Intelligent Robotics
智慧機器人

產品及產業化 Product And Industrialization

RCC 機器人單元系統
Robot Cell Controller (RCC) System

簡介 Introductions

RCC(Robot Cell Controller) 為用於機器人生產單元控制系統之單元控制器，可同時控制多種機器人並同步其動作，能以多機完成生產製造之任務，並且能接受影像、力量、振動與雷射感測器等等訊號，完成更智慧化與數位化之應用，更為下一階段的主流發展技術之一。

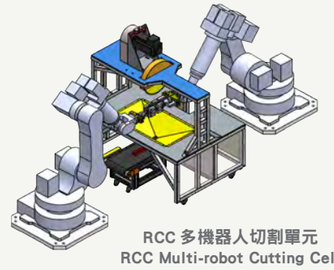
RCC (Robot Cell Controller) is a robot cell controller used in a robotic system which can control multiple robots simultaneously and synchronize their actions. It can complete manufacturing tasks with multiple machines, and can accept images, forces, vibrations and laser signals for more intelligent and digital applications. It is one of the mainstream technologies in next generation development.

特色與創新 Features and Innovations

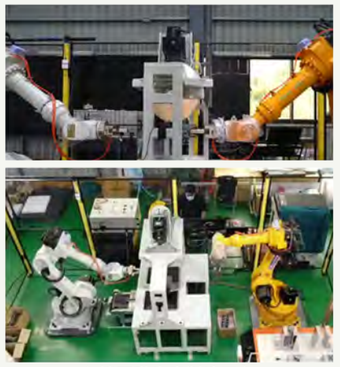
- 可同時控制多款機械手臂，支援國際上主流廠牌。
- 具備機器人同動同步技術，如讓雙手臂同時舉起重物。
- 具備機器人軌跡避障技術，可以讓運算出避障軌跡，避免路徑運動過程中發生碰撞。
- 具備可視化程式編輯系統，降低使用者操作難度。
- 支援影像、力量等外部感測處理，提供更智慧化的解決方案。
- 具備 3D 模擬功能與路徑生成，可離線進行軌跡編程。
- 機器人高精度提升技術，可提高受控手臂定位精度。
- It can control a variety of robots at the same time.
- With robot synchronizing technology.
- With the robot trajectory obstacle avoidance technology.
- With a visual program editing system.
- It supports external sensing.
- With 3D simulation function and path generation, trajectory programming can be performed offline.
- With robot's high-precision lifting technology.

應用與效益 Applications and Benefits

- 多機協作生產製造單元。
- Multi-robot collaborative manufacturing cell.



RCC 多機器人切割單元
RCC Multi-robot Cutting Cell



多機同動生產製造平台
Robotics Collaboration Platform

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噴漆機器人路徑規劃模擬系統

Path Planning and Simulation System of Spraying Robot

簡介 Introductions

噴塗產業大部分皆以人工為主，且噴塗工件少量多樣，路徑的變化隨著工件的不同而有所變異，因此難以實現噴塗系統自動化，而透過導入噴塗自動化模擬軟體路徑生成，以及模擬軟體專用之噴塗教導槍，可讓機器人可以針對不同形狀的工件進行噴塗加工，完成噴塗自動化之任務。

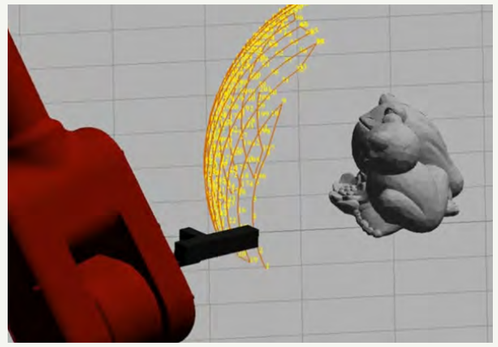
The spraying industry is based on manual work. Due to the small quantity and large variety of spraying workpieces per batch, it is difficult to automate or change the spraying path. By importing spraying automation simulation software for path generation and using spraying teaching guns, robots can overcome the challenges of varied shapes and complete the task of spraying automation..

