Connecting Innovation & Reality

創新科研 與時並進

LSCM

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

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 Mainland.

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

香港浸會大學 HONG KONG BAPTIST UNIVERSITY

- Location-based Service (LBS) Technologies

香港中文大學 The Chinese University of Hong Kong

- E-Commerce, Logistics and Supply Chain Management
- IoT Technologies
- Gerontech & Community
- Location-based Service (LBS) Technologies

香港城市大學 City University of Hong Kong

- E-Commerce, Logistics and Supply Chain Management
- IoT Technologies

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

- E-Commerce, Logistics and Supply Chain Management
- Construction
- Location-based Service (LBS) Technologies

香港大學 THE UNIVERSITY OF HONG KONG

- E-Commerce, Logistics and Supply Chain Management
- IoT Technologies
- Construction

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

- Location-based Service (LBS) Technologies
- IoT Technologies
- Construction
- Gerontech & Community

Special Edition 2021 Inventions Geneva Evaluation Days

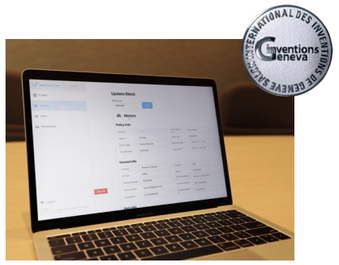
At the Special Edition 2021 Inventions Geneva Evaluation Days, LSCM won four awards including one Gold medal and three Silver medals.

Gold Medal

Electronic Wristband and Monitoring System for Hong Kong's "StayHomeSafe" Home Quarantine Support Solution

Silver Medal

Seamless Navigation in Urban Environment



Next InsurChain

Delivery Robot with End-to-end Navigation Policy

物流及供應鏈多元技術研發中心 (簡稱LSCM)

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的行業採用有關技術以提升競爭力。

與本地大學聯合研發之創新科技

香港浸會大學 HONG KONG BAPTIST UNIVERSITY

- 位置基礎服務技術

香港中文大學 The Chinese University of Hong Kong

- 電子商貿、物流及供應鏈管理
- 物聯網技術
- 樂齡科技及社會服務
- 位置基礎服務技術

香港城市大學 City University of Hong Kong

- 電子商貿、物流及供應鏈管理
- 物聯網技術

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

- 電子商貿、物流及供應鏈管理
- 建築
- 位置基礎服務技術

香港大學 THE UNIVERSITY OF HONG KONG

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- 物聯網技術
- 建築
- 樂齡科技及社會服務

2021 年日內瓦國際發明展

憑藉四項研發技術，LSCM於2021年日內瓦國際發明展大放異彩，勇奪一金三銀的驕人佳績。

金獎

支援香港家居檢疫措施的「居安抗疫」電子手環及監察系統

銀獎

城市無縫定位系統

劃時代保險鏈

具有端到端導航策略的遞送機械人

AIR CARGO TRANSIT SECURITY SYSTEM

Overview

In response to the requirements of the International Civil Aviation Organisation for the safety inspection of all air cargoes, LSCM is developing 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.

Problem addressed

This project develops a security monitoring and management solution based on video analysis, which enables an open-top flatbed trailer to provide secured road transportation between two secured premises, as an alternative to fixing a protective net on each air cargo pallet.

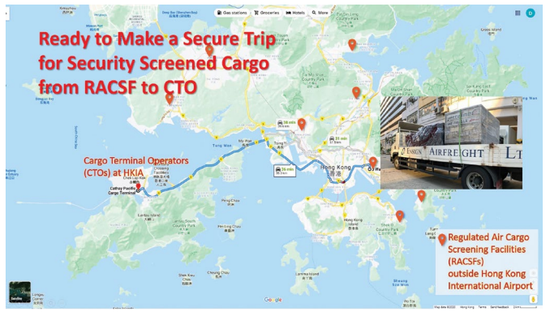
Innovation

- A set of camera modules designed and developed for secured installation in an open-top flatbed trailer provide full visual coverage of all 5 open sides (4 lateral and top sides).
- A video analytics intrusion detection module developed 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 truck location and any detected intrusion incidents.

Key Impact

- 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 on protective net on each air cargo pallet.

Air Cargo Transit Security System



Research Completion

15 August, 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

空運中轉保安系統

簡介

因應國際民航組織對所有空運貨物進行安全檢查的要求，LSCM正研究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，再運送至機場貨運站內，以減輕機場貨運站在運作上的負擔。

解決方案

此項目開發一個基於影像分析的保安監測和管理系統，讓平板拖車能夠在兩個保安場地之間提供具保安性的運輸，同時亦為每個貨運集裝板上放置保護網提供另一個選擇。

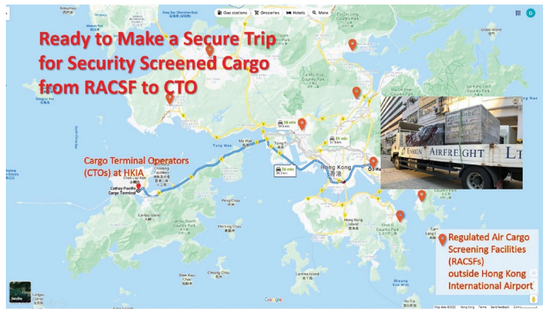
創新技術

- 攝錄機模組可安全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，用於進行車載入侵檢測。
- 管理控制台模組可讓貨車司機在陸路運輸過程中管理保安監測過程，及與線上保安監測服務聯絡，通報有關貨車位置和任何檢測到的異常情況。

主要成效

- 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防護網的時間和成本。

空運中轉保安系統



完成研究日期

2021年8月15日

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

NEXT INSURCHAIN

Overview

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.

Problem addressed

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. There is three-level access control: grant different access rights to insurance companies, regulators, and the insured. The policy information is divided into three parts, namely "public", "restricted" and "confidential". The design mechanism of Next InsurChain allows all parties to access public information.

Innovation

- 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.

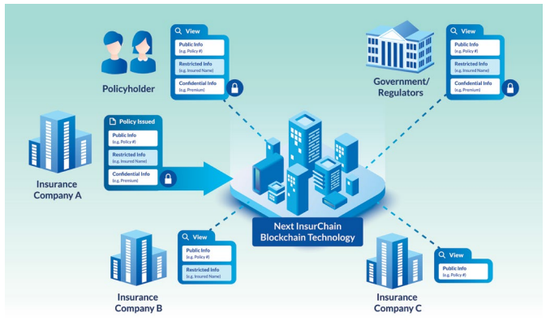
Key Impact

- Claims documents can be privately shared by insurance companies, so claims can be handled more efficiently.
- Traceability of policies on blockchain can eliminate unlicensed selling.
- Reduce operation cost and credit risks

Award

- Next InsurChain has won a Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days

Next InsurChain



Research Completion

14 March, 2020

Applications

- Insurance policies validation and checking

劃時代保險鏈

簡介

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有效率地共享和追蹤保單資料，同時為共享資料提供適當的訪問控制和私隱保護。

解決方案

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。它提供三級訪問權限：適用於授予保險公司，監管機構和受保人不同的訪問權限。每份保單資料均分為三個部分，即「公開」、「受限」和「機密」。劃時代保險鏈的設計機制允許各方訪問公開信息。

創新技術

- 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，而受保人可以訪問自己的保單的所有資料。
- 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，協助保單報價等。

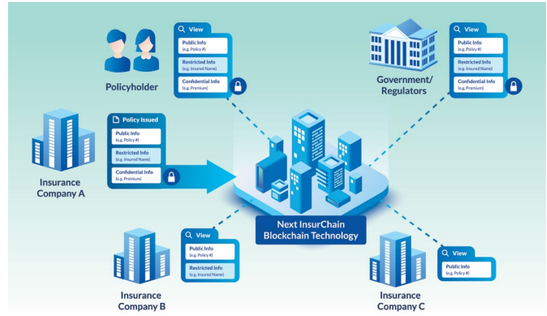
主要成效

- 保險公司可以共享索賠文件，因此可以更有效地處理索賠。
- 將保單儲存在區塊鏈上可以防止未經許可的銷售。
- 降低運營成本和信用風險。

獎項

- 劃時代保險鏈獲得2021年日內瓦國際發明展銀獎。

劃時代保險鏈



完成研究日期

2020年3月14日

應用範疇

- 保單驗證和檢查

FOOD SAFETY

Overview

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.

Problem addressed

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

Innovation

- 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.
- Analytic tool is developed based on a non-targeted methodology so that prior knowledge of the contaminants is not required.

Key Impact

- Non-targeted methodology and database can effectively identify any anomalies which arise from potential contaminants or adulterants without prior knowledge.
- Immediate and appropriate measures can be taken

Big data-enabled Collaborative Database for Non targeted Contaminants Detection

Research Completion

31 October, 2021

Applications

- Tackling food fraud
- Authenticating food items

Commercialisation opportunities

- Technology licensing

食品安全

簡介

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。

解決方案

此項目把企業現有涵蓋中國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。

創新技術

- 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。

主要成效

- 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

基於大數據技術的非靶向污染物檢測協作數據庫

完成研究日期

2021年10月31日

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

E-ARBITRATION / E-MEDIATION CLOUD SERVICES PLATFORM

Overview

This project has developed an e-Arbitration / e-Mediation Cloud Services platform to handle disputes through arbitration and mediation. AI Machine Translation technology is used to provide domain-specific language translation service.

Problem addressed

Secure collaboration group is 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 are encrypted before transmission over the Internet and stored in the system with access control.

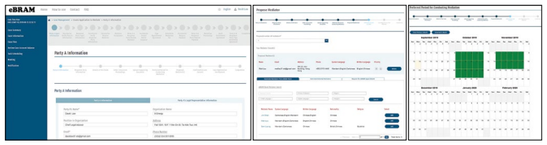
Innovation

- Video Conferencing 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.
- Continuous Re-authentication and Object Policy technology is developed to protect against unauthorised access at logged on computers. Auto-logout is in place to protect against logged-on computers being left unattended.
- 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.

Key Impact

- Improves translation accuracy for specific industries
- Enhances internet transaction security

e-Arbitration / e-Mediation Cloud Services Platform



Research Completion

30 April, 2020

Applications

- Continuous re-authentication for video conferencing
- Domain specific machine translation

Commercialisation opportunities

- Technology licensing

電子仲裁/調解雲服務平台

簡介

此項目開發了一個電子仲裁/調解雲服務平台，以透過仲裁和調解處理糾紛。而人工智能機械翻譯技術則可提供特定領域語言翻譯服務。

解決方案

平台在申訴人、答辯人和仲裁人之間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。

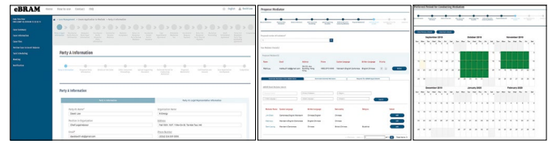
創新技術

- 視像會議功能將為申訴人、答辯人與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。最終裁定將安全地存儲在平台中，供各參與者下載。
- 連續重新認證和對象策略技術，用以防止資料在已登錄的電腦上被盜取。自動登出的功能可以防止已登錄的電腦在無人看管的情況下被盜取資料。
- 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。

主要成效

- 提高特定行業的翻譯準確性
- 增強互聯網交易的安全性

電子仲裁/調解雲服務平台



完成研究日期

2020年4月30日

應用範疇

- 適用於視像會議的連續重新認證功能
- 特定領域的機器翻譯系統

商品化機會

- 技術授權許可

HK-ZHUHAI TRADE FACILITATION PLATFORM

Overview

HK-Zhuhai Trade Facilitation Platform is an information service platform that connects the HK's Industries and the Zhuhai E-Port for handling import and export trade declaration. The platform benefits the importers, exporters and forwarders in handling trade and logistics between the Mainland and the ASEAN markets via Hong Kong, with the vision of expanding to the Belt and Road market and global market.

Problem addressed

The 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. It involves research for methodologies to provide information of the (i) HS coding practices, (ii) declaration terminology translation across different customs, (iii) specific declaration procedures/forms.

Innovation

- 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 required fields in one language, and the domain-specific translation engine will translate the filled information into the relevant languages accurately using specific wordings for customs declaration and trade.
- The platform establishes a secured data channel for information exchange between Zhuhai E-Port and authorised companies, handles the conversion and workflow of multiple forms, and streamlines the data preparations for customs declaration in Hong Kong and other territories.

Key Impact

- Benefit importers, exporters and forwarders in handling trade and logistics between the Mainland and ASEAN markets via Hong Kong.
- Overcome the challenges of the complexity when dealing with customs declaration for trade and logistics.

