決方案。

Innovation 創新技術

- AI-assisted group photo browsing based on facial recognition
- Chatbot-enabled interactive enquiry for available services and information:
  - Meal of the day
  - Activities announcement
  - Training videos
  - Weather
  - Notice/memo
- RFID-based activities signing-up
- Auto in-range connection for vital sign measuring equipment
- 基於人臉識別的AI輔助合照瀏覽
- 與聊天機械人互動，查詢可用服務和資訊：
  - 每日餐單
  - 活動公告
  - 培訓視頻
  - 天氣
  - 通告/備忘錄
- 基於RFID的活動登記
- 在指定範圍內自動連接生命體徵測量設備

Key Impact 主要成效



Service Logging and Information Kiosk System for Elderly Homes, District Centres and Rehabilitation Centres
適用於長者院舍、地區中心及復康中心的服務記錄及資訊查詢系統

- Reduce the workload of elderly service professionals in their daily routine paperwork so that they can concentrate on providing other care / rehabilitation services for the elderly.
- Provide Self-service functions to elderly members, help to maintain their self-reliance ability, enhance their self-esteem, and help them adapt to technology.
- 減輕護理人員的日常文書工作量，讓他們可以專注於其他長者護理/復康服務。
- 為長者提供自助服務，協助他們保持自理能力，提高他們的自信心，協助他們適應科技。

Research Completion
2021

Applications
- Service Logging and Information Kiosk System for Elderly homes / district centres / rehabilitation centres

Commercialisation opportunities
- Technology licensing

完成研究年份
2021

應用範疇
- 於長者護理院舍/地區中心/復康中心進行服務記錄和提供資訊

商品化機會
- 技術授權許可

Ultra-Wideband Activity Level Monitoring System

超寬帶活動程度監測系統

Overview 簡介

This monitoring system measures the activity levels of the elderly and detect any abnormal conditions by using state-of-the-art ultra-wideband (UWB) and signal processing technologies.

此監測系統透過使用最先進的超寬帶(UWB)和訊號處理技術以測量長者的活動程度，並檢測有否異常情況。

Problem addressed 解決方案

Ultra-Wideband Activity Monitoring System for Solitary Elderly
應用超寬帶技術於獨居長者活動監測

The elderly service Industry has been in need of novel technologies to reduce the demand for manpower and resources to cope with the ageing population. This project utilises UWB technologies to provide a non-contact and no-image monitoring solution to measure the elderly's activity levels in elderly centres, which helps the caregivers to enhance work efficiency.

長者服務業界一直需要嶄新技術以減低因人口老化而產生的人力和資源需求。此項目利用UWB技術在長者中心提供非接觸式及無圖像的長者活動程度監測技術，藉此協助護理人員提高工作效率。

Innovation 創新技術

- Utilising UWB technology to detect respiration rate and other activities in order to provide mm-level spatial and movement analysis.
- 利用UWB技術檢測呼吸率和其他活動，以提供毫米級空間和活動分析。

Key Impact 主要成效

- Provide real-time feedbacks on respiration rate and bed occupancy detection to help caregivers provide efficient remote care services for the elderly.
- 提供呼吸頻率和床位檢測的實時反饋，協助護理人員為長者提供高效率的遠程看護服務。

Award 獎項

Gold Medal at the 46th International Exhibition of Inventions Geneva in 2018

2018年第46屆日內瓦國際發明展金獎

Research Completion
2017

Applications
- Respiration rate detection
- Bed occupancy detection

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 呼吸率檢測
- 床位使用檢測

商品化機會
- 技術授權許可

RFID Blind Cane

無線射頻識別視障人士手杖

Overview 簡介

The project develops the navigation software, the RFID blind cane hardware and RFID tags in various form factors to provide easy navigation in city areas for visually impaired users.

此項目旨在開發各種導航軟件、無線射頻識別技術(RFID)視障人士手杖硬件和RFID標籤，為視障人士在市區輕鬆導航。

Problem addressed 解決方案

In Hong Kong, the visually impaired encounters various difficulties when travelling indoor and outdoor. With RFID technology and audio-based navigation, the Blind Cane Navigation System provides guidance to the visually impaired and leads them to their destination with the shortest route.

在香港，視障人士無論在室內或室外行走時均面對很多困難。LSCM研發的視障人士手杖系統，透過無線射頻識別技術及導航語音為視障人士提供指引，帶領他們以最短路線抵達目的地。

Innovation 創新技術

An RFID-based blind cane

- RFID tags with various form factors to provide navigation landmarks:
  - Under tactile pavement
  - Embedded in metal-chassis guiding strip
- Cloud platform for blind-guiding site map management
- Navigation mobile app with two operation modes:
  - Free walking mode
  - Target destination mode

基於RFID的視障人士手杖

- 具有各種外形尺寸的RFID標籤以提供導航地標：
  - 在導盲磚路面下
  - 嵌入金屬底盤導向條
- 盲人引導站點地圖管理雲端平台
- 備有兩種操作模式的導航流動應用程式：
  - 自由步行模式
  - 設定目的地模式

Key Impact 主要成效

RFID Blind Cane and RFID Tags for Navigation
無線射頻識別視障人士手杖系統

- Enable visually impaired users to navigate in unfamiliar city areas without the need to memorise the routes in advance.
- Provide immediate and updated information about the routes in advance (e.g. closure / blockage) to avoid danger.
- 為視障人士在不熟悉的市區導航，令他們無需預先記住路線
- 預先提供有關路線的即時和更新資訊(例如關門/阻塞)，以避免危險

Award 獎項

Outstanding RFID Blind Cane System in Hong Kong Smart City Award 2018

Gold Medal with Congratulations of the Jury Award in the 44th International Exhibition of Inventions Geneva in 2016