特色與創新 Features and Innovations

- 3D 互動操作介面並可支援多種類型 3D 模型。
- 多種噴塗路徑生成方式設定。
- 快速進行場景建置並快速生成噴塗路徑。
- 工件曲面最佳噴塗距離設定與噴幅設定。
- 通訊整合各家機械手臂。
- 工件與機器人座標轉換。
- 機器人奇異點分析與極限分析。
- 3D interactive interface supporting a variety of models.
- Variety path generation methods.
- Fast to establish scenario and generate spraying path.
- Best spraying path analysis and range setting.
- Integrates communication protocol with a variety of robots.
- Workpiece and robot coordinate translation.
- Robot singularity and limit analysis.

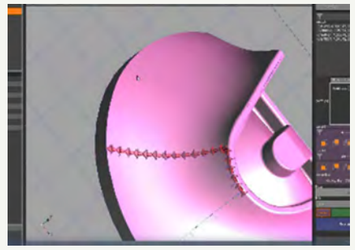
應用與效益 Applications and Benefits

- 噴塗自動化產業：相較傳統可縮短工件進行噴塗評估時程。
- Compared with traditional methods, it can shorten the spraying evaluation time of workpieces in the spraying automation industry.



噴漆自動化模擬軟體
Spraying Simulator

噴塗教導槍
Spraying Guiding Device



表面路徑生成
Surface Path Generation

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FOVision 智慧視覺模組

FOVision All In One Vision Module

簡介 Introductions

整合「機器視覺」、「智慧運算」、「主動式引導光源」於一體的機器人智慧視覺模組，小巧機身具備高靈活性，可搭配各廠牌機械手臂與加工機進行整合應用。不須複雜的編程，輕鬆導入視覺定位、上下料、導引加工到組裝工 序等，大幅提升工廠換線的速度及靈活性。

FOVision is an all-in-one robot vision module that integrates machine vision, intelligent computing, and active guide light sources into a compact and highly flexible form factor. It can be seamlessly integrated with a wide range of robotic arms and machining equipment from different brands, and enables easy implementation of various functions such as visual positioning, material handling, and assembly without the need for complex programming. FOVision greatly improves factory line changeover speed and flexibility.

特色與創新 Features and Innovations

- AI 自動化工具：全自動生成AI訓練資料庫，免人工標註。
- AI 視覺辨識導引機器人技術：以 AI 進行物件定位與識別，導引機器人自動化進行上下料與堆棧作業。
- 視覺快速換線：協助工廠快速換線辨識不同工件，免視覺工程師調校。
- AI automation tool: fully automatic generation of AI training database without manual annotation.
- AI visual recognition guided robot technology: uses AI to locate and recognize objects, guiding robots to perform automated loading and stacking operations.
- Rapid changeover: helps factories to quickly identify and recognize different workpieces without the need for visual engineers to make adjustments.

應用與效益 Applications and Benefits

- 機器人上下料（隨機取料、混料、加工機應用）、機器人堆棧（棧板、籠車）、機器人加工（除鏽、塗裝、 焊接）。
- 工廠快速換線、 彈性生產製造。
- Robotic loading and unloading for random and mixed parts, as well as machine applications; robotic palletizing for pallet and cage. handling; robotic processing for rust removal, painting, and welding.
- Quick line change and flexible manufacturing.

視覺系統
Vision System

機器人取料
Robotic Pick-and-place

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RoboTwin 元宇宙智慧工廠模擬平台

RoboTwin Metaverse Smart Factory Simulation Platform

簡介 Introductions

RoboTwin 元宇宙智慧工廠平台有別於數位雙生系統，除虛實整合外，更具備人的模擬功能。可透過 VR 裝置創造使用者沈浸感與真實感。本技術已與國際電機大廠合作，針對可生產電動用動力模組的馬達產線，透過 RoboTwin 平台技術串連 AI 與智慧製程，建立客戶專屬的元宇宙廠模擬系統，超前模擬與線上即時掌握產線狀態，降低不必要的成本與提升生產效率。

RoboTwin's Metaverse Smart Factory Platform offers more than a traditional digital twin system with its added ability to simulate human interaction and create a sense of immersion through the use of VR. Developed in collaboration with international electrical manufacturers, this platform enables advanced simulation and real-time monitoring of production lines; thereby, reducing costs and improving efficiency through AI and intelligent processes.