HK-Zhuhai Trade Facilitation Platform

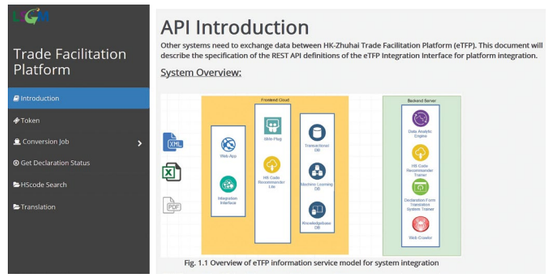


Fig. 1.1 Overview of eTFP information service model for system integration

Research Completion

25 January, 2021

Applications

- Trade facilitation between the Greater Bay Area and ASEAN Region

Commercialisation opportunities

- Technology licensing

香港－珠海貿易便利平台

簡介

香港－珠海貿易便利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。平台可協助從事貿易和物流的進口商、出口商及貨代公司，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。

解決方案

此項目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，便利處理報關程序。透過研究有效的方法以獲取相關領域知識，包括 (一) HS 編碼方法，(二) 不同地區海關的術語翻譯，(三) 具體的申報程序/表格。

創新技術

- 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，讓使用者可以更方便地選擇適當的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。

主要成效

- 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。
- 便利個別清關程序中繁複的貿易和物流申報流程。

香港－珠海貿易便利平台

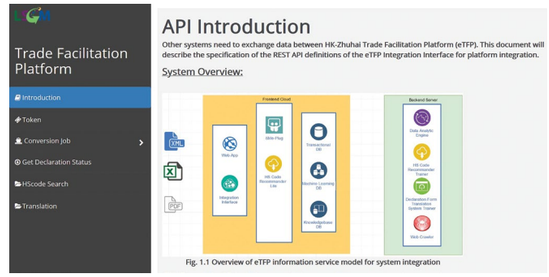


Fig. 1.1 Overview of eTFP information service model for system integration

完成研究日期

2021年1月25日

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

BIGARM ENGINE

Overview

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 load of reclaim belts of the Hong Kong International Airport and reduce the baggage collection time.

Problem addressed

This project utilises BigARM specially to deal with baggage reclaim belts allocation. Using all flight (origin, weather, aircraft type, etc.) and ground (runway, parking bay, CIQ, etc.) operation related data to predict the arrival time of flights, the total number of arrival bags, and the time for passengers to reach the Baggage Reclaim Hall, the BigARM then works 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. This load balance helps to eliminate baggage delivery stoppage due to reclaim belt congestion, and thereby provides speedy baggage collection by the passengers.

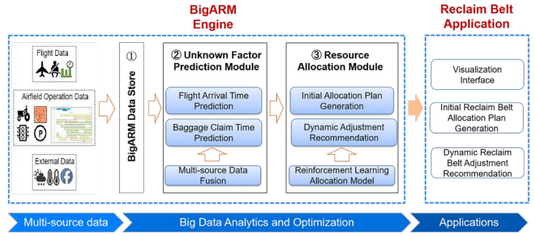
Innovation

- 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 baggage reclaim belt allocation at the Hong Kong International Airport.

Key Impact

- 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

Big Data-Driven Airport Resources Management (BigARM) Engine and Application Tools



Research Completion

28 February, 2021

Applications

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

Commercialisation opportunities

- Technology licensing

基於大數據的機場資源管理引擎

簡介

本項目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。

解決方案

這項目利用BigARM專門處理行李輸送帶的分配。BigARM利用航班數據(如來源地、天氣、機種等)及地面資訊(如跑道、停泊位置、CIQ等)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。透過平均分配行李，平均地使用各輸送帶，從而減少因輸送帶堵塞而停止派送行李的情況發生，以縮短提取行李的時間。

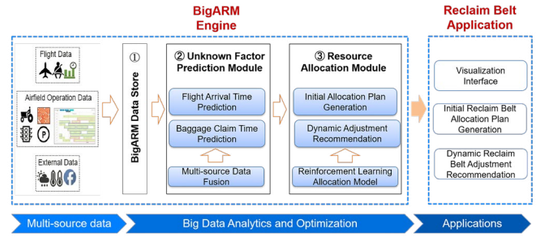
創新技術

- 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。

主要成效

- 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

基於大數據的機場資源管理引擎及應用工具



完成研究日期

2021年2月28日

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

IPARK : CORE TECHNOLOGIES OF INTELLIGENT E-COMMERCE LOGISTICS PARKS

Overview

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

Problem addressed

E-Commerce has developed 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 China. 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.

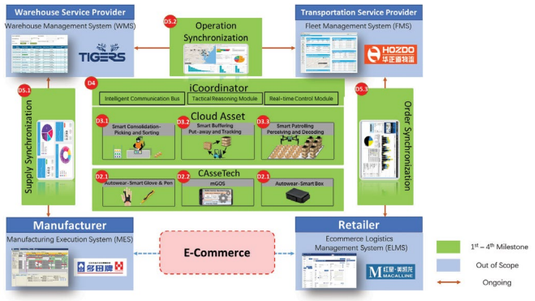
Innovation

- 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.

Key Impact

- Improve the quality, reliability and efficiency of coordination throughout the whole order fulfilment process
- Reduce order processing time along the whole supply chain

iPark : Core Technologies of Intelligent E-Commerce Logistics Parks



Research Completion

31 December, 2019

Applications

- Logistics & Warehouse Management

Patent Applications

- CN 202023338130.6
- CN 202023338283.0

Commercialisation opportunities

- Technology licensing

智慧電商物流園物聯網

簡介

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。

解決方案

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。

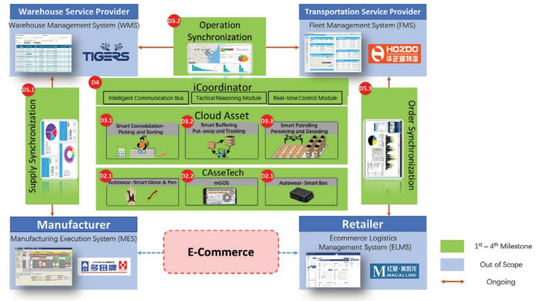
創新技術

- 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、物流追蹤過程和管理產品中發揮作用。
- 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將根據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。

主要成效

- 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

智慧電商物流園區物聯網



完成研究日期

2019年12月31日

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

SMART TRAFFIC CONTROL SYSTEM

Overview

The Tai Tam Road (Dam Section) was constructed more than a century ago and is part of the thoroughfare connecting Chai Wan and Stanley. As its width is only 5-meters, congestion problems often occur when large vehicles pass through the road. Since the dam is a declared monument, widening that section of the road is not possible. The Smart Traffic Control System (STCS) based on video analytics technology is thus developed to identify types of vehicles and analyse the traffic flow, so as to control the traffic light smartly in order to shorten the traffic queue.

Problem addressed

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

Innovation

- The Smart Traffic Control System (STCS) 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.
- It can also generate detailed traffic reports to revamps the transportation system in the future.

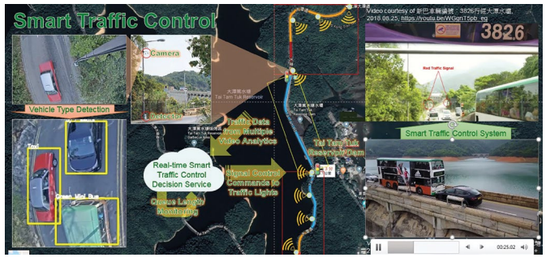
Key Impact

- The STCS collects real-time traffic flow data of each side of the road in Tai Tam Road and automatically allocates the optimal green signal time to reduce the vehicles' waiting time.
- The STCS has been implemented in Tai Tam Road (Dam Section) since August 2018 and has been proven to be twice as effective in terms of saving time when compared with traditional traffic lights.

Award

- The Smart Traffic Control System has won a Silver medal at the 47th International Exhibition of Inventions of Geneva in 2019.

Smart Traffic Control System



Research Completion

31 December, 2021

Applications

- Smart Traffic Lights

Commercialisation opportunities

- Technology licensing

智能交通控制系統

簡介

逾百年前建成的大潭道水壩段是連接柴灣和赤柱的主要道路，路面寬約五米，當大型車輛使用道路時經常會出現擠塞問題。鑑於水壩是法定古蹟，路面不可擴寬。因此，應用以影像分析技術的智能交通控制系統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。

解決方案

這個低成本的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。

創新技術

- 智能交通控制系統 (STCS) 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。
- 系統更可提供詳細的交通報告，以便將來改善交通系統。

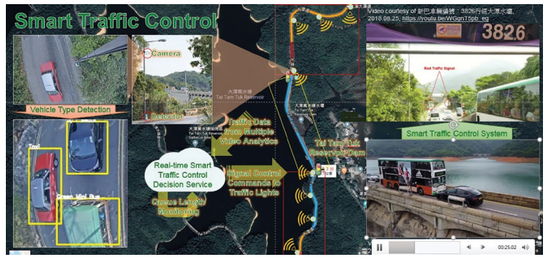
主要成效

- STCS實時收集大潭路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。
- STCS於2018年8月已在大潭道 (大壩段) 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。

獎項

- 智能交通控制系統在2019年舉行的第47屆日內瓦國際發明展榮獲銀獎。

智能交通控制系統



完成研究日期

2021年12月31日

應用範疇

- 智能交通燈

商品化機會

- 技術授權許可

TROLLEY AVAILABILITY MONITORING SYSTEM

Overview

The Trolley Availability Monitoring System disseminates updated information of trolley availability statuses via a mobile application to frontline staff. It helps ensure that sufficient trolleys are available to passengers.

Problem addressed

When the quantity of trolley in any pick-up points drops below the pre-set level, the Trolley Availability Monitoring System will immediately notify the frontline staff via the Trolleys mobile app. The continuous trolley monitoring from the video streaming content of all pick-up points distributed over a large area avoids the time lag data collected by patrolling. The real-time quantity intelligence enables the frontline staff to effectively replenish the trolleys and thus improve the quality of passenger services at the Hong Kong International Airport.

Innovation

- 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 for different insufficiency statuses.

Key Impact

- 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 one-off installation procedures as well as long-term maintenance management.

Award

- In 2018, the Trolley Availability Monitoring System has won a Gold Medal at the 46th International Exhibition of Inventions Geneva.

Video Analytics for Resources Management

Research Completion

21 September, 2012

Applications

- Trolley or asset management

Commercialisation opportunities

- Technology licensing

行李車供應監控系統

簡介

行李車監控系統透過流動應用程式，向前線人員發放最新行李車供應狀態的資訊，以確保有足夠的行李車可供旅客使用。

解決方案

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員工。由巡查人員監察分佈在每個領取點的行李車數量的數據往往滯後，而系統可根據不斷更新的視頻影像內容，點算行李車的數量。實時行李車數量資料有助員工盡快補充行李車，以確保為旅客提供的行李車數量充足，從而提升香港國際機場客戶服務的質素。

創新技術

- 基於機械學習的影像目標物件檢測系統組件，應用於檢測各類資源的類型，如行李車
- 應用目標物件檢測系統組件的視頻處理基礎架構和系統
- 資源監控和管理系統，並備有針對各種不足狀態的手機通報功能

主要成效

- 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，可省卻相關的一次性安裝工序，以及所需的長遠維修管理。

獎項

- 行李車供應監控系統在2018年第46屆日內瓦國際發明展榮獲金獎。

資源管理影像分析

完成研究日期

2012年9月21日

應用範疇

- 行李車或物資管理

商品化機會

- 技術授權許可

BLOCKCHAIN ENABLED E-CHEQUE APP

Overview

e-Cheque Wallet applications developed by LSCM provides a more convenient platform for e-Cheque transactions, and facilitates new business models and entrepreneurship in e-Commerce/e-Logistics.

Problem addressed

LSCM researched and adopted Bitcoin technologies to achieve the duplicate prevention and traceability objectives on e-Cheque transaction flow without a centralised repository. Bitcoin is a purely peer-to-peer payment system, allowing online payments to be sent directly from one party to another without going through a centralised financial institution. The Bitcoin payment verification scheme uses Proof-of-Work (PoW) to verify payments and Blockchain as a distributed ledger to prevent double spending. In e-Cheque, the transfer of e-Cheque from a payer to a payee shares many similar characteristics of payment by Bitcoin. The Blockchain mechanism of distributed ledger also appears to fulfil the traceability need of e-Cheque.