香港智慧城市大獎2018 — 傑出RFID視障人士手仗系統

2016年第44屆日內瓦國際發明展評審團嘉許金獎

Research Completion
2017

Applications
- Navigation assistance for the visually impaired

Patent Applications
- US 15/537,535 / CN 2014 8008 3737.2/ HK 18104124.1 / EP 14908247.1/ KR 2017-7017137 / AU 2014 414586/ SG 11201705047T / UK 3233015 / DE 60 2014 066 874.4 / FR 3233015

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 為視障人士提供導航協助

專利申請
- US 15/537,535 / CN 2014 8008 3737.2/ HK 18104124.1 / EP 14908247.1/ KR 2017-7017137 / AU 2014 414586/ SG 11201705047T / UK 3233015 / DE 60 2014 066 874.4 / FR 3233015

商品化機會
- 技術授權許可

Infrared Thermal Sensing Safety Alert System

紅外線熱能感應警報系統

Overview 簡介

This Infrared Thermal Sensing Safety Alert System is a privacy preserving system designed for monitoring an individual's safety in a private space. It analyses the real-time thermal data of the private space to determine whether the individual needs support from their caregivers.

這個紅外線熱傳感警報系統是一個高度保障私隱的安全監察系統。系統會根據實時熱能數據，分析有關長者是否需要護理人員協助。

Problem addressed 解決方案

Falling or fainting in the bathroom is a common accident among the elderly. Because of the high privacy level in the bathroom, the accident often cannot be found immediately. The support of medical treatment will then be delayed.

長者在浴室跌倒或暈倒是常見的意外，但往往因為浴室是較為私人的空間，發生意外而未能察覺，造成救援延遲。

Innovation 創新技術

Infrared Thermal Sensing Safety Alert System for the Elderly
適用於長者的紅外線熱能感應警報系統

- This low-cost thermal sensing technology can help detect and analyse human movement. When body movement is not detected for a period of time, an alarm will alert the caregivers that the person being looked after may be in danger.
- It is a privacy preserving system that uses a lower resolution thermal sensor to monitor an individual's safety in a private space.
- 這個低成本的熱能感應技術，可以協助檢測和分析人體移動。當一段時間內未有檢測到人體移動時，將發出警報，通知護理人員被照顧者有可能處於危險情況。
- 保障隱私，使用低解像度的熱傳感器來監測位於私人空間內的人士之安全。

Key Impact 主要成效

- Enhance the work efficiency of the elderly home and the arrangement of manpower.
- 提升長者院舍的效率及更有效地安排人手。

Award 獎項

Gold Medal at the 47th International Exhibition of Inventions Geneva in 2019
Silver Medal at the 1st Asia Exhibition of Inventions Hong Kong in 2018
2019年第47屆日內瓦國際發明展金獎
2018年第1屆亞洲發明展覽會 — 香港 銀獎

Research Completion
2017

Applications
- Elderly homes or elderly centres

Patent Applications
- US 16/234,693
- CN 2018 1162 3707
- HK 18113867.3

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 長者院舍或長者中心

專利申請
- US 16/234,693
- CN 2018 1162 3707
- HK 18113867.3

商品化機會
- 技術授權許可

GPS Tracking Technologies

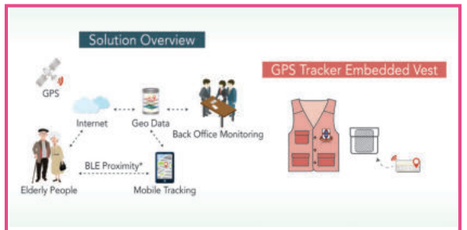
全球定位追蹤技術

Overview 簡介

The elderly who suffers from dementia or other forms of memory-related problems may get lost easily during outing activities. The GPS tracking technology can help find the missing persons.

患有腦退化症或其他與記憶力相關問題的長者在戶外活動時都較容易走失。而GPS追蹤技術則可以協助尋找這些走失人士。

Problem addressed 解決方案



GPS Tracking Technologies 全球定位追蹤技術

While we encourage the elderly to participate in outdoor activities, we are often worried about their safety as they may wander away from the caregivers. In this solution, each elderly person will wear a vest embedded with a tracker during outing activities. So, the location information of the tracker will be sent to the server. The operators in the service centre can define the geo-fencing zone. If a tracker is outside the zone, alerts will be generated.

雖然我們鼓勵長者參加戶外活動，但我們亦擔心他們的安全，例如跟照顧者走散。在這個解決方案中，每位長者在外出活動時，都會穿著一件安裝了追蹤器的背心，追蹤器的位置訊息會發送至伺服器。而服務中心的營運商可以界定地理圍欄區域，如果追蹤器在區域以外，便會發出警報。

Innovation 創新技術

- The web-based GPS tracking system is easy to use by operators. The location of each person can be displayed on a map. Operators can also use the system to locate a specific elderly person.
- A vest with a location tracking system is developed to assist the elderly centre to better monitor the elderly persons' location during outdoor activities.
- 基於網絡的GPS追蹤系統易於操作，每人的位置都可以顯示在地圖上。操作人員亦可以使用系統來監測個別長者的位置。
- 具有定位追蹤系統的背心協助長者中心在進行戶外活動時，更有效地監測長者的位置。

Key Impact 主要成效

- Enable the elderly and their caregivers to enjoy life and work independently but remain connected in the event of emergency.
- Help prevent wandering while promoting autonomy and freedom of the elderly with dementia, and relieve the caregivers' stress and anxiety.
- 讓長者及其照顧者能夠獨立享受生活及工作，但在緊急情況下仍能保持聯繫。
- 有助於防止游走，同時讓患有腦退化症的長者能自主和自由地活動，並舒緩照顧者的壓力和焦慮。

Research Completion
2016

Applications
- Elderly care

Commercialisation opportunities
- Technology licensing

完成研究年份
2016

應用範疇
- 長者照顧

商品化機會
- 技術授權許可

Baby Tag and Baby Tracking Management Control System

嬰兒標籤與嬰兒綜合管理監察系統

Overview 簡介

LSCM developed the Baby Tag and Baby Tracking Management Control System to enhance the security and system control to reduce the risk of baby abduction in the hospitals.

