City University of Hong Kong

Bright Future Engineering Talent Hub – Student Project Exhibition 2023

Featured Project Details

Department	Project Title	Project Description
Department of Systems Engineering 系統工程學系	Structural Digital Twin of Composite Aircraft for Damage Diagnosis 基於航空複合材料飛機數字孿生體的損傷檢測	The damage mechanism in aerospace composites is complex due to its intrinsic anisotropic and multilayer properties. This project proposed a damage diagnostic method that leverages the establishment of a structural digital twin of the composite aircraft component. With the large amount of the virtual sensor data generated from the structural digital twin as well as the experiment data, a generalizable data-driven model was built which can successfully identify the damage in the aircraft composite structures. 由於其固有的各向異性和多層特性，航空複合材料的損傷形式非常複雜。這個項目提出了一個基於航空複合材料飛機結構孿生體的損傷診斷方法。利用從結構孿生體產生的虛擬傳感器數據，加上實驗數據，建立了一個具有普適性的數據驅動模型來識別航空複合材料結構的損傷。
Department of Architecture and Civil Engineering 建築學及土木工程學系	Urban Puzzle 城市拼圖	Urban Puzzle is an interactive game for envisioning scenarios of urban development whilst getting acquainted with the GBA's urban morphological patterns. The project presents a structuralist approach to analyzing the role of infrastructure in the physical definition of a grand chessboard. Located in the Southern part of the Chinese coastal area, the GBA is the largest urbanized area in the

		world. In the last four decades, the region underwent a fast urbanization process, reaching a population of about 100 million people spatially organized on a stratified network of connections, which are geographically articulated, culturally embedded, economically levered, socially sustained, and environmentally symbiotic. The project offers the opportunity of disentangling this interconnected set of interwoven linkages for the infinite recombination of the territorial elements. "城市拼圖"是一個用於展望城市發展，同時熟悉大灣區的城市形態的互動遊戲。該項目採用一種結構主義的方法來分析基礎設施在"大棋盤"中的角色。大灣區位於中國沿海地區南部，是全球最大的城市化地區。在過去的四十年，該地區經歷了快速的城市化進程，人口達到了約一億人。他們在空間上組織了一個多層次的聯繫網絡，該網絡在地理上清晰可辨，文化上根深蒂固，經濟上相互作用，社會上可持續發展，環境上互惠共生。該項目提供了一個可以讓我們解開這相互交織關係的機會，以便對區域中不同要素進行無限的重新組合。
Department of Biomedical Engineering 生物醫學工程學系	Haptic Feedback Technologies in Flexible Microsystems for Human-machine Interfacing 柔性觸覺反饋人機交互	Human-machine interfaces (HMIs) enable the realization of the interactions between users and robotics. Conventional HMIs are based on bulky, rigid, and expensive machines that mainly focus on robots/machines control and lack of adequate feedback to users. Therefore, it limited the applications for conducting complicated tasks. We developed a thin, soft, skin-like electronic device that allows adequate adhesion to the skin, by cooperating

| | | pressure sensors of the robot. When the robotic arm contact with other objects, users can get haptic feedback, like the a feeling of touch from our devices. It has greatly improved the applicability of the HMI system in different scenarios.

人機交互系統能夠讓使用者和機器進行更好的互動。傳統的人機交互系統依賴笨重、昂貴且不可彎曲的器件，只專注於對機器的控制，而缺少由機器回傳給使用者的反饋，因而限制了機器以及人機交互系統在一些複雜任務中的應用。

有見及此，我們開發了一個輕薄，柔軟且可緊貼使用者皮膚的柔性電子裝置。當機器上的壓力傳感器觸碰到物體並檢測到壓力時，壓力信號會回傳給操作者皮膚上的柔性電子器件，經由我們開發的柔性電子器件，給操作者帶來與機器所檢測到的相同觸覺感受，從而大大改善了機器以及人機交互系統在不同情景下的適用性。 |
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| Department of Computer Science

電腦科學系 | AI in Computer Science

電腦科學中的 AI | This featured project showcases AI research projects in Computer Science. AI Captions - the AI looks at an image and generates sentences to describe the contents. AI Artist - the AI takes an image and paints it in a different artistic style.

此特色項目展示了電腦科學的人工智能研究項目。 AI 字幕 - AI 查看圖像並生成描述內容的句子。 AI 藝術家 - 人工智能會拍攝一幅圖像，並以不同的藝術風格進行繪畫。 |
| Department of Electrical Engineering | Invisibility and Supervisibility with Electromagnetic | By tuning the shape, material and metallic patterning of surfaces, one can control their response to incoming light and |

電機工程學系	Metasurfaces 用電磁"超表面"實現隱形和顯影	electromagnetic waves. This can lead to surfaces that hide objects from radars and from the naked eye. Properly tuned metasurfaces may also lead to increased visibility, making objects easier to detect. Besides radar and visual applications, metasurfaces can find many applications in communication and imaging. This project will introduce the topics of metasurface and scientific invisibility to the public using a simple demonstration of hiding from a radar. 透過設計表面的形狀、物料和金屬的分佈，我們可以控制它們如何反射可見光和電磁波，從而把物件從雷達和肉眼下隱藏起來，實現"隱形"效果。經過適當設計的超結構表面（簡稱"超表面"）也能提高物體的可見度，為偵測帶來便利。除了雷達和可見物體的隱形與顯影外，超表面也能在通訊和成像系統上廣泛應用。本項目將透過躲避雷達的示範向大家介紹超表面和其應用場景。
Department of Mechanical Engineering 機械工程學系	A Powerful Nanogenerator with Ultrahigh Power Density 具有超高功率密度的納米發電機	The new powerful nanogenerator that CityU invents can power 40 W bulbs and 180 W lamps only actuated by hand, foot or vibrating structure. This new invention not only sets a record of the high-power output of similar nanogenerators but also paves a new avenue for using nanogenerators to power a wide range of commercial electrical appliances in the real-world applications. 城大發明的新型強大納米發電機可以為 40 W 燈泡和 180 W 燈供電，只要通過手、腳或其他振動結構便可以啟動。這項新發明不僅創造了同類納米發電機的高功率輸出紀錄，而且為實際應用納米

		發電機的各種商用電器提供動力，開闢了一條新途徑。
Department of Materials Science and Engineering 材料科學及工程學系	New Generation Flexible Solar Cells 新型柔性太陽能電池	The project presents a new generation of solar cell technology based on printable materials. These solar cells offer new form factors, such as flexibility, semi-transparent, and color-tunability, and they are particularly suitable for building integrated photovoltaic applications 項目將展示一種由可印刷材料製成的新一代太陽能電池技術，電池更具備柔性、半透明和顏色可調性等特性，適合光伏建築一體化方面的應用。