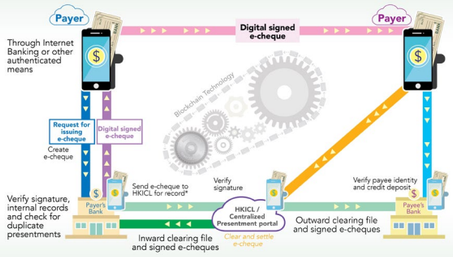
Innovation

- In contrast to most e-Wallets that use a traditional centralised ledger, LSCM e-Cheque app utilises the Blockchain technology which provides a safe and reliable system to eradicate replicated and counterfeit cheques and strengthen corporate's 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.

Key Impact

- If a distributed environment is without a centralised repository, e-Cheques could be transferred from "wallet" to "wallet". But with this project, every transaction is stored on blockchain, transaction immutability, duplicate prevention and traceability/forensics is 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.

Blockchain enabled e-Cheque App



Research Completion

30 November, 2017

Applications

- Blockchian enabled e-Cheque wallet

Patent Applications

- HK 18102860.3
- HK 62020002528.1

Commercialisation opportunities

- Technology licensing

基於區塊鏈的電子支票應用程式

簡介

由LSCM研發的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。

解決方案

LSCM研究和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。比特幣是一種純粹點對點的支付系統，允許網上支付直接從一方發送到另一方，而無需通過中央金融機構。比特幣支付驗證方案則使用工作證明(PoW)來驗證支付，並使用區塊鏈作為分佈式賬本以防止雙重支付。在此項目，電子支票從付款人到收款人的轉移與比特幣支付具有許多相似的特徵。而分佈式賬本的區塊鏈機制可滿足電子支票的可追溯性需求。

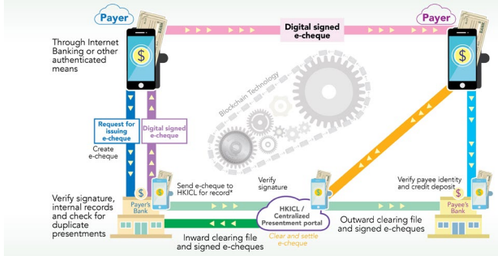
創新技術

- 有別於其他以中央記帳方式記錄交易的電子錢包，LSCM的電子支票應用程式利用區塊鏈(Blockchain)技術，為電子支票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。

主要成效

- 假如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」。但現在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。
- 它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。

基於區塊鏈的電子支票應用程式



完成研究日期

2017年11月30日

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

ImseCAVE

Overview

In collaboration with the University of Hong Kong, LSCM developed a system which is a fully immersive and automatic cave-like virtual environment. It can be used for training, decision-making, and evaluating the high-order skills of professionals.

Problem addressed

In imseCAVE, the technologies of virtual and augmented reality, together with real-time motion capture, are deployed with an artificial intelligence-based behavior profiling algorithm. The algorithm was developed to achieve dynamic scenario creation, visualisation, user skills profiling, and performance evaluation in critical operations.

Innovation

- A fully immersive and cave-like virtual environment trains high-level management and technical professionals to make strategic decisions during critical operations in a timely manner.
- It transmits life-like scenarios of complex operations through visualisation and dynamic interaction, while users' activities and behaviour are recorded to be analysed.

Key Impact

- Deliver a novel and cost effective solution for training and evaluation of professionals in decision making and high-order skills.
- The virtual reality-empowered system developed represents a state-of-the-art design of capitalising the virtual reality technology with artificial intelligence methods to deliver an integrated system that create a cost effective, versatile and reconfigurable, interactive and immersive training environment that readily supports evidence and discovery-based training in operation planning and decision making.

Award

- ReVAI, the VR training system developed for CASL engineers, has won the Silver Medal in the 47th International Exhibition of Inventions of Geneva in 2019.

A Virtual Reality (VR) System for Strategic Operation Training

Research Completion

15 September, 2016

Applications

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

Commercialisation opportunities

- Technology licensing

虛擬實境系統

簡介

本中心與香港大學攜手合作，開發了一個沉浸式洞穴型自動虛擬實境系統。它為對高級管理和技術人員的決策和技能培訓和評估方面，提供一個嶄新而具成本效益的解決方案。

解決方案

此項目透過使用人工智能行為分析計算法於虛擬實境、擴增實境和實時動作捕捉技術上，建立動態情景和將其可視化，讓用戶在完成這些重要的操作後，可獲得技能分析和表現評估。

創新技術

- 一個沈浸式洞穴型自動虛擬實境，培訓高級管理和技術人員作出適時及關鍵性的決策。
- 讓培訓者在栩栩如生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。

主要成效

- 提供一個新穎且具成本效益的解決方案，適用於培訓和評估專業人員在決策及高階技能方面的能力。
- 這虛擬實境系統是一種先進的設計，將虛擬實境技術與人工智能互相結合，提供一個集成系統，創建一個具有成本效益、多功能和可重組的互動式和沈浸式培訓環境，支援實證訓練和發現式訓練，培訓使用者作出規劃和決策。

獎項

- 為中國飛機服務有限公司的工程師所開發的虛擬實境培訓系統ReVAI，在2019年舉行的第47屆日內瓦國際發明展上獲得銀獎。

虛擬實境系統之應用—策略及實踐培訓

完成研究日期

2016年9月15日

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

RFID-ENABLED SENSING

Overview

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.

Problem addressed

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.

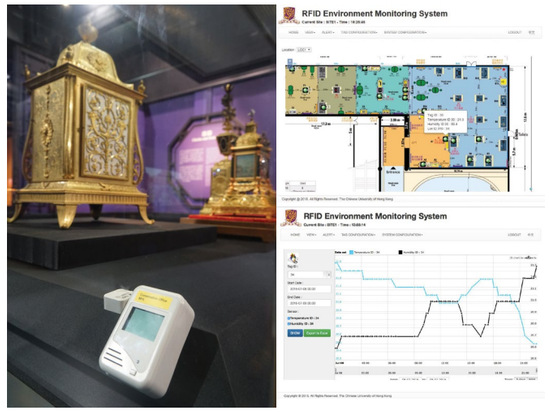
Innovation

- 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.

Key Impact

- 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.

RFID-Enabled Sensing Technologies for Real-time Environmental Monitoring and Facility Management



Research Completion

30 April, 2015

Applications

- IoT Sensor System for facility management

Commercialisation opportunities

- Technology licensing

紅外線熱能感應 無線射頻識別傳感技術

簡介

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。

解決方案

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。

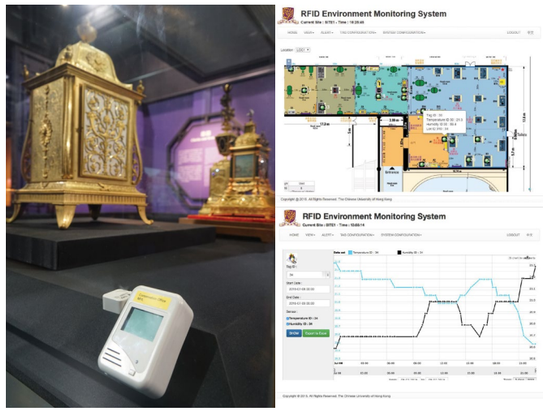
創新技術

- 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。

主要成效

- 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。

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



完成研究日期

2015年4月30日

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

Overview

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.

Problem addressed

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.

Innovation

- 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.

Key Impact

- 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

Product Authentication at Retail Points – Infrastructure and Systems

Research Completion

30 Sept, 2013

Applications

- Product Authenticity Verification

Patent Applications

- CN 2013 8008 0974.9
- HK 17101312
- TW 103107867

Commercialisation opportunities

- Technology licensing

產品驗證技術

簡介

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。

解決方案

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。

創新技術

- 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。

主要成效

- 消費者可以透過流動應用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

虛擬實境系統之應用—策略及實踐培訓

完成研究日期

2013年9月30日

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

Overview

This project aims to enhance the efficiency of cross-border custom clearance across multiple jurisdictions, while maintaining tight security and control.

Problem addressed

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

Innovation

- The system supports real-time GPS tracking and monitoring. It also offers unique security token control.
- While a single locking device (E-lock) supports multiple jurisdictions, independent locking control across jurisdictions is achieved.

Key Impact

- Since the trial of the 'Intermodal Transshipment Facilitation Scheme' from 2012 and 'Single E-lock scheme' from 2016 , it has been extended to 63 clearance points in Guangdong province including Guangzhou Nansha Free Trade Zone, Jiangmen International Electronic Commerce Express Mail Sorting Clearance Centre and Guangzhou Airport, with the 13 clearance points in Hong Kong, including Hong Kong International Terminals and Kwai Chung Customhouse, 819 express intermodal transportation routes are offered. Up to May 2019, the scheme has been on trial for more than 118,900 times, with over 52 million consignments being handled.

Award

- E-lock has won the Silver Medal at the 45th International Exhibition of Inventions Geneva in 2017.

IoT Cross-Boundary Fast-Clearance Security Application

Research Completion

17 January, 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

電子關鎖

簡介

此項目旨在提升跨境清關速度和效率，同時保持嚴格的保安和控制。

解決方案

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。

創新技術

- 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被鎖定監控。

主要成效

- 自2012年推出「多模式聯運轉運貨物便利計劃」，並於2016年試行「跨境一鎖計劃」，到目前為止計劃在內地廣東省共有63個清關點，包括南沙保稅港區、江門市跨境電商快件分揀清關中心及廣州機場等，加上香港13個清關點，例如香港國際貨櫃碼頭及葵涌海關大樓等，共提供819條聯運快線。截至2019年5月，已累積超過118,900車次，以及處理5200萬件貨物。

獎項

- 電子鎖技術於2017年舉行的第45屆日內瓦國際發明展中獲得銀獎

物聯網跨境快捷通道應用程式

完成研究日期

2012年1月17日

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

RFID PARCEL LOCKER

Overview

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.

Problem addressed

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.

Innovation

- 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.

Key Impact

- 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.

Award

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

RFID-enabled parcel locker system

Research Completion

31 March, 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

無線射頻識別包裹儲物櫃

簡介

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。

解決方案

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。

創意技術

- 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。

主要成效

- 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。

獎項

- 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。

無線射頻識別包裹儲物櫃系統

完成研究日期

2017年3月31日

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

TELE-CONTROL WAREHOUSE STACKERS USING 5G

Overview

High labour and rental cost are two common challenges faced by many local warehouses. LSCM's technology enhances the functions of existing warehouse stackers by using Fifth Generation Cellular Network (5G) and advanced sensing technologies.

Problem addressed

The use of 5G can provide high-speed and low-latency data transmission. This, not only enables the tele-control of multiple stackers at the same time, but also allows the incorporation of remote sensing technologies such as cameras for live image processing, and distance detection through laser technology (LiDAR).

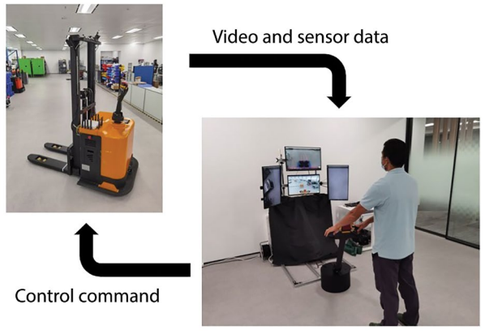
Innovation

- 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 10ms, which is short enough for operators to respond in nearly real-time according to what is displayed on the screen.
- Assistive moving guidelines overlay real-time video around the stacker based on the position of the steering wheel. Experienced operator can handle it without much training.

Key Impact

- Reduce multiple motor drivers into a single unit to reduce BOM cost.
- Customise and integrate electronic components to reduce production complexity and redesign mechanical structure to reduce production cost.