LSCM研發的嬰兒標籤和嬰兒綜合管理監察系統，旨在提高照顧嬰兒時的保安和系統控制，從而減低嬰兒在醫院被擄拐的風險。

Problem addressed 解決方案

Baby Tag 嬰兒標籤與嬰兒綜合管理監察系統

In order to improve the security of new-born babies and protect the babies from abduction. This system will raise a visual and audio alert when unauthorised movements of the new-born babies or attempts in tampering of the tag have been detected.

為了加強嬰兒保安及減低嬰兒在醫院內被拐帶的風險，系統能偵測到初生嬰兒在未經授權的情況之下被移往別處，或當標籤遭受到破壞時，系統便會發出警示畫面及警報聲。

Innovation 創新技術

- Tamper-resistant strap and double ring design to reduce “false alarm” of the tag wearing status.
- The RFID reader is developed to assign a specific timeslot and channel for RF communication with Baby Tag against collision.
- Baby Tracking Management Control System is designed for caregivers to respond quickly to the alerts generated by the Baby Tag.
- 防止破壞的手帶和雙環設計，能減少對標籤佩戴狀態的「誤報」。
- RFID閱讀器為嬰兒標籤的射頻通訊分配特定的時隙和頻道，避免通訊信號互相干擾。
- 嬰兒綜合管理監察系統讓照顧者快速地對嬰兒標籤發出的警報作出反應。

Key Impact 主要成效

- Enhance the security and mitigate the danger of baby abduction in hospitals.
- The real-time tracking solution can be adopted in the community.
- 提高保安，並減低住院的嬰兒被擄拐的風險。
- 這個實時追蹤解決方案可應用於社區。

Award 獎項

Bronze Medal in the 49th International Exhibition of Inventions Geneva in 2024

Bronze Medal in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023

2024年第49屆日內瓦國際發明展銅獎

2023年第3屆亞洲創新發明展覽會 — 香港 銅獎

Research Completion
2014

Applications
- People/asset tracking in hospital environment

Patent Applications
- US 14/766,819
- CN 2013 8007 5416.3
- HK 16101739.6
- EP 13 874 810.8
- UK EP13874810.8
- DE 60 2013 059 880.0
- FR EP13874810.8
- CN 201380080703.3
- HK 16114457.9

Commercialisation opportunities
- Technology licensing

完成研究年份
2014

應用範疇
- 於醫院環境內的人/物資追蹤

專利申請
- US 14/766,819
- CN 2013 8007 5416.3
- HK 16101739.6
- EP 13 874 810.8
- UK EP13874810.8
- DE 60 2013 059 880.0
- FR EP13874810.8
- CN 201380080703.3
- HK 16114457.9

商品化機會
- 技術授權許可

RFID-Tagged Vest & Gate Door System

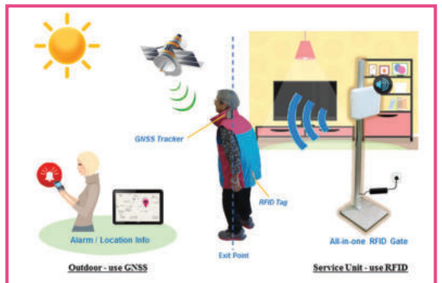
無線射頻識別背心及閘門

Overview 簡介

RFID technologies can safeguard the elderly from accidental wandering. RFID signals from tagged vests can be detected by the installed antenna. If an elderly person wearing the RFID-tagged vest leaves the elderly home or elderly centre without permission, the system will alert the monitoring staff by issuing an alert so that they can take immediate actions.

RFID技術可防止長者意外走失。內置無線射頻識別(RFID)標籤的背心可以透過天線檢測到RFID訊號，如果穿著內置RFID標籤背心的長者擅自離開長者院舍或長者中心，系統會發出警報通知監控人員，以便他們立即採取行動。

Problem addressed 解決方案



RFID technologies to safeguard the elderly from accidental wandering
適用於長者監察的無線射頻識別技術

Advocated and supported by Tung Wah Group of Hospitals - Wong Cho Tong District Elderly Community Centre, this RFID solution is used to detect the in/out status of patients with dementia when they wander away from the elderly home/ elderly centre.

The elderly wearing the vests with the built-in RFID tags will be detected automatically in case they wander away from the premises without permission.