特色與創新 Features and Innovations

- 高擬真渲染技術：提供高真實度的外觀表現。
- 高擬真物理推算技術：提供高真實度動靜態的模擬。
- 虛實融合技術：串連虛擬與真實世界雙向訊號，進行回授控制與參數分析優化等。
- 沈浸式互動：提供沈浸式體驗，與虛擬端工廠進行互動。
- High-fidelity rendering technology: provides realistic visual appearance.
- High-fidelity physics-based simulation technology: provides realistic dynamic and static simulation.
- Hybrid technology: connects virtual and physical worlds through signal feedback for feedback control and parameter analysis optimization.
- Immersive interaction: provides an immersive experience through interactive engagement with the virtual factory.

應用與效益 Applications and Benefits

- 超前模擬：透過高擬真度的模擬器技術，事前規劃工廠產線佈建，降低導入失敗風險及成本。
- 遠程專家協助：透過本技術，遠端協助高複雜場域作業進行故障排除。
- 元宇宙教練：使用 VR 裝置於元宇宙中進行沈浸式設備與系統操作教育訓練。
- Advanced simulation: uses high-fidelity simulation technology to plan factory layout and reduces risks and costs of implementation.
- Remote expert assistance: enables remote experts to provide troubleshooting support for complex field operations.
- Metaverse coach: immersive equipment and system operation education and training conducted in the metaverse using VR devices.

實際工廠場景
Real Factory

虛擬工廠場景
Virtual Factory

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分散式派車管理系統

Decentralized Dispatch Management System

簡介 Introductions

傳統式派車管理系統容易發生壅塞的情形和擴充不同車型的困難。分散式派車管理系統以優化派車系統中的交管邏輯為主要技術，以利提升運載效率。

Traditional dispatch management systems are prone to congestion and face difficulties when expanding to different vehicle models. Decentralized dispatch management systems focus on optimizing traffic control to improve transportation efficiency.

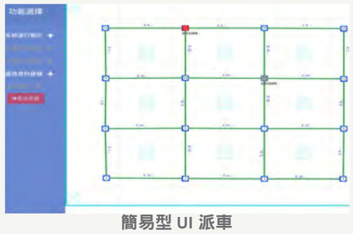
特色與創新 Features and Innovations

- 系統支持：派車管理系統支持 MES/ERP/WMS：常見的通信接口並定制與製造和物流管理系統。
- 趕車服務功能：若二車路徑終點相同時，會有趕車服務功能，當其中一台車依照任務派送順序到終點，另一台車要進入相同終點時，車間通訊後會將原先完成任務車輛趕走後，再進入終點。
- 派車系統穩定運行：此套派車管理系統已成功導入國內封測廠，並以 全天 24 小時穩定的運行。
- System Support: Dispatch management system supports MES/ERP/WMS: custom common communication interfaces are integrated with logistics management systems.
- Stable Operation of Dispatch System: The system has been successfully implemented in domestic testing factories and operates stably 24 hours a day.
- Rush Service Function:Rush service function is featured when two vehicles have the same destination.
- Via communication between the two vehicles, the first vehicle to arrive and complete the task delivery will be commanded to leave before the second vehicle approaches.

應用與效益 Applications and Benefits

- 多車路徑規劃、趕車服務等功能之派車管理系統，可應用於物流倉儲、自動化設備產業、運機械加工載產業。
- Multi-vehicle path planning and rush service function which can be applied to logistics and warehousing, automated equipment industry, and transportation machinery manufacturing industry.

分散式派車管理系統搬運彎管應用
Dispatch Management System Handling Pipe Bending Machine Application



簡易型 UI 派車
Simple UI Dispatch Management System

監控 AGV 狀況
Monitoring of AGV Status

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免模具摺邊工具與機器人核心軟體

Mold-free Roller Hemming Tool and SmithOS

簡介 Introductions

傳統汽車鈑金摺邊製程仍需承靠大型客製化模具，而現今機器人摺邊應用多仰賴經驗俱足的師傅費時教導成千點群以生成機器人路徑、鈑金品質亦需長時間試誤找出成型參數。免模具摺邊工具與機器人核心軟體可降低機器人摺邊應用技術門檻並有效降低成本，同時實現少量多樣彈性生產，以滿足現今市場多變之需求。

Traditional automotive sheet metal hemming process needs to rely on large custom molds, and today's robotic folding applications rely on experienced masters to teach thousands of points to generate robot paths, as sheet metal quality also requires a long trial and error to find out the molding parameters. The mold-free bending tool and robot core system, SmithOS, has been developed to lower the technical threshold of robot bending applications and effectively reduces costs, while achieving flexible production to meet the changing needs of today's market.