Tele-Control Warehouse Stackers Using 5G



Research Completion

30 September, 2021

Applications

- Logistics & Warehouse management

Commercialisation opportunities

- Technology licensing

5G遙控倉庫電動堆高車

簡介

許多本地倉庫皆面對人工成本和租金高昂的兩大挑戰。因此，LSCM將第五代移動通信網絡 (5G) 和傳感器等技術融入現有的堆高車。

解決方案

由於使用5G可以提供高速、低延遲的數據傳輸，所以可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。

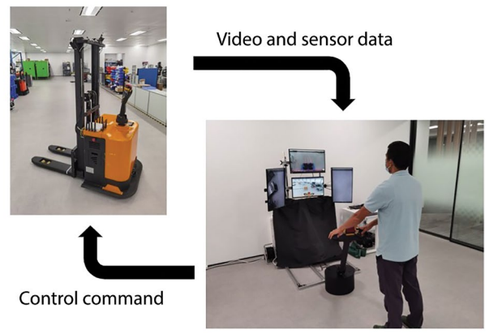
創新技術

- 5G技術實現的高數據傳輸速率，具有增強移動寬帶 (eMBB) 、海量機器通信 (mMTC) 和高度可靠低時延通訊 (URLLC) 等特點，能建立大覆蓋範圍、高性能和可靠的傳訊方案。
- 低時延通信把時間延遲情況降低到大約10毫秒，操作員幾乎可以實時地根據屏幕上顯示的內容作出反應。
- 輔助移動指引根據方向盤的位置，在堆高車周圍覆蓋實時的影片。經驗豐富的操作員無需太多培訓即能操作。

主要成效

- 把多個電機驅動器減至一個單元以降低物料成本。
- 定制和整合電子零件以降低生產的複雜性，並重新設計機械結構以降低生產成本。

5G遙控倉庫電動堆高車



完成研究日期

2021年9月30日

應用範疇

- 物流和倉庫管理

商品化機會

- 技術授權許可

COST COMPETITIVE MOTOR DRIVING SYSTEM

Overview

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.

Problem addressed

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.

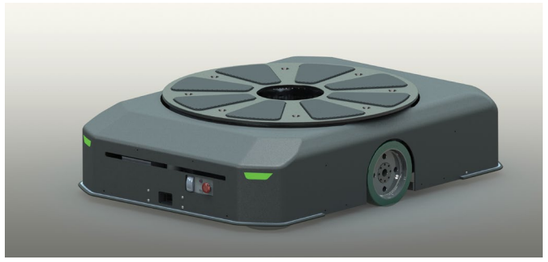
Innovation

- 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.

Key Impact

- This AGV specific motor/driving system helps reduce costs
- High accuracy
- Easy to control

Cost competitive motor driving system for warehouse AGV



Research Completion

30 January, 2022

Applications

- Logistics & Warehouse management

具價格競爭力的驅動系統

簡介

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。

解決方案

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。

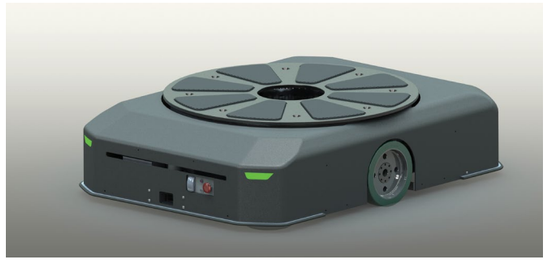
創新技術

- 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。

主要成效

- AGV專用電機/驅動系統有助於降低成本
- 高精確度
- 易於操作

應用於倉庫自動導航車、具價格競爭力的的驅動系統



完成研究日期

2022年1月30日

應用範疇

- 物流和倉庫管理

HEAVY DUTY AUTONOMOUS GUIDED VEHICLES

Overview

To keep pace with the fast development of worldwide e-commence, businesses rely 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, but also handling stock-taking tasks during closing time.

Problem addressed

Businesses of local warehouses has been challenged by increasing rental and labour costs. There is also additional pressure to provide more value-added services, such as handling small orders for e-Commerce. The deployment of autonomous 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.

Innovation

- 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.

Key Impact

- Significantly save manpower and time spent 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 storage and retrieval.

Heavy Duty Autonomous Guided Vehicles

Research Completion

23 July, 2021

Applications

- B2B and B2C warehouses
- Mini-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

重型自動導航搬運車

簡介

隨着全球的電子商貿日趨成熟，客戶對倉存管理有極高的要求，希望藉此減少訂單的處理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，它除了可以搬運貨物，還可以於下班時段自動進行盤點工作，省時省力。

解決方案

本地倉庫的業務面對人工和租金成本上升的挑戰，亦面對需要提供更多增值服務的壓力，例如處理電子商貿的小額訂單。而在倉庫中使用自動導航搬運車可減少人力，及更有效地利用倉庫的空間，亦可更快捷地處理訂單和令運作更準確。

創新技術

- AGV硬件：
  - 自動平衡 (具有對不平坦的地板作出的調較)
  - 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
  - 透過移動應用程式能實時監察AGV的當前位置、狀態、警報和電池用量

主要成效

- 顯著節省人力和時間，並提高日常倉庫操作的安全性。
- 通過密集的貨架排列提高貨架存儲空間的使用率。
- 為已預約作存儲和取件的小型租戶提供7x24的自助服務。

重型自動導航搬運車 (AGV)

完成研究日期

2021年7月23日

應用範疇

- 企業對企業和企業對客戶的倉庫
- 迷你商店
- 存儲

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

ROBO-9 : SENSOR FUSION TECHNOLOGIES FOR VISUALLY IMPAIRED

Overview

This project aims to develop an ease-of-use robot vision and sensing solution for mobility assistance to enhance the quality of life of individuals with visual impairment.

Problem addressed

In this project, Navigation Control Module (NCM) is designed to comprise RFID, GNSS, Wi-Fi and BLE technologies. The NCM provides real-time positioning information that suits the operation in both indoor and outdoor environments.

Innovation

- 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 left, right, straight and stop. Inside the base, different sensors are placed, which help determine the turning angle and speed.
- Navigation & locationing function provides walking guidance including free walking and target destination which is designed to be integrated to a cloud platform.

Key Impact

- Employ robot vision and multi-sensing for mobility assistance to provide point-to-point navigation information
- Enhance the quality of life of individuals with disabilities and their ability to participate fully in social activities

Robo-9 : Sensor Fusion Technologies for the Visually Impaired

Research Completion

31 May, 2021

Applications

- Walking guidance for people with vision impairment

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

ROBO-9：為視障人士而設的傳感器融合技術

簡介

此項目旨在開發易於使用的機械人視覺和傳感技術，應用於出行輔助，以提升視障人士的生活質素。

解決方案

此項目使用無線射頻識別(RFID)、衛星導航系統(GNSS)、無線網絡(Wi-Fi)和低功耗藍牙(BLE)等技術，設計導航控制模組(NCM)。NCM適合在室內和室外環境中使用，提供實時定位資訊。

創新技術

- 包含用於物體檢測、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報，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。
- 此導航定位功能提供步行指引，包括隨意行走和到達指定的目的地，此功能亦整合到雲端平台上。

主要成效

- 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。
- 提升殘疾人士的生活質素，並提高他們參與社交活動的能力。

Robo-9：為視障人士而設的傳感器融合技術

完成研究日期

2021年5月31日

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

DELIVERBOT

Overview

This technology was developed to provide automatic and reliable delivery services. The delivery robot was built with advanced software and hardware infrastructure to travel in complex and dynamic environments.

Problem addressed

The delivery robot 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 even the paths are with gateways and many moving obstacles.

Innovation

- 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 investigated.
- Unlike traditional interpolation methods which only consider depth data from LIDAR, this project adopts content-based sensor fusion depth estimation for collision avoidance.

Key Impact

- Ease the shortage of resources and manpower
- Improve productivity and work 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

Award

- Delivery Robot with End-to-end Navigation Policy has won a Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days.

Deliverbot

Research Completion

15 July, 2021

Applications

- Logistics & Warehouse Management
- Office automation

Commercialisation opportunities

- Technology licensing

運送機械人

簡介

此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遞送機械人，可在複雜和動態環境中行走。

解決方案

運送機器人利用激光雷達和LSCM研發的深度學習路徑規劃策略，透過同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。

創新技術

- 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。
- 跟只考慮來自LIDAR的深度數據的傳統插值方法不同，此項目採用基於內容的傳感器融合深度估算來避免碰撞。

主要成效

- 舒緩資源和人力短缺的問題
- 提高生產力和工作效率
- 協助解決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

獎項

- 具有端到端導航策略的遞送機械人獲得2021年日內瓦國際發明展銀獎。

運送機械人

完成研究日期

2021年7月15日

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

Overview

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.

Problem addressed

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.

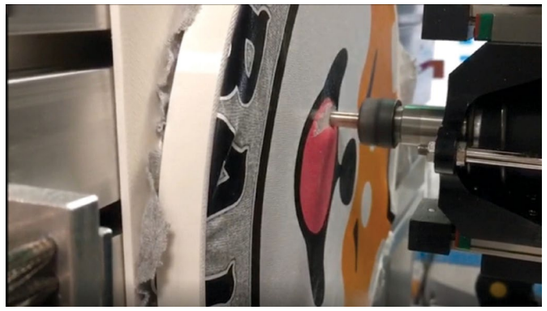
Innovation

- 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.

Key Impact

- Increase the efficiency of product conformity assessment
- Reduce human errors during the process

Robotic Material Preparation Device Using Tactile and Visual Guidance



Research Completion

30 March, 2019

Applications

- Product and quality testing

Commercialisation opportunities

- Technology licensing

適用於品質檢定的材料準備機械人裝置

簡介

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。

解決方案

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。

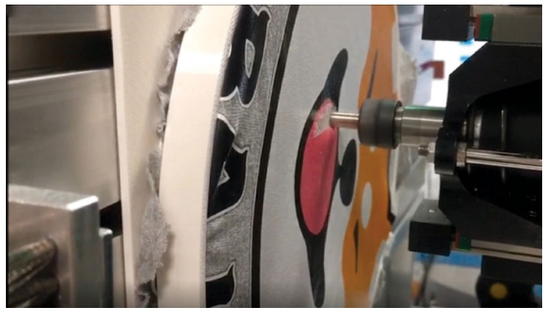
創新技術

- 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。

主要成效

- 提高產品規格評定的效率
- 減少流程中的人為錯誤

以觸覺和視覺導引的材料準備機械人



完成研究日期

2019年3月30日

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

Overview

This project aims to develop key building block technologies of service robots for warehouses, banks, and elderly homes. People searching, navigation and motion stability techniques are investigated.

Problem addressed

Service Robots (SR) are designed and developed to handle specific tasks that often involve interaction with humans. In some cases, service robots are developed to perform complicated and dangerous tasks in which human life could be threatened. For example, wall crawling robots are deployed to perform pipe inspection tasks in nuclear power plants.

Innovation

- Intelligent service robots 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 robots move around and search for humans. Infrared camera can be installed in the service robot to enable it to move towards the target person.

Key Impact

- Service robots with build-in functions of self-navigation and different interactive applications to cater for the needs of various industry sectors.

Smart Service Robot

Research Completion

19 December, 2019

Applications

- Elderly homes, estate management, shopping mall

Commercialisation opportunities

- Technology licensing

智能服務機械人

簡介

此項目為倉庫、銀行和長者院舍研發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。

解決方案

服務機械人 (SR) 一般應用於處理經常與人類有互動的特定工作。在某些情況下，服務機械人會被應用於執行可能威脅人生安全且複雜和危險任務。例如，在核電站中應用爬牆機械人執行管道檢查工作。

創新技術

- 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。
- 服務機械人可安裝紅外線攝錄器，向目標人物前進，以尋找指定的人。

主要成效

- 內置自動導航功能和不同交互應用的服務機械人，滿足各行業的需求。

智能服務機械人

完成研究日期

2019年12月19日

應用範疇

- 安老院、屋村管理、商場

商品化機會

- 技術授權許可

SMART LIFTER

Overview

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 even smaller than either of the machines. With the additional sensors, such as force sensors, the operation efficiency can be enhanced.

Problem addressed

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 simply turned into a stratified (or personalised) lifter for elderly care applications. It would generate significant economic and social benefits for local industries and society.

Innovation

- An adjustable level controller will be generated to provide additional supporting force for object manipulation /handling.
- The lifter is a new equipment tailored for confined and unstructured warehouses or settings. It assists human operators to manoeuvre around such environments 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.

Key Impact

- Help workers to handle various objects easily and safely
- Able to turn into a stratified lifter for elderly care applications

Smart Lifter / Transporter for Object Handling in Confined Space

Research Completion

30 March, 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

智能起重機

簡介

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。

解決方案

LSCM的智能起重機/運輸機器是針對香港的傳統倉庫而設計。它不但可執行特定和精細的工作，還可以輕易地改裝成適用於長者護理的起重機，對本地社會作出顯著的經濟和社會效益。

創新技術

- 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非統一的倉庫或環境中工作，從而提高整體倉庫的生產力和效率。
- 智能起重機包含一個新的組合式末端執行器(包括其控制器)，協助處理多項不同形狀和種類的物件。

主要成效

- 協助工人既輕鬆又安全地處理各種物件
- 能夠改裝為應用於長者護理的升降台

適用於擠迫環境的智能起重機/運輸機器

完成研究日期

2019年3月30日

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

Overview

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.