此RFID解決方案獲得東華三院黃祖棠社區服務中心的支持和採用，以協助監察腦退化症患者進出護理場所的情況。

穿上內置RFID標籤外套的長者若然走失或擅離院舍，護理人員可以盡早知道，並把他們尋回。

Innovation 創新技術

- Leveraging multiple technologies in unison for more comprehensive elderly care service.
- A single solution to provide both indoor monitoring as well as outdoor tracking.
- The system is easy to use and requires simple training for caregivers.
- 整合多種技術，達至更全面的長者照顧服務。
- 提供室內監察和室外追蹤的一站式解決方案。
- 系統容易使用，護理人員只需接受簡單的培訓。

Key Impact 主要成效

- Automate operations to enhance workplace efficiency and productivity to minimise operating cost.
- Optimise the value of internal costs and free up resources that could be allocated to improving elderly services.
- The elderly wearing the vests with built-in RFID tags will be detected automatically in case they wander away from the elderly homes or elderly centres without permission.
- Provide better care services and secure the safety of the elderly.
- 透過自動化操作，提高工作場所的效率及生產力，從而大大地降低營運成本。
- 優化內部成本的價值，並釋放可用於改善長者服務的資源。
- 系統會自動檢測到穿著內置RFID標籤背心並擅離長者院舍或長者中心的長者。
- 為長者提供更好的照顧和安全保護。

Research Completion
2013

Applications
- Elderly homes or elderly centres

Commercialisation opportunities
- Technology licensing

完成研究年份
2013

應用範疇
- 長者院舍或長者中心

商品化機會
- 技術授權許可

Automated Concrete Cube Testing System

自動混凝土磚測試系統

Overview 簡介

Jointly developed by LSCM and the Geotechnical Engineering Office (GEO) of the Civil Engineering and Development Department (CEDD), the Automated Concrete Cube Testing System is the first of its kind in the world that automates the process of testing the compressive strength of concrete cubes and provide a controlled environment for curing the cubes.

這個全球首創的自動混凝土磚測試系統由LSCM及土木工程拓展署轄下的土力工程處共同研發，能自動測試混凝土磚的抗壓強度和提供受控的護養環境。

Problem addressed 解決方案

Since there is a high demand for conducting materials compliance tests, especially concrete cube testing, GEO's Public Works Laboratories would like to increase their testing capacity through automation so that all concrete cube tests can be conducted efficiently, and the quality can be enhanced.

由於業界對土力工程處的工務試驗所提供的物料測試，特別是混凝土磚測試，需求很高，當局希望利用這自動化混凝土磚測試系統來提高測試能力及質素。

Innovation 創新技術

Automated Concrete Cube Testing System
自動混凝土磚測試系統

- The system can automatically carry out the entire concrete cube testing, including concrete cube curing, weight and dimension measurement and compression testing.
- It includes an overhead xyz moving stage, robotic arm on rail, laser 3-dimensions measurement device and compression test machine.
- An AI system is included to distinguish whether the fracture mode of the concrete cube sample meets the requirements by computer vision technology and help identify any potential issues or areas for improvement.
- 這系統可以將整個混凝土磚測試(包括混凝土磚護養、重量和尺寸量度，以及壓力測試)自動化。
- 系統包括高架xyz軸移動平台、軌道移動式機械臂、鐳射三維尺寸測量裝置和壓磚機。
- 系統配備人工智能系統，利用電腦視覺分析技術，判斷混凝土磚的破裂模式是否符合測試規範的要求，並協助識別任何潛在問題或需要改進的地方。

Key Impact 主要成效

- The system enhances the accuracy, repeatability, and speed of testing.
- It reduces the risk of operator's error and enhances the safety by eliminating the need of handling heavy concrete cubes manually.
- The system has already been put into operation at GEO's Public Works Regional Laboratory (Sham Shui Kok).
- 該系統提高了混凝土磚測試的準確性、複驗的能力和速度。
- 它減低了操作員出錯的風險，並免除人手處理有一定重量的混凝土磚的需要，提高安全性。
- 該系統已在土力工程處的工務區域試驗所(深水角)應用。

Award 獎項

Bronze Medal in the 48th International Exhibition of Inventions Geneva in 2023
Gold Medal in the 3rd Asia Exhibition of Innovations and Inventions Hong Kong in 2023
Outstanding Concrete Cubes Automated Testing System in Smart Living Partnership Awards 2022
2023年第48屆日內瓦國際發明展銅獎
2023年第3屆亞洲創新發明展覽會 — 香港 金獎
2022智慧生活夥伴大獎 — 傑出混凝土磚自動化測試系統

Research Completion
2023

Applications
- Concrete cube testing

Patent Applications
- US 18/177,894
- CN 2023 1027 6177.3
- HK 2202 3069 508.6

Commercialisation opportunities
- Technology licensing

完成研究年份
2023

應用範疇
- 混凝土磚測試

專利申請
- US 18/177,894
- CN 2023 1027 6177.3
- HK 2202 3069 508.6

商品化機會
- 技術授權許可

Digital Twin For Construction Resource And Progress Management

施工資源與進度管理數字孿生技術研究

Overview 簡介

In collaboration with the Polytechnic University of Hong Kong, a Digital Twin technology that supports construction management is developed in this project. The digital twin concept, paired with wearable and mobile devices on a construction site, allows up-to-date information to provide automatic resource allocation monitoring and waste tracking for a predictive and lean approach to resource management.

本項目與香港理工大學合作，開發一項數字孿生技術以支援施工管理。把數字孿生概念與建築工地上的可穿戴和移動設備互相結合，有助隨時監控資源和進行廢料追蹤，從而作出具前瞻性和精益的資源管理。

Problem addressed 解決方案

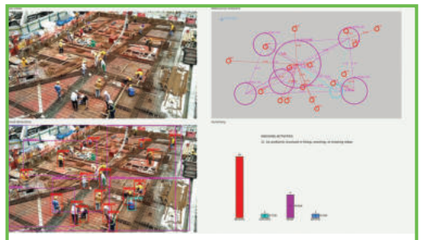
The conventional construction management relies on sampling labour productivity data as a baseline to control the overall project budget and progress. Manual inspection, however, has limitations in gauging the overall cost and productivity. This error-prone process inevitably leads to misjudgement, unnecessary resource overrun, and post-event remedies. The industry is longing for a new management tool for better construction project management.