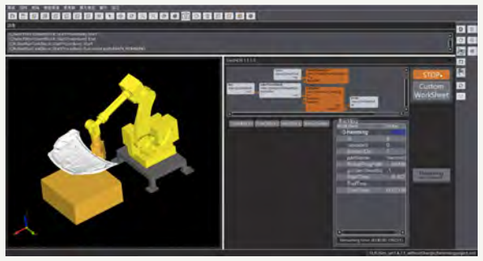
特色與創新 Features and Innovations

- 免模具摺邊工具，調控正向力 300-3000N，摺邊角 0° 到 60°，尺寸：226 x 246 x 456.5 m^3。
- 機器人核心系統 SmithOS，On-line 工單介面與製程參數調控(機器人速度、摺邊力量、摺邊角)；可整合視覺、雷射、力量各感測器。
- Mold-free roller hemming tool features a force control range of 300-3000N with an adjustable hemming angle of 0°-60° and dimension of 226 x 246 x 456.5 m^3.
- Robot core system, SmithOS, features user-friendly interface for the online modification of process parameters (velocity, hemming force and hemming angle), and supports vision, laser and force sensors.

應用與效益 Applications and Benefits

- 汽車鈑金產業，省去模具製造成本與時間。
- Saves cost and time in the roller hemming process of the automotive industry.

免模具摺邊工具
Mold-free Roller Hemming Tool



機器人核心系統
SmithOS

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SmithOS：機器人單元的核心軟體

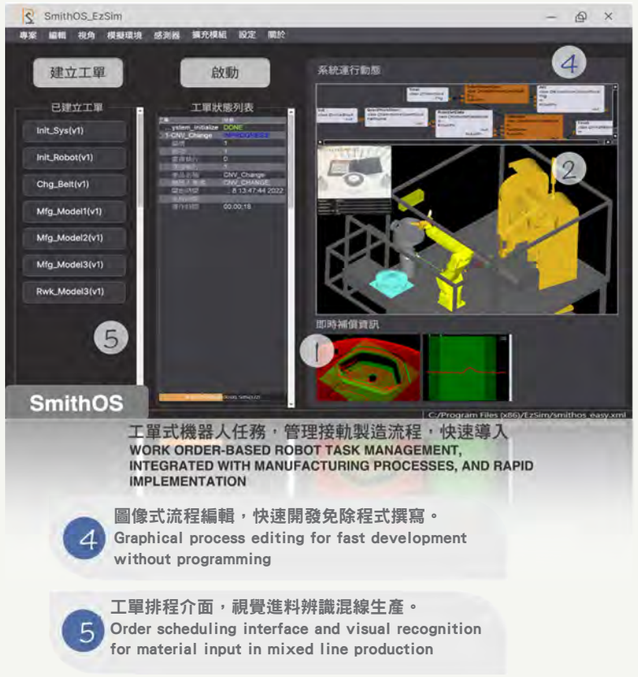
SmithOS: Robot Workcell Operating System

簡介 Introductions

SmithOS 為一套適用於跨品牌工業機器人單元的即時核心控制軟體，具備生產工單排程介面、製程參數調整介面、機器人即時通訊控制層 (Robot Communication Layer, RCL)、感測器通訊層 (Hardware Abstraction Layer, HAL) 與多執行緒迭代流程控制。

SmithOS is a real-time core control software compatible with multiple industrial robot brands. It features a production work order scheduling interface, a process parameter adjustment interface, a Robot Communication Layer (RCL) for real-time robot communication control, a Hardware Abstraction Layer (HAL) for sensor communication, and multi-threaded iterative process control.

特色與創新 Features and Innovations



整合關鍵感測資訊精準調控製程參數
INTEGRATING KEY SENSOR INFORMATION FOR PRECISE CONTROL OF PROCESS PARAMETERS

1 支援視覺、力量、雷射感測器，精確掌握製程變異。 Supports laser, force, and 3D vision sensors

2 機器人路徑即時迭代補償，確保生產品質穩定。 Applies iterative process algorithms to maintain production quality

3 製程參數設定介面，關鍵參數快速修改。 Process parameter adjustment interface for quick modification of key parameters

製程參數調整頁面
PROCESS PARAMETER ADJUSTMENT PAGE

應用與效益 Applications and Benefits

- 應用：金屬加工、物流撿貨。
- Metal processing and warehouse goods picking.

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