Problem addressed

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.

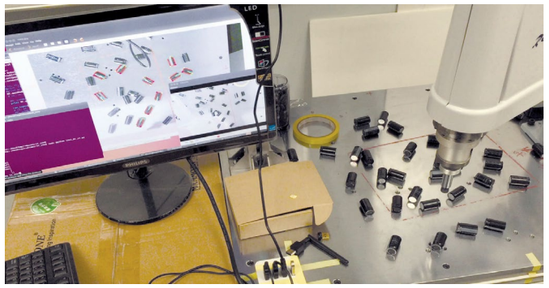
Innovation

- 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

Key Impact

- 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.
- 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.

Physical Sensory Systems for Human-Robot Collaborative Tasks



Research Completion

29 July, 2018

Applications

- Physical Sensory Systems for Human-Robot Collaborative Tasks

Commercialisation opportunities

- Technology licensing

協作機械人的傳感系統

簡介

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。

解決方案

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。

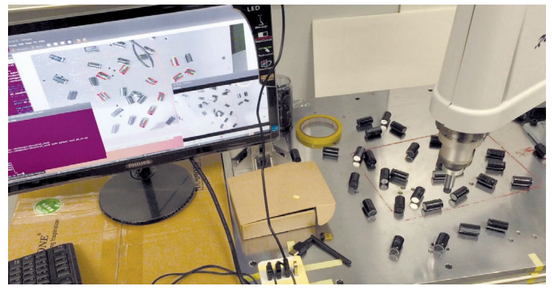
創新技術

- 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。

主要成效

- 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。

協作機械人的傳感系統



完成研究日期

2018年7月29日

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

Overview

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.

Problem addressed

The RGB-D vision system sends shape, size and surface information of the baggage to pneumatic end-effector to operate on label affixing. The 3D model and RGB image are passed to a machine learning algorithm to segment objects in the scene.

Innovation

- After each object is detected and classified as target object of end-effector, surface fitting algorithm is applied to the 3D model to identify the suitable position for 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.
- The technology's pilot run has been conducted by the Hong Kong International Airport (HKIA) for testing its deployment in actual industrial environments.

Key Impact

- This service robot can replicate manual repetitive label affixing tasks to reduce human fatigue.

Smart Robot Hand and Eye Co-ordination Enabling Technologies for e-Commerce Warehouse Management

Research Completion

15 January, 2018

Applications

- Luggage label affixing

Commercialisation opportunities

- Technology licensing

智慧型手眼協調機械臂定位系統

簡介

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。

解決方案

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。

創新技術

- 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。
- 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。

主要成效

- 服務機械人可以代替人手張貼標籤的重複性工作，減少工人的勞損。

應用於電子商貿倉庫之智慧型手眼協調機械臂定位系統

完成研究日期

2018年1月15日

應用範疇

- 張貼行李標籤

商品化機會

- 知識產權許可

FOLLOW-ME ROBOT

Overview

This project aims to develop a follow-me robot with platooning technology to alleviate the workload of warehouse operators and increase overall logistics efficiency.

Problem addressed

With the booming of e-commerce recently, warehouse automation faces new challenges. Changing from B2B to B2C operation, warehouse logistics tasks become more fragmented. Instead of using a trolley to deliver heavy items, the follow-me robot can help the workers carry goods and follow them around the warehouse. And platooning technology enables the robot to increase capacity instantly. Without any need of infrastructure modification, it is more cost-effective for small-sized businesses.

Innovation

- Using Ultra-wide Band and vision technologies for personal tracking and platooning
- Automatic collision avoidance

Key Impact

- Increase warehouse efficiency and productivity
- Reduce workers' strain and fatigue
- Help operator to carry bulky and heavy items
- No infrastructure modification needed

Follow-me robot

Research Completion

31 March, 2022

Applications

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

Commercialisation opportunities

- Technology licensing

自動隨行機械人

簡介

此項目旨在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，並提高整體的物流效率。

解決方案

隨著近年電子商務的蓬勃發展，倉庫自動化面對新的挑戰。營運從企業對企業模式轉變至企業對客戶模式，倉庫物流處理的工作變得零散。而隨行機械人可以幫助倉務員搬運貨物，並跟隨他們在倉庫中行走，使人員不用推動裝載著重物的手推車。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。

創新技術

- 使用超寬帶和視覺技術進行個人跟蹤和列隊行駛
- 自動防止碰撞

主要成效

- 提高倉庫效率和生產力
- 減低工人的壓力和疲勞
- 幫助操作員搬運重物
- 無需修改基礎設施

自動隨行機械人

完成研究日期

2022年3月31日

應用範疇

- 物流樞紐
- 電子商務中心
- 傳統倉庫
- 工廠

商品化機會

- 技術授權許可

STAYHOMESAFE HOME QUARANTINE SUPPORT SOLUTION

Overview

This project was developed to facilitate the compulsory home quarantine arrangement implemented by the Hong Kong SAR government to combat COVID-19.

Problem addressed

The "StayHomeSafe" solution, consisting of an electronic wristband (e-wristband) and a monitoring system, provides a tracking mechanism to ensure the confinee's presence in the designated quarantine premises during the quarantine period. By installing a tracking device in the residence and pairing it with an e-wristband worn by the confinee, the system monitors the tracking device remotely on the received signals emitted from the e-wristband and sends out alerts if there are any abnormalities.

Innovation

- 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 confinee's status. When there are any abnormalities, the system will inform the related department to take necessary actions.

Key Impact

- Support the ongoing epidemic prevention in Hong Kong

Award

- The Electronic Wristband and Monitoring System for Hong Kong's "StayHomeSafe" Home Quarantine Support Solution have won the Gold Medal in the Special Edition 2021 Inventions Geneva Evaluation Days.

"StayHomeSafe" Home Quarantine Support Solution

Research Completion

21 February, 2021

Applications

- Tamper detection electronic wristbands for hospitals
- Perform multi-manufacturer wristband reporting through mobile device
- Information exchange and tracking
- Workflow integration for operation and monitoring

Patent Applications

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

Commercialisation opportunities

- Technology licensing

「居安抗疫」居家檢疫方案

簡介

此系統旨在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。

解決方案

「居安抗疫」系統技術利用電子手環及監測系統，確保檢疫人士於檢疫期間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，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。

創新技術

- 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。

主要成效

- 持續支援香港的防疫工作

獎項

- 支援香港家居檢疫措施的「居安抗疫」電子手環及監察系統榮獲2021年日內瓦國際發明展金獎。

支援香港家居檢疫措施的「居安抗疫」電子手環及監察系統

完成研究日期

2021年2月21日

應用範疇

- 電子手環可應用於醫院，並防止被蓄意破壞
- 透過流動設備管理由不同製造商製造的手環
- 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

ULTRA-WIDEBAND ACTIVITY MONITORING SYSTEM

Overview

LSCM has developed a monitoring system to measure the activity levels of the elderly and detect any abnormal conditions by using state-of-the-art ultra-wideband (UWB) and signal processing technologies.

Problem addressed

Population ageing is a global problem. The elderly service Industry has been looking for novel technologies to reduce the manpower and resources required for the rapid aged population growth. Existing solutions mainly rely on wearable devices or camera images. Instead, LSCM utilises UWB technologies to provide a non-contact and no-image elderly monitoring solution in elderly centres, to help the caregivers to improve work efficiency.

Innovation

- Utilising UWB technology to detect respiration rate and other activities in order to provide mm-level spatial and movement analysis.

Key Impact

- Provide real-time feedbacks on respiration rate and bed occupancy detection to help caregivers provide efficient remote monitoring service for the elderly.

Ultra-Wideband Activity Monitoring System for Solitary Elderly

Research Completion

2 April, 2017

Applications

- Respiration rate detection
- Occupancy detection

Commercialisation opportunities

- Technology licensing

超寬帶活動監測系統

簡介

LSCM研發了一個監測系統，透過使用最先進的超寬帶 (UWB) 和訊號處理技術來測量長者的活動水平，並檢測異常情況。

解決方案

長者服務業界一直在尋找新技術以減輕老化人口快速增長而產生的人力和資源需求。現有的解決方案主要使用可穿戴的設備或圖像。而LSCM則利用UWB技術在長者中心提供非接觸式及無圖像長者監控技術，藉此協助護理人員提高工作效率。

創新技術

- 利用UWB技術檢測呼吸率和其他活動，以提供毫米級空間和運動分析。

主要成效

- 提供呼吸頻率和床位檢測的實時反饋，幫助護理人員為長者提供高效率的遠程監控服務。

應用超寬帶技術於獨居長者活動監測

完成研究日期

2017年4月2日

應用範疇

- 呼吸率檢測
- 使用率檢測

商品化機會

- 技術授權許可

RFID BLIND CANE

Overview

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.

Problem addressed

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.

Innovation

- 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

Key Impact

- 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.

RFID Blind Cane and RFID Tags for Navigation

Research Completion

15 November, 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

無線射頻識別視障人士手杖

簡介

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。

解決方案

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。

創新技術

- 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平台
- 具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

主要成效

- 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

無線射頻識別視障人士手杖系統

完成研究日期

2017年11月15日

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

SERVICE LOGGING AND INFORMATION KIOSK SYSTEM

Overview

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

Problem addressed

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 to allowing them to handle some self-service tasks in order to maintain their self-reliance ability. Moreover, in order 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 solution to these issues.

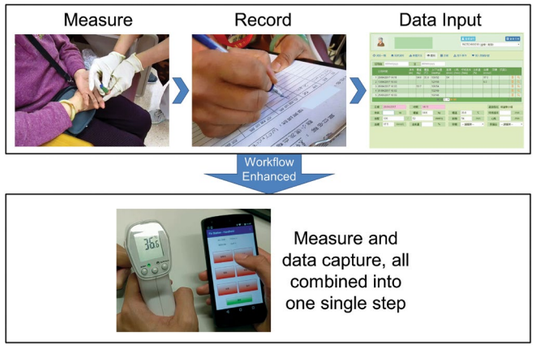
Innovation

- AI-assisted group photo browsing based on facial recognition
- Chatbot-enabled interactive enquiry for available services and information:
  - Meal of the day
  - Weather
  - Activities announcement
  - Notice / memo
  - Training videos
- RFID-based activities signing-up
- Auto in-range connection for vital sign measuring equipment

Key Impact

- 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.

Service Logging and Information Kiosk System for Elderly Homes, District Centres and Rehabilitation Centres



Research Completion

30 April, 2021

Applications

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

Commercialisation opportunities

- Technology licensing

服務記錄及資訊查詢系統

簡介

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。

解決方案

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。

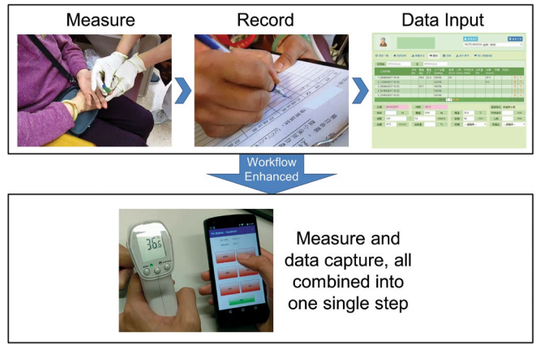
創新技術

- 基於人臉識別的AI輔助合照瀏覽
- 與聊天機械人互動，查詢可用服務和信息：
  - 每日餐單
  - 天氣
  - 活動公告
  - 通知/備忘錄
  - 培訓視頻
- 基於RFID的活動註冊
- 在指定範圍內自動連接生命體徵測量設備

主要成效

- 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。

服務記錄及資訊查詢系統



完成研究日期

2021年4月30日

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

INFRARED THERMAL SAFETY SYSTEM

Overview

The 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.

Problem addressed

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.

Innovation

- A privacy preserving system that uses a lower resolution thermal sensor to monitor individual's safety in a private space.

Key Impact

- If the individual falls and is unconscious, the system will alert the relevant caregivers to take immediate action.

Award

- The Infrared Thermal Sensing Safety Alert System won a Gold Medal at the 47th International Exhibition of Inventions Geneva in 2019 and a Silver Medal at the 1st Asia Exhibition of Inventions Hong Kong which was held in 2018.