傳統的施工管理依賴針對勞動生產力數據的抽樣巡檢，作為控制項目總體預算和進度的參考。由於人手檢查(取樣)只能以有限的資源以衡量總體成本和生產率，過程容易出錯，因而導致不可避免的誤判、不必要的資源超支，以及事後補救。業界需要新的工具，以更妥善地管理施工項目。

Innovation 創新技術

- The technologies transform the practice of resource and progress control with a fully automated and non-invasive solution.
- The comprehensive solution leverages state-of-the-art technologies in computer vision, to enhance the construction quality management, as well as the construction resource and progress management.
- Digital data is formed by sensors that continuously monitor changes in the environment and report the updated status in form of measurements and pictures.
- The domain-specific resource and progress management methods based on the data collected via computer vision and robotics are novel regarding the subtle technological fusion.
- 這技術透過完全自動化和非侵入性的解決方案，改善資源和進度管理。
- 利用最先進的計算機視覺技術整合的綜合解決方案，提升施工質量，以及施工資源和進度的管理。
- 數字數據由傳感器持續監測環境變化而產生，並以測量值和圖片報告最新的狀態。
- 根據計算機視覺和機械人技術收集的數據而生成的特定領域資源和進度管理方法，在細緻的技術融合方面是嶄新的。

Key Impact 主要成效



A computer vision-enabled digital twin for construction resource and progress management
施工資源與進度管理數字孿生技術研究

- This project contributes to transforming the construction management practice to be a population-based, intensive, and proactive process.
- It helps enhance resource productivity, reduce resource waste and progress lagging, as well as enhancing project performance.
- This application will provide accurate and timely statistics of resources and progresses by fusing multiple data sources so that critical data can be synchronously collected, managed, and used.
- The technologies can help enhance the competitiveness of the Hong Kong construction industry and promote creativity and innovation, which is helpful in recruiting and retaining younger workers.
- 此項目有助於將施工管理轉變為以數據為基礎的、密集式和具前瞻性的過程。
- 它有助提高資源生產力，減低資源浪費和進度滯後，並提高項目成效。
- 此應用將透過融合多項數據源，提供準確、及時的資源和進度統計數據，以便同步收集、管理和使用關鍵數據。
- 此技術能提升香港建築業的競爭力，並鼓勵創意和創新，有助業界招聘和挽留年輕員工。

Award 獎項

Silver Medal in the 49th International Exhibition of Inventions Geneva in 2024
Outstanding Construction Resources and Progress Management System in Smart Living Partnership Awards 2022
2024年第49屆日內瓦國際發明展銀獎
2022智慧生活夥伴大獎 — 傑出建築工程資源與進度管理系統

Research Completion
2022

Applications
- Construction

Commercialisation opportunities
- Technology licensing

完成研究年份
2022

應用範疇
- 建築

商品化機會
- 技術授權許可

Smart Construction Platform

智慧建造管理平台

Overview 簡介

In collaboration with the Hong Kong Polytechnic University, LSCM developed a smart construction platform (abbreviated as BIMGLE) by integrating Cloud BIM technology and Image Processing. The platform can enable project stakeholders (including the public) to keep abreast of the progress of the project. The technologies can also mitigate project delays and improve productivity of the industry.

本項目與香港理工大學合作，透過整合雲端BIM技術和圖像處理，開發一個智能建築平台(簡稱為BIMGLE)。平台可以讓與項目有關的單位(包括公眾)及時了解工程的進展情況。這些技術還可以減少項目延誤，並提高效率。

Problem addressed 解決方案

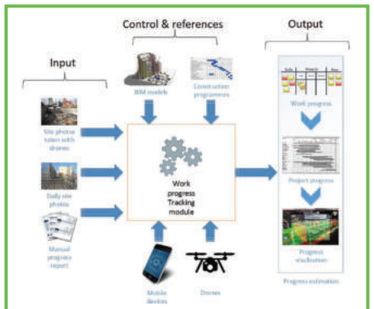
This technology can systematically extract and transform Building Information Modeling (BIM) objects into a construction management platform according to construction plans. It is a BIM-based task decomposition and assignment technology that enables workers to directly access BIM information and work instructions, a means of information indexing and retrieval that enable workers' convenient and timely access to information relevant to their work, and an image processing tool that automatically estimates progress according to BIM models and site photos.

這技術能根據施工計劃，有系統地提取BIM資料及將其轉換到另一個施工管理平台中。它是一個基於BIM的工作分配和指派技術，使BIM資訊和工作指令可以直接下達至工人，透過資訊索引和檢索，使工人可以更方便地及時獲得與其工作相關的資訊。它利用圖像處理技術，可根據BIM模型和現場照片作自動的進度估計。

Innovation 創新技術

- To support location-based progress monitoring, the project planner can define or reuse Location Breakdown Structure (LBS) and Work Breakdown Structure (WBS) in the platform. Then the activities in construction program can be assigned to LBS and WBS. In this way, the work order can be indexed according to locations and works.
- In work progress tracking module, it allows site personnel to record and report work progress using images. A site image recognition engine is developed to automatically recognise and analyse the unsorted images by using the pattern recognition and deep learning technology.
- BIM models visualisation provides a progress visualisation platform, so that it facilitates better information-sharing among all project participants through mobile devices and web pages.
- 為了支援位置基礎進度監控，項目規劃人員可以在平台中界定或重新使用位置細分結構(LBS)和工作細分結構(WBS)，然後將施工計劃中的活動分配給LBS和WBS。透過這種方式，工作訂單可以根據地點和工程編制索引。
- 工作進度追蹤模組可允許現場工作人員使用圖像記錄和報告工作進度。項目所開發的工地圖像識別引擎會利用模式識別和深度學習技術，自動識別和分析未被分類的圖像。
- BIM模型可視化提供了一個可檢視進度的平台，以便透過流動設備和網站跟所有項目參與者分享資訊。