Infrared Thermal Sensing Safety Alert System for the Elderly

Research Completion

30 March, 2017

Applications

- Elderly homes or elderly centres

Patent Applications

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

Commercialisation opportunities

- Technology licensing

紅外線熱能感應警報系統

簡介

這紅外線熱傳感警報系統，是一個高度保障私隱的安全的監察系統。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。

解決方案

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。

創新技術

- 保障隱私，使用低解像度的熱傳感器來監測處於私人空間中的個人安全

主要成效

- 如果偵測到危險， 系統會向照顧者發出警報，使其作出相應行動。

獎項

- 系統於2019年舉行的第47屆日內瓦國際發明展中獲得金獎殊榮及2018年舉行的第一屆亞洲發明展覽會－香港中獲得銀獎。

適用於長者的紅外線熱能感應警報系統

完成研究日期

2017年3月30日

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

RFID-TAGGED VEST & GATE DOOR SYSTEM

Overview

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.

Problem addressed

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.

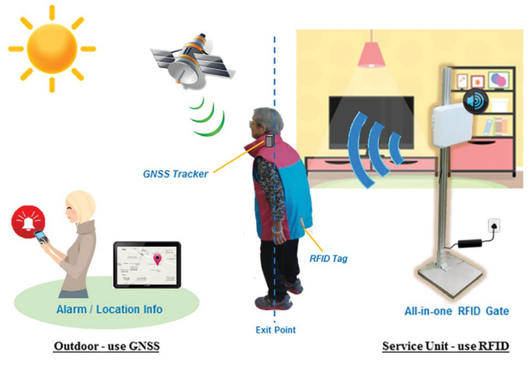
Innovation

- Leveraging of 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

Key Impact

- 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 put towards 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

RFID technologies to safeguard the elderly from accidental wandering



Research Completion

30 September, 2013

Applications

- Elderly homes or elderly centres

Commercialisation opportunities

- Technology licensing

無線射頻識別背心及閘門

簡介

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。

解決方案

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。

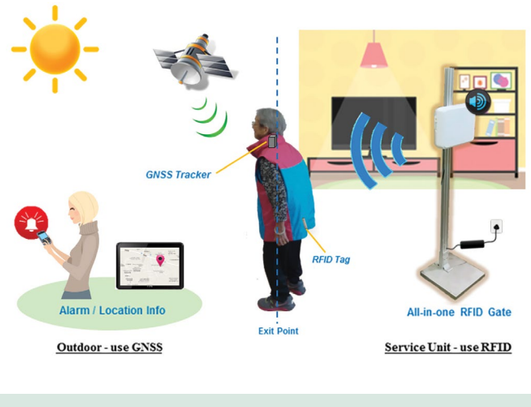
創新技術

- 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

主要成效

- 透過自動化操作，提高工作場所的效率及生產力，從而大大地降低運營成本
- 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

適用於長者監察的無線射頻識別技術



完成研究日期

2013年9月30日

應用範疇

- 長者院舍或長者中心

商品化機會

- 技術授權許可

GPS TRACKING TECHNOLOGIES

Overview

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.

Problem addressed

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.

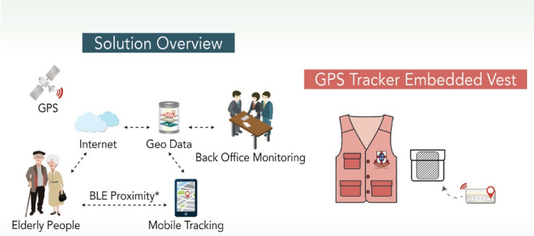
Innovation

- 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.

Key Impact

- 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

GPS Tracking Technologies



Research Completion

2 May, 2016

Applications

- Elderly care

Commercialisation opportunities

- Technology licensing

全球定位追蹤技術

簡介

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。

解決方案

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。

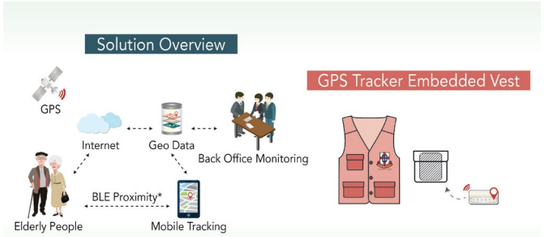
創新技術

- 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。

主要成效

- 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

全球定位追蹤技術



完成研究日期

2016年5月2日

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

Overview

This project aims to design Baby Tag and Baby Tracking Management Control System to enhance the security and system control to reduce the risk of baby abduction in the hospital environment.

Problem addressed

The Baby Tag and Baby Tracking Management Control System provide protection to new-born babies against abduction by raising a visual and audio alert when unauthorised movements of new-born babies or attempts in tampering of the tag have been detected.

Innovation

- 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 to respond quickly to the alerts generated by the Baby Tag.
- Network protocol is designed to balance battery life, response time and tag density.

Key Impact

- Use of technology solution to enhance the security and mitigate the danger of baby abduction in hospitals.
- The real-time tracking solution can be adopted in the community.

Baby Tag

Research Completion

14 June, 2014

Applications

- People/asset tracking in hospital environment

Patent Applications

- US 14/766,819
- CN 2013 8007 5416.3
- HK 16101739.6
- EP 13874 810.8
- CN 2013 8008 0703.3
- HK 16114457.9

Commercialisation opportunities

- Technology licensing

嬰兒標籤與嬰兒綜合管理監察系統

簡介

此項目旨在設計嬰兒標籤和嬰兒綜合管理監察系統，以提高照顧嬰兒時的保安和系統控制，從而減低嬰兒在醫院環境中被擄拐的風險。

解決方案

嬰兒標籤和嬰兒綜合管理監察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。此技術可以加強嬰兒保安及減少嬰兒在醫院內被拐帶的風險。

創新技術

- 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信道，防止出現衝突。
- 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告作出反應。
- 網絡協議能平衡電池壽命、回應時間和使用標籤的密度。

主要成效

- 使用技術解決方案來提高保安，並減低住院的嬰兒被擄拐的危險
- 實時追蹤解決方案可應用於其他社區服務

嬰兒標籤與嬰兒綜合管理監察系統

完成研究日期

2014年6月14日

應用範疇

- 於醫院環境內人/物資的追蹤

專利申請

- US 14/766,819
- CN 2013 8007 5416.3
- HK 16101739.6
- EP 13874 810.8
- CN 2013 8008 0703.3
- HK 16114457.9

商品化機會

- 技術授權許可

OUTDOOR IOT SENSING NETWORK FOR TREE MANAGEMENT

Overview

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

Problem addressed

The project helps monitor the trees on their stability based on the tilt angle and direction data collected by the sensing devices. The system will monitor the trees on an individual site level and at a centralised system level. With deep analysis of the continuous monitoring data, the trees with potential risks can be identified. In addition, the system supports the Greening, Landscape & Tree Management Section (GLTMS) of the Development Bureau with their tree management to optimise the disposal work to minimise the traffic disruption and ensure the safety of Hong Kong residents by providing statistics of collapsed trees.

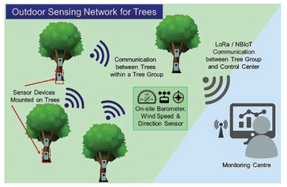
Innovation

- Trials are conducted on various sites, collecting information about the trees within individual sites before sending data to the monitoring centre.
- Each tree within the site 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 various weather conditions.

Key Impact

- 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 from varying levels of temperature, rain and wind speeds can be observed.

Outdoor IoT Sensing Network and Data Management Platform for Site-specific Tree Management



Research Completion

30 March, 2022

Applications

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

Commercialisation opportunities

- Technology licensing

用於樹木管理的室外物聯網傳感網絡

簡介

此項目透過建立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。

解決方案

此項目將根據傳感設備所收集的傾斜角度和方向數據，監測樹木的穩定性。系統將在單一地點和中央系統進行監控。而收集到的樹木數據將作詳細分析，以辨識潛在的問題。此外，系統還支援發展局綠化、園境及樹木管理組 (GLTMS) 的樹木管理，於颱風後自動統計已倒塌的樹木的數量，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確保香港市民的安全。

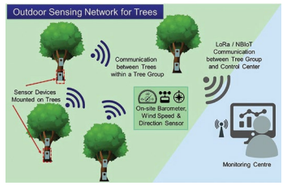
創新技術

- 在不同地點進行試用，把數據傳送到監控中心之前收集各個地點內樹木的資料。
- 試用場地內的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。
- 帶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，從而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。

主要成效

- 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

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



完成研究日期

2022年3月30日

應用範疇

- 屋村、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

RFID ASSET MANAGEMENT SYSTEM

Overview

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.

Problem addressed

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.

Innovation

- Compare 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 a click of button, the scanning process can locate the items and identify missing ones with ease.

Key Impact

- Enhance the efficiency and accuracy of identifying items
- Replace the existing paper-based inventory management system

RFID Asset Management System

Research Completion

19 March, 2018

Applications

- Inventory tracking and management

Commercialisation opportunities

- Technology licensing

無線射頻識別物資管理系統

簡介

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。

解決方案

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。

創新技術

- 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。

主要成效

- 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

無線射頻識別物資管理系統

完成研究日期

- 2018年3月19日

應用範疇

- 庫存追蹤和管理

商品化機會

- 技術授權許可

SMART BARRIER SYSTEM

Overview

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

Problem addressed

The Smart Barrier System enhances the effectiveness of the remote barriers built by the Civil Engineering and Development Department (CEDD) of the HK SAR Government throughout the years. By deploying internet-of-things sensor technologies, the system can detect the impact of landslide debris on the barriers in real time and issue instant alerts to the authority.

Innovation

- To improve public safety against landslides, an instant camera system with infrared light has been developed to provide images and instantly transmit them to the related departments for follow-up immediately.
- An on-site Warning Message System (WMS) helps deliver the landslide warning messages by using the technique of Moving Message Display and strengthen the structural support of the system to withstand the external load brought by extreme weather.

Key Impact

- The system helps to prevent the public from staying too close to the barriers during adverse weather, which can mitigate the risk of landslide hazards in natural terrains.

Award

- The Smart Barrier System has won the Silver Medal at the 47th International Exhibition of Inventions of Geneva in 2019.

Smart Barrier System

Research Completion

31 July, 2020

Applications

- Landslide detection

Patent Applications

- HK 3202 1024 847.7

Commercialisation opportunities

- Technology licensing

智能泥石壩系統

簡介

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、可靠及低能量消耗的監察系統可實時偵測山泥傾瀉的風險。

解決方案

智能泥石霸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。利用物聯網傳感器技術，系統可以實時檢測防護屏障是否遭到山泥撞擊，並即時通知相關部門跟進。

創新技術

- 為了減低山泥傾瀉對公眾安全的危險，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的部門作出跟進。
- 系統使用流動信息顯示技術於最接近山坡的位置，發出「警告」的訊息，令附近的居民及行人即時知道，並加強系統的結構支持，以承受極端天氣帶來的損壞。

主要成效

- 系統有助於防止公眾在惡劣天氣下逗留在距離防護屏障太近的地方，從而減輕因天然山坡山泥傾瀉帶來災害的風險。

獎項

- 智能泥石霸系統在2019年舉行的第47屆日內瓦國際發明展榮獲銀獎。

智能泥石壩系統

完成研究日期

2020年7月31日

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

ULTRA-WIDEBAND PACKAGE SCANNER

Overview

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.

Problem addressed

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 counterpart, to identify potentially mis-packed goods. Weighing method may identify missing parts but it is notable to detect 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.

Innovation

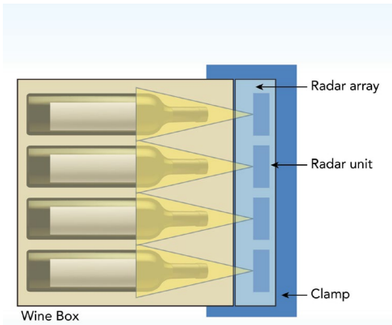
A portable and non-invasive scanner which uses UWB and RF technologies

- 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

Key Impact

- A low-cost non-destructive screening method
- Inventory control or quality assurance system without unpacking the items
- Effective workflow and increased productivity

UWB Package Scanner for Inventory Management



Research Completion

2 March, 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

超寬頻包裝掃瞄器

簡介

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。

解決方案

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。而這種非破壞性物體掃描儀器能把不同雷達輸出的波形變化作出關聯，以識別非標準的物體並作出篩選。

創新技術

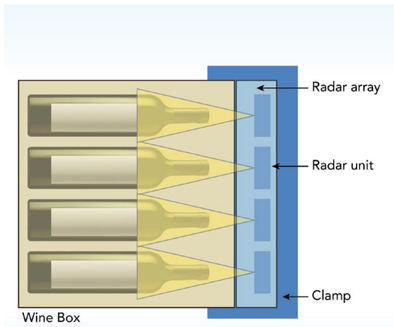
使用UWB和RF技術的便攜式非入侵式掃描儀器

- 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

主要成效

- 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

應用於庫存管理的超寬帶包裝掃瞄器



完成研究日期

2018年3月2日

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

Overview

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 effectively monitoring water level changes and gas concentration changes within drainage and sewage manholes.

Problem addressed

To monitor the collected data remotely, the data management system built based on cloud computing and storage technologies allows convenient real-time access to the data for analysis by users. Besides, APPs were also developed for on-site data browsing. With the sensing network, application software, cloud computing and cloud storage technologies, high risk areas such as flood blackspots, manholes with high density explosive gases and even areas at risk of landslides can be closely monitored.

Innovation

- A unique sensing network for effectively collecting underground sensor data in an extremely severe operating environment
- Special design antenna for underground to above ground communication
- An above ground mesh network is developed for backend system communication

Key Impact

- This project provides a very unique sensing network for effectively collecting underground sensor data in an extremely severe operating 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.

An Integrated Sensor Module and Ubiquitous Wireless Network for Smart Drainage System

Research Completion

24 March, 2018

Applications

- Drainage Management

Commercialisation opportunities

- Technology licensing

智能渠道管理系統

簡介

本中心與香港中文大學攜手合作，建立了一個靈活高效、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。

解決方案

此技術結合採集數據以及後台軟件管理系統、雲計算及存儲系統和用戶自定的警報機制，實現對城市洪水黑點、潛在的山泥傾瀉區域、人為非法傾倒導致的水渠淤塞，以及充斥著有害氣體而有可能導致的危險地區進行監控，及時地防範災害發生。根據所收集到的實時數據和以往的歷史數據分析，對潛在危險發出預警。

創新技術

- 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信的特殊設計天線
- 開發了地上網狀網絡，應用於後端系統通信

主要成效

- 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。

結合無線傳感模組及網絡的智能渠道管理系統

完成研究日期

2018年3月24日

應用範疇

- 渠道管理

商品化機會

- 技術授權許可

RFID METAL TAGS

Overview

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.

Problem addressed

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.

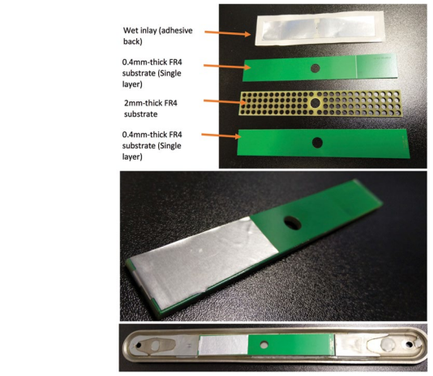
Innovation

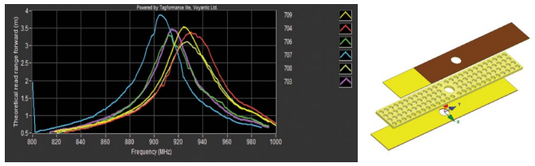
- Long read range on metal substrate by using directional reflector technology
- Thin and compact antenna
- Soft printed RFID antenna technology on different materials

Key Impact

- Various UHF RFID tag antennas designed for metal, brick, soil and plastic, etc.
- UHF RFID tag antenna customisation

Metal Tag structure and embedded in guidance for the visually impaired





Research Completion

31 August, 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

無線射頻識別
金屬標籤

簡介

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。

解決方案

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，兼具高的性能。

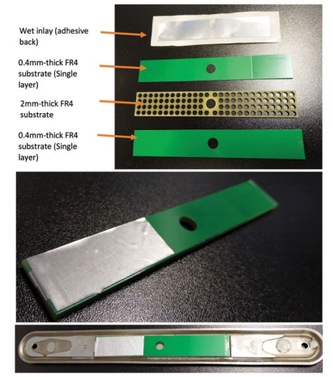
創新技術

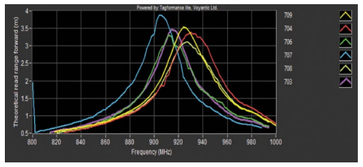
- 透過使用定向反射器技術在金屬基板上達到更長的讀取範圍
- 纖薄小巧天線
- 能在不同材料上印刷的RFID天線技術

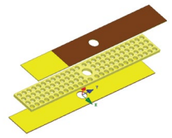
主要成效

- 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

金屬標籤結構並嵌入到視障人士引導徑中







完成研究日期

2017年8月31日

應用範疇

- UHF RFID嵌入視障人士引導徑地磚
- 實時定位和製圖
- 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

RFID READER ANTENNA

Overview

This project aims to design a compact and high-performance UHF RFID antenna for integrated reader.

Problem addressed

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.

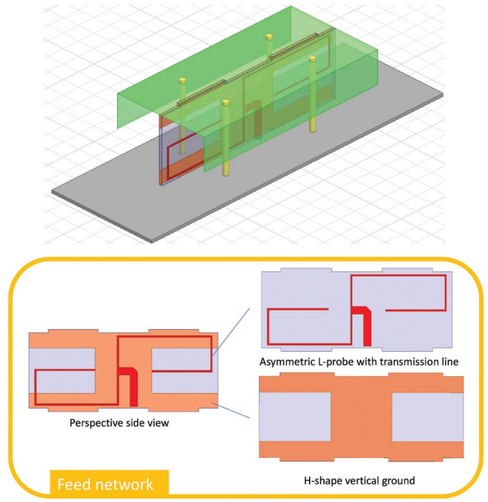
Innovation

- 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

Key Impact

- Compact integrated UHF RFID reader size
- Enhance reading distance
- Access UHF RFID tag in any orientations

RFID Reader Antenna



Research Completion

31 May, 2020

Applications

- Retailing
- Inventory management
- Positioning

Commercialisation opportunities

- Technology licensing

無線射頻識別集成閱讀器天線

簡介

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。

解決方案

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。

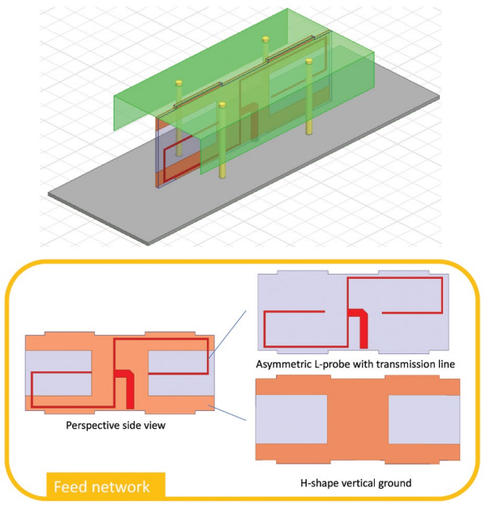
創新技術

- 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

主要成效

- 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

無線射頻識別閱讀器天線



完成研究日期

2020年5月31日

應用範疇

- 零售業
- 庫存管理
- 定位

商品化機會

- 技術授權許可

LORA IOT PLATFORM

Overview

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.

Problem addressed

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.

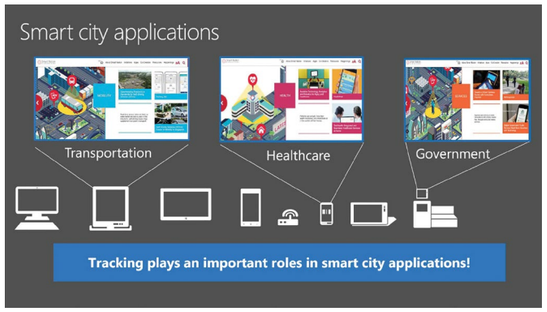
Innovation

- 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.

Key Impact

- 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 China market where LoRa is the basic elements in IoT development.

LoRa IoT Platform for Smart City Technology and Applications Development



Research Completion

19 February, 2020

Applications

- Logistics and transportation
- Smart City applications

Patent Applications

- US 62916241

Commercialisation opportunities

- Technology licensing

LORA物聯網平台

簡介

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。

解決方案

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。

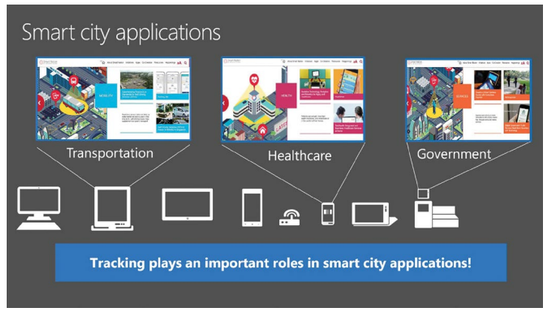
創新技術

- 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。

主要成效

- 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市場連接的重要元素。

配合智慧城市發展的LoRa物聯網平台



完成研究日期

2020年2月19日

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

Overview

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.

Problem addressed

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.

Innovation

- 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.

Key Impact

- 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.

Award

- Seamless Navigation in Urban Environment has won the Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days.

Seamless Navigation in Urban Environment through Multiple Sensor Fusion and GNSS Multipath Mitigation

Research Completion

30 September, 2019

Applications

- Smart city navigation

Commercialisation opportunities

- Technology licensing

城市無縫定位系統

簡介

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。

解決方案

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。

創新技術

- 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。

主要成效

- 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

獎項

- 城市無縫定位系統榮獲2021年日內瓦國際發明展銀獎。

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

完成研究日期

2019年9月30日

應用範疇

- 智慧城市導航

商品化機會

- 技術授權許可

GNSS BASED INFRASTRUCTURE

Overview

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.

Problem addressed

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.

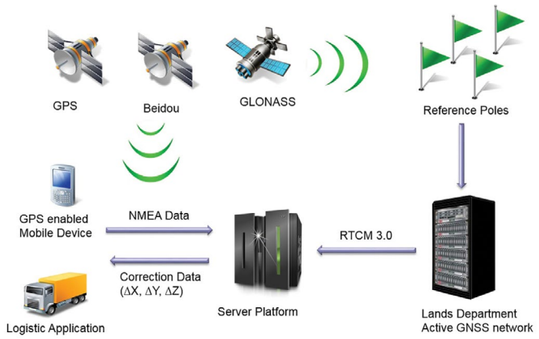
Innovation

- 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.

Key Impact

- With 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.

Development of a Hong Kong Positioning Infrastructure Based on GPS, Beidou, and Ground Based Augmentation System



Research Completion

14 September, 2016

Applications

- Smart city navigation

Commercialisation opportunities

- Technology licensing

基於GNSS的基礎設施

簡介

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。

解決方案

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)。

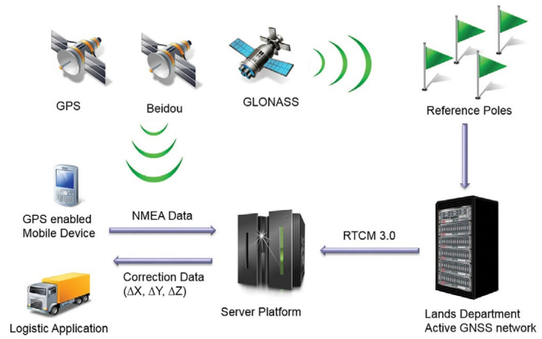
創新技術

- 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，並達至以米級的準確度(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。

主要成效

- 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。

基於GPS、北斗及地面增強系統的香港衛星定位平台



完成研究日期

2016年9月14日

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

Overview

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.

Problem addressed

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.

Innovation

- 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 .

Key Impact

- 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 Geodatabase Framework for Hong Kong: A Lightweight 3D Seamless Spatial Data Acquisition System (SSDAS)

Research Completion

31 December, 2018

Applications

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

Patent Applications

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

Commercialisation opportunities

- Technology licensing

無縫三維空間數據採集系統

簡介

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。

解決方案

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)。

創新技術

- 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。

主要成效

- 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。

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

完成研究日期

2018年12月31日

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

專利申請

- 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

Overview

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.

Problem addressed

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").

Innovation

- 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.

Key Impact

- 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.

Award

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

Smart AP : Wi-Fi Positioning and Optimisation for a Smart City

Research Completion

31 January, 2018

Applications

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

Commercialisation opportunities

- Technology licensing

智能接入點

簡介

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) 上運行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。

解決方案

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。

創新技術

- 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。

主要成效

- 借助用戶位置訊息(熱圖)，商場營運商能夠透過移動推送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。

獎項

- 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。

智能接入點：智慧城市的無線Wi-Fi定位和系統優化

完成研究日期

2018年1月31日

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 LOCALISATION TRACKING AND NAVIGATION

Overview

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.