Key Impact 主要成效



Smart Construction Platform based on Cloud BIM and Image Processing
基於BIM雲端和圖像處理技術的智慧建造管理平台

- Automate the manual model update tasks and further enhance Proactive Construction Management System's adoption in the construction industry.
- Extend the use of BIM from design to construction process management which helps eliminate some root causes of project delays and enhance the productivity of the industry.
- 將手動模型更新工作自動化，進一步提高主動施工管理系統在建造業的採用率。
- 將BIM的使用從設計擴展到施工過程管理，這有助消除項目延遲的一些根本原因，並提高行業的生產力。

Research Completion
2018

Applications
- Construction project management

Commercialisation opportunities
- Technology licensing

完成研究年份
2018

應用範疇
- 建造業項目管理

商品化機會
- 技術授權許可

IoT Network and BIM

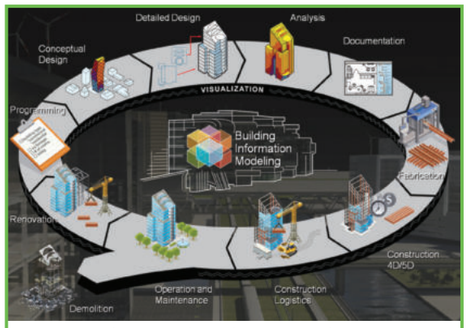
物聯網網格和建築訊息模型

Overview 簡介

In collaboration with the Hong Kong University of Science and Technology, LSCM developed a Building Life Cycle Management system by adopting an integrated semantic knowledge-based BIM and further extended it by attaching additional IoT information to the Mechanical, Electrical and Public Health (MEP) components, so that facility management and building analysis can be done in one portal interface.

本項目與香港科技大學合作，建立了一個支援建築生命週期管理的系統。此項目採用了建築資訊模型(BIM)，並把額外的拓撲和語義訊息附加到機械、電氣和公共衛生(MEP)組件上，從而令設施管理及建築分析可於同一網站介面完成。

Problem addressed 解決方案



IoT Mesh network and Integrated Semantic knowledge-based BIM for Building Life Cycle Management
利用物聯網網格和建築信息模型支援建築生命週期管理

The project extends the current geometric information in BIM by including semantic information to enhance operations in construction and facility management. A novel multi-sensor network based on Bluetooth MESH technology provides updated tagged building facilities spatial location and their associated semantic attributes. Building facility managers can then monitor the maintenance and sensors information via the online BIM portal.

此項目把帶語義的訊息加入到現有BIM的幾何訊息中，以提升建築和設施管理的運作。基於藍牙技術的新型多傳感器網格，可提供已標記的建築設施最新的空間位置及其關聯語義屬性。建築設施管理人員便可透過BIM網站監控、維修和處理傳感器的訊息。

Innovation 創新技術

- The integration of structural and MEP semantic information in BIM will enhance the quality and information exchange in BIM, leading to more efficient design layout and precise operation in building lifecycle management.
- The integration of structural and GIS information in BIM will enhance the spatial planning and project management in building lifecycle management.
- The integration of semantic BIM and sensors information through Bluetooth mesh technology allows speedy and accurate building facilities information exchange and the control of facilities maintenance operations in building lifecycle management.
- 整合BIM的結構和帶語義訊息可提升BIM質素及資訊交流，從而提升建築生命週期管理的設計及運作。
- 整合BIM的結構和地理訊息系統資訊將改善BIM建築生命週期管理的空間規劃及項目管理。
- 透過藍牙網格技術整合帶語義的BIM和傳感器信息，從而在建築生命週期管理上，提供快速並準確的建築設施資訊交流，亦可管理設施維修工作。

Key Impact 主要成效

- The development of integrated semantic knowledge based BIM system provides a comprehensive set of information to enable a more efficient and cost-effective building lifecycle management operation.
- The design phase of the building project can be benefited significantly from the full integration of the architectural, civil, structural, and MEP design rules and standards set by knowledge base.
- 開發基於集成語義知識的BIM系統提供全面的訊息，以實現更高效和更具成本效益的建築生命週期管理。
- 知識庫內已整合的建築、土木、結構和MEP設計規則和標準將有利於建築項目的設計。

Research Completion
2017

Applications
- Construction and facility management

Patent Applications
- 1 US and 6 China Provisional Patents

Commercialisation opportunities
- Technology licensing

完成研究年份
2017

應用範疇
- 建築及設施管理

專利申請
- 一項美國和六項中國臨時專利

商品化機會
- 技術授權許可

Rear RFID Alarm Sensing System

無線射頻識別倒車警報系統

Overview 簡介

This project aims to improve construction site safety to prevent the accidents related to reversing vehicles, blind spots and huge vehicles as sometimes it is difficult to visually detect nearby workers.

此項目旨在提高施工場地的安全，特別是那些因倒車、盲點和大型車輛而難以察覺到附近工人的相關事故。

Problem addressed 解決方案

In response to the accidents caused by reversing vehicles, LSCM has developed a RFID car reverse backup system that provides workers with RFID-tagged work vests and helmets. A RFID sensor system is also installed at the back of each vehicle and heavy-duty machinery, which will send a warning signal to the driver to prevent industrial accident if a worker is behind the vehicle.