Problem addressed

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.

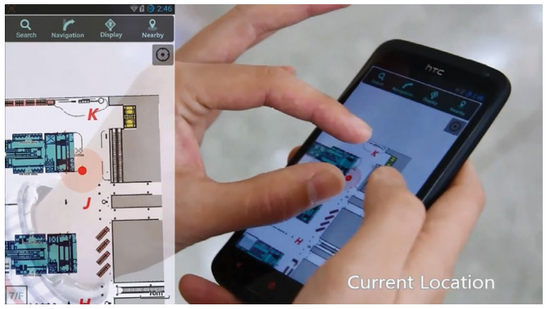
Innovation

- 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.

Key Impact

- 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.

Indoor Localisation, Tracking and Navigation



Research Completion

30 June, 2015

Applications

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

Commercialisation opportunities

- Technology licensing

室內定位、追蹤和導向

簡介

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。

解決方案

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。

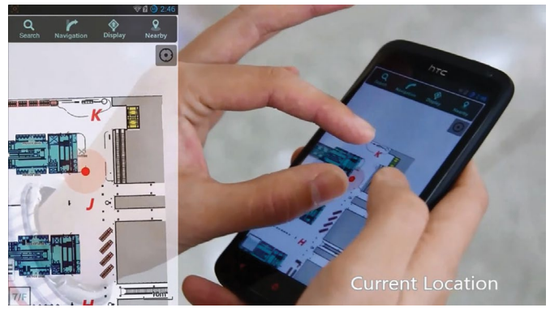
創新技術

- 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。

主要成效

- 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。

室內定位、追蹤和導向



完成研究日期

2015年6月30日

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

INDOOR LOCATION ANALYTICS SYSTEM

Overview

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.

Problem addressed

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.

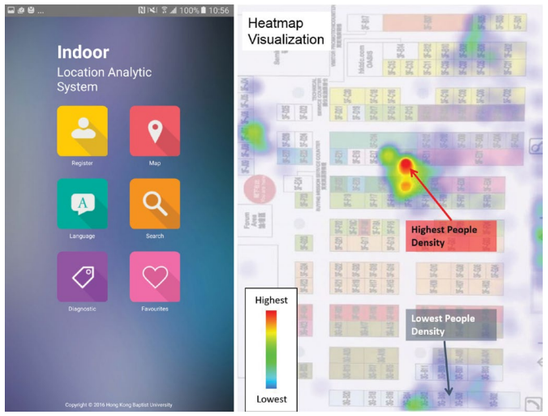
Innovation

- 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.

Key Impact

- 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.

Physical Indoor Location Analytics System for Exhibition and Convention Industries



Research Completion

4 November, 2017

Applications

- Indoor location analytics system for exhibition and convention industries

Commercialisation opportunities

- Technology licensing

室內位置數據分析系統

簡介

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。

解決方案

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。

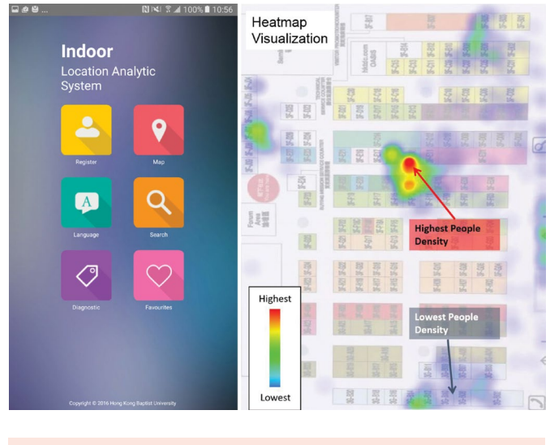
創新技術

- 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。

主要成效

- 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

適用於展覽及會議行業的室內位置數據分析系統



完成研究日期

2017年11月4日

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

RFID-ENABLED BIM PLATFORM

Overview

While Building Information Modeling (BIM) enables better productivity for public housing construction in Hong Kong, data fragmentation and discontinuity hinder its development. 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.

Problem addressed

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.

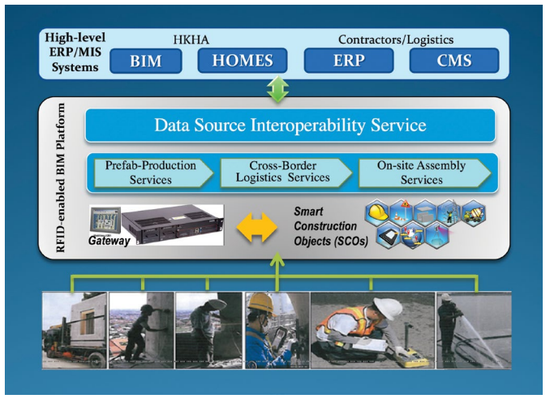
Innovation

- 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.
- The project 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.
- The 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.

Key Impact

- Enhance the competitiveness of the construction industry in the perspectives of shortening project time
- Reduce the usage of construction resources
- Improve the efficiency in cross-border customs logistics
- Improve the responsiveness to market and engineering changes

RFID-Enabled BIM Platform for Prefabrication Housing Production in Hong Kong



Research Completion

15 July, 2016

Applications

- Construction
- Project / Resource Management

Commercialisation opportunities

- Technology licensing

無線射頻識別建設訊息平台

簡介

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。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。

解決方案

平台主要涵蓋：(1)無縫溝通和協調多個項目之間的互相操作性的關鍵技術；(2)跨境預製物流和供應鏈管理的可視化和可追蹤技術；(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。

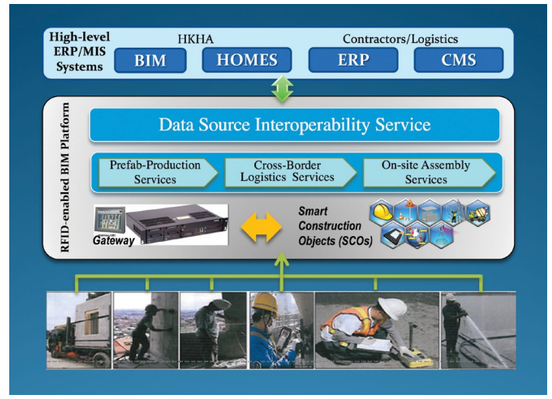
創新技術

- 這個解決方案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，整個過程都需要用到收集到的數據，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。
- 這項目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，同時運用雲端技術和創新的RFID網關技術，以管理智能建築物件。
- 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。

主要成效

- 縮短工期從而提升建造業的競爭力
- 減少建築資源的使用
- 提高跨境海關物流效率
- 提高對市場和工程變化的應變能力

基於RFID的香港預製房屋建設訊息平台



完成研究日期

2016年7月15日

應用範疇

- 建築
- 項目/資源管理

商品化機會

- 技術授權許可

SMART CONSTRUCTION PLATFORM

Overview

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.

Problem addressed

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

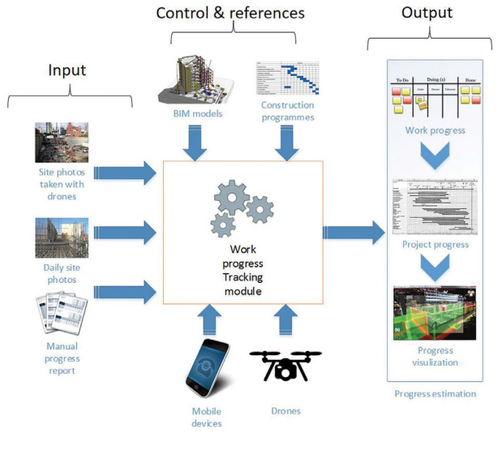
Innovation

- 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.

Key Impact

- 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.

Smart Construction Platform based on Cloud BIM and Image Processing



Research Completion

31 May, 2018

Applications

- Construction Project Management

Commercialisation opportunities

- Technology licensing

智慧建造管理平台

簡介

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。

解決方案

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。

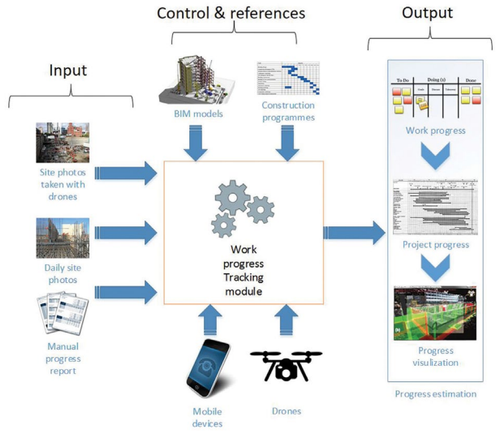
創新技術

- 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。

主要成效

- 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。

基於BIM雲端和圖像處理技術的智慧建造管理平台



完成研究日期

2018年5月31日

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

Overview

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.

Problem addressed

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.

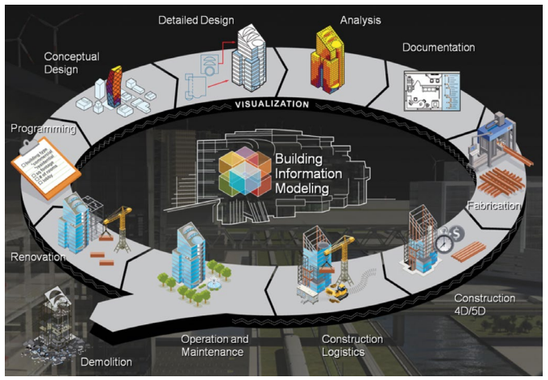
Innovation

- 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.

Key Impact

- 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.

IoT Mesh network and Integrated Semantic knowledge-based BIM for Building Life Cycle Management



Research Completion

6 September, 2017

Applications

- Construction and Facility Management

Patent Applications

- 1 US and 6 China Provisional Patents

Commercialisation opportunities

- Technology licensing

物聯網網格和建築訊息模型

簡介

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。

解決方案

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。

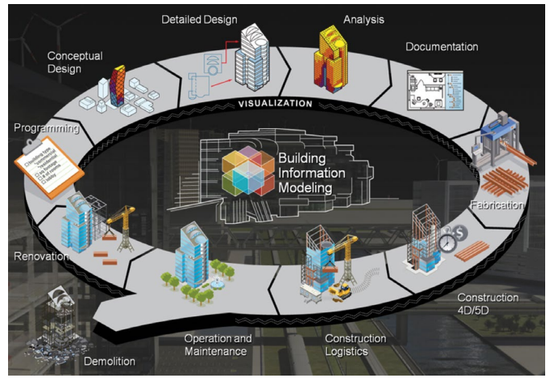
創新技術

- 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。

主要成效

- 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。

利用物聯網網格和建築信息模型支援建築生命週期管理



完成研究日期

2017年9月6日

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

Overview

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

Problem addressed

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.

Innovation

- 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.

Key Impact

- Enhance construction site safety
- Prevent industrial accidents

Rear RFID Alarm Sensing System for Vehicle in Construction Industry

Research Completion

19 September, 2016

Applications

- Construction Site Safety

Commercialisation opportunities

- Technology licensing

無線射頻識別倒車警報系統

簡介

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。

解決方案

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。

創新技術

- 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。

主要成效

- 提升工地安全
- 防止工業事故

應用於工地的實時RFID感應警報管理系統

完成研究日期

2016年9月19日

應用範疇

- 工地安全

商品化機會

- 技術授權許可

PROACTIVE CONSTRUCTION MANAEMENT SYSTEM

Overview

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.

Problem addressed

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.

Innovation

- 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).

Key Impact

- 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.

Proactive Construction Management System

Research Completion

31 October, 2014

Applications

- Construction Safety Management
- Logistics and supply chain management

Commercialisation opportunities

- Technology licensing

基於位置實時現場安全管理系統

簡介

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的危險，並發出主動警報，以避免意外發生。

解決方案

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。

創新技術

- 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。

主要成效

- 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。

基於位置實時現場安全管理系統

完成研究日期

2014年10月31日

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

Overview

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.

Problem addressed

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.

Innovation

- 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.

Key Impact

- 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.

Safety Belt Alarm System for Construction safety

Research Completion

14 Jun, 2014

Applications

- Construction safety

Patent Applications

- CN 2014 8007 8827.2
- HK 17108380.2

Commercialisation opportunities

- Technology licensing

安全帶警報系統

簡介

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。

解決方案

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。

創新技術

- 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。

主要成效

- 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

應用於工地安全的安全帶警報系統

完成研究日期

2014年6月14日

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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