針對倒車所引起的意外，LSCM研發了一套無線射頻識別倒車警報系統，為工人提供附有RFID標籤的工作背心及安全帽，同時在每輛工車和重型機器的車尾裝上RFID感應系統。如果工人接近工車和重型機器的後方，RFID感應系統就會對駕駛員發出警告訊號，預防工業意外。

Innovation 創新技術

- Since most market available RFID tags are not designed to be worn on human bodies, a specially designed RFID tag is developed and embedded in the safety helmets and reflective vests for construction sites.
- The developed RFID tags are installed in safety helmets and reflective vests. More than one RFID tags are installed because workers may approach the vehicles in any directions in construction sites.
- The installation of the RFID Sensing Unit is simple. Strong magnets are used to attach the RFID Sensing Unit on the rear side of the vehicle. Workers can simply fix the unit on the desired position and then turn it on.
- 由於市場上大多數的RFID標籤並不適合穿戴在人體上，因此需要研發一種特別的RFID標籤，並藏於安全帽和反光背心內。
- RFID標籤被安裝在安全帽和反光背心內。由於工人在施工場地會由不同方向接近車輛，所以需要在安全帽和反光背心安裝多於一個RFID標籤。
- RFID感應系統的安裝非常簡單，只需使用強磁鐵將RFID感應系統安裝在車輛尾部。工作人員只需將設備固定在所需的位置，然後啟動設備。

Key Impact 主要成效

Rear RFID Alarm Sensing System for Vehicles in Construction Industry
應用於工地的實時RFID感應警報管理系統

- Enhance construction site safety
- Prevent industrial accidents
- 提升工地安全
- 防止工業事故

Research Completion
2016

Applications
- Construction site safety

Commercialisation opportunities
- Technology licensing

完成研究年份
2016

應用範疇
- 工地安全

商品化機會
- 技術授權許可

RFID-Enabled BIM Platform

無線射頻識別建築訊息平台

Overview 簡介

With the help of LSCM, an RFID-enabled BIM Platform for Prefabrication Housing Production in Hong Kong was developed jointly by The University of Hong Kong and The Hong Kong Polytechnic University.

在LSCM的協助下，香港大學及香港理工大學共同研發了一個基於無線射頻識別技術的建築訊息(BIM)平台，並已投入本港預製房屋生產之用。

Problem addressed 解決方案

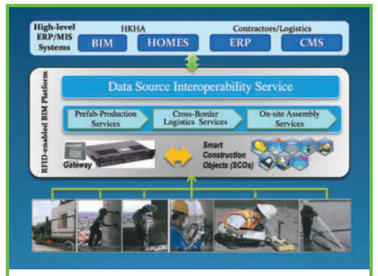
While Building Information Modeling (BIM) enables better productivity for public housing construction in Hong Kong, data fragmentation and discontinuity hinder its development. This RFID-enabled BIM platform allows real-time visibility and traceability of prefabricated components and facilitates site management. It also helps bridge the gaps between BIM and HOMES for more efficient and effective project management.

BIM有助提高香港興建公共房屋的效率。然而，它面對兩個主要的問題，分別是數據不完整，及操作的間斷性。而這個基於無線射頻識別技術的建築資訊(BIM)平台讓相關人員可就整個建築工程項目進行實時查察，亦能追蹤組件，以協助工地管理。它亦能填補BIM及HOMES之間的差距，有助提升項目管理的效率與效益。

Innovation 創新技術

- Three different attributes of the integrated platform include: (1) seamless communication and coordination among multiple stakeholders through improved information interoperability between processes; (2) more efficient cross-border prefabrication logistics and supply chain management through improving real-time information visibility and traceability; and (3) seamless communication and coordination between the logistics and on-site assembly to enable a Just-In-Time (JIT) housing production.
- The solution uses RFID for tracking the pre-cast components from prefabrication production and transportation logistics to delivery at the construction site, and installation of the prefabrication components where the tracking data is used for life cycle management of the project. The geo-spatial data collected is then fed into the BIM system.
- Converts typical construction objects into Smart Construction Objects, using IoT and Cloud technology, which is introduced along with an innovative "RFID-enabled Gateway" designed and developed for managing the SCOs.
- 此平台主要涵蓋：(1)提升生產過程資訊互通的關鍵技術，讓相關人員溝通和協調多個項目；(2)跨境預製物流和供應鏈管理的可視化和追蹤技術；(3)透過物流及施工現場的實時溝通和協調，實現及時盤存的生產調節。
- 運用無線射頻識別技術追蹤預製組件，由組合房屋的配件製造、運輸，以至送達到工地進行組裝，整個過程都需要使用收集到的數據，作整個項目的週期管理。收集所得的地理空間數據會輸入到BIM系統。
- 利用物聯網技術及將常見的建築物件轉化為智能建築物件，同時利用雲端技術和創新的RFID網關技術，以管理智能建築物件。

Key Impact 主要成效



RFID-Enabled BIM Platform for Prefabrication Housing Production in Hong Kong
基於RFID的香港預製房屋建設訊息平台

- Enhance the competitiveness of the construction industry by shortening the project period
- Reduce the usage of construction resources
- Improve the responsiveness to market and changes in the construction projects
- 縮短工期從而提升建造業的競爭力
- 減少建築資源的使用
- 提高對市場和工程變化的應變能力

Award 獎項

Hong Kong University Knowledge Exchange Award, Faculty of Architecture
Construction Industry Council (CIC) BIM achievement award 2020
香港大學建築學院知識轉讓獎
2020建造業議會建築信息模擬比賽獎

Research Completion
2016

Applications
- Construction
- Project / Resource management

Commercialisation opportunities
- Technology licensing

完成研究年份
2016

應用範疇
- 建造業
- 項目/資源管理

商品化機會
- 技術授權許可

Proactive Construction Management System

基於位置實時現場安全管理系統

Overview 簡介

In order to reduce site accidents, LSCM and The Hong Kong Polytechnic University have developed the Proactive Construction Management System (PCMS). PCMS can enhance the capacities of workers to detect potential dangers, and provide proactive warnings to avoid accidents.

為了減少工程意外，LSCM和香港理工大學研發了主控式建築管理系統(PCMS)。PCMS可用於提醒工人在建築工地的潛在危險，並發出主動警報，以避免意外發生。

Problem addressed 解決方案

PCMS integrates RTLS with VCS technologies. RTLS includes a series of wireless location tags and anchors. Location tags can be installed on the safety helmet and anchors are designed to be fixed somewhere as reference points. RTLS can calculate the positions by measuring the distances between tags and anchors. With these real-time positions, the system can track workers or moving devices.

PCMS整合了RTLS與VCS技術。RTLS包括一系列無線位置標籤和錨點。位置標籤可安裝在安全頭盔上，而錨點則被固定在某地方作為參考點。RTLS可以透過偵測標籤和錨點之間的距離來計算位置。透過這些實時偵測功能，系統可以追蹤工人或移動設備的位置。

Innovation 創新技術

Proactive Construction Management System
基於位置實時現場安全管理系統

- Workers can receive warning signals from PCMS when they are entering dangerous areas, or when they are being threatened by moving devices.
- PCMS provides various management functions via websites, such as to define dangerous zones, configure anchors, and establish relations between tags and tag carriers.
- To ensure technical feasibility and robustness of PCMS, we have conducted many trial tests in the projects of Civil Engineering and Development Department (CEDD).
- 當工作人員進入危險區域，或其安全受到移動設備的威脅時，工作人員可以收到警報訊號。
- PCMS還可以透過網站提供各種管理功能，如界定危險區域、配置錨點、建立標籤與標籤載體之間的連繫。
- 為了確保PCMS技術的可行性和穩定性，此項目已經多次在土木工程拓展署(CEDD)的項目中試行。

Key Impact 主要成效

- Prevent fatal accidents causing casualty from happening in construction sites
- Enrich construction management procedures by enabling a real-time 3D monitoring of construction activities.
- Improve the practice of construction management significantly as it enables pro-active management rather than reactive management.
- 防止建築工地發生致命/傷亡事故。
- 透過啟用對施工活動的實時3D監控來鞏固施工管理程序。
- 由於系統支援主動式管理而不是被動式管理，故能顯著地改善施工管理模式。

Research Completion
2014

Applications
- Construction safety management
- Logistics and supply chain management

Commercialisation opportunities
- Technology licensing

完成研究年份
2014

應用範疇
- 建造業安全管理
- 物流及供應鏈管理

商品化機會
- 技術授權許可

Safety Belt Alarm System

安全帶警報系統

Overview 簡介

This project aims to design a real-time sensing system to monitor the engagement of safety belts in construction sites. The system will detect some dangerous situations, such as the absence of a lifeline, the irregular positioning of the lock, or the improper engagement status of the hook, and notify the site workers in real time to remind them to properly engage their safety devices.

此項目設計了實時的感應系統，可監察工地內安全帶的使用情況，同時亦能偵測危險狀況，例如：安全繩沒有繫上、安全扣的安裝方向不正確，或安全扣沒有扣上，並即時通知工人，提醒他們正確地繫上安全設備。

Problem addressed 解決方案

Construction site safety is a major concern of the society. There are cases where workers do not properly engage the safety belt when working on elevated places. The sensors are designed to be installed in the rope grabs and hooks of the safety belts to detect the engagement status. Real-time safety belt engagement status is transmitted to the site server through the readers installed in the construction site. Whenever a violation situation is detected, a form of notification will be given to the workers directly or to a mobile device of their supervisor.

工地安全是社會關注的重大問題。有些情況下，工人在高空工作時並沒有正確地繫好安全帶。安全帶的抓繩和掛鉤上安裝了帶有感應器的射頻標籤，用以檢測連接狀態。安裝在現場的無線射頻識別閱讀器會接收到實時的安全帶連接狀態，以便透過安裝在現場的伺服器進行分析。若發現違規行為，它會直接向工人或其主管的流動設備發出通知。

Innovation 創新技術

Safety Belt Alarm System for Construction safety
應用於工地安全的安全帶警報系統

- Sensors are designed to be mounted onto the safety belt which can be used to detect the improper usage of safety belt.
- A real-time monitoring system is developed to receive safety belt sensor status. It will trigger an alarm when workers are found to be working in an elevated area without properly engaging the safety belt.
- 傳感器安裝在安全帶上，可用於檢測不當使用安全帶的情況。
- 開發了一個實時監控系統來接收安全帶傳感器的狀態。當發現工人於高空工作時沒有正確繫好安全帶，將會發出警報。

Key Impact 主要成效

- This technology can improve Safety-at-Work practice for the construction industry.
- The system can contribute to enhance the construction site safety level in Hong Kong.
- Easy-to-use Safety Belt Alarm System in construction sites.
- 此技術可以改善建築行業的工作安全。
- 此系統有助提高香港的建築工地安全水平。
- 安全帶警報系統易於在施工場地使用。

Award 獎項

Bronze Medal in the 44th International Exhibition of Inventions Geneva in 2016
2016年第44屆日內瓦國際發明展銅獎

Research Completion
2014

Applications
- Construction safety

Patent Applications
- CN 2014 8007 8827.2
- HK 17108380.2

Commercialisation opportunities
- Technology licensing

完成研究年份
2014

應用範疇
- 建築工地安全

專利申請
- CN 2014 8007 8827.2
- HK 17108380.2

商品化機會
- 技術授權許可

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