跨域實作 Open LABs

文稿整理／林珮雯

本校創創工坊於 112 年 1 月 9 日至 1 月 13 日辦理「Open LABs！續。旭。不休」跨域實作年度成果展，分為「科技智慧永續」、「文化文明永續」和「生命健康永續」3 大主題。本院一共有 7 堂實作課程參與並展出 17 件精采作品，透過豐沛的跨域成果讓每一個師生，不只是在課程中展現優秀作品，也希望打開教室的大門分享給全校師生，達到「全校共享共創」的目標。

當無人機遇見 AI－自動無人機飛航展示

課程名稱：無人機自動飛航與電腦視覺概論
師資：陳冠文

課程以實驗課實作的方式，由課程提供可程式取像、操控的無人機 (DJI Tello EDU)，並教授所需之電腦視覺技術，學生於期末完成無人機自動飛航的目標，並透過此實作課程，加深對電腦視覺的學習動力。

貪食蛇

課程名稱：數位電路實驗
師資：范倫達
作者：朱亭霖、陳郁安、楊永琪

同學結合課程中的內容將貪食蛇透過 FPGA 及 VGA 實現出來，將 FGPA 開發板上的操控按鈕與開關跟遊戲中的蛇作連結，並設定不同的難度以及對場景的設計，把貪食蛇成功的實現在硬體上。

俄羅斯方塊

課程名稱：數位電路實驗
師資：范倫達
作者：侯博軒、賴御安、官霆軒、黃彥傑

我們透過結合 FPGA 以及 VGA 把 Tetris 的特色實現。從最基本的 Tetris 邏輯 (移動旋轉方塊、方塊堆疊以及消除) 到方塊的顯示、計時計分板，再到 T 轉等等進階的功能，先透過課程中學到的介面一一將這些功能做測試，再轉到 VGA 螢幕上實現出來。此外，過程裡的每個步驟都包含著時脈的處理、與 FPGA 功能的連接、邏輯的設計以及圖片的雕琢。經過這些步驟才能將最終的成品呈現在大家眼前。

皮卡丘打排球

課程名稱：數位電路實驗
師資：范倫達
作者：鄭鈞瀚、張博凱、羅民棋、黃柏竣

同學使用 FPGA 以及 VGA 把皮卡丘打排球復刻出來。透過對每個 pixel 進行更改，使這次的畫面更加精緻，並且在經過同學集思廣益之後，為遊戲添加了許多功能，例如增加障礙、增加風

阻或是讓對手狂暴化，讓遊戲可玩性增加了很多。

The Dying Walker

課程名稱：XR 跨域專題
師資：莊榮宏 謝啟民 張宏宇 王銓彰
作者：任軒、陳鈺祥、黃靖芳、楊舒云

《The Dying Walker》是一部 VR360 的沉浸式影片，講述了身在科技革新的時代，藉由主角無節制地追尋發財夢，而忘記關心眼前正在發生的事，點出世人在科技的輔助下會有一切唾手可得的幻覺，容易讓生活重心失衡，成為沒有靈魂的「Dying Walker」。

樂光 Music Across Time

課程名稱：XR 跨域專題
師資：莊榮宏 謝啟民 張宏宇 王銓彰
作者：巫廷翰、徐培欽、艾奎華、楊舒云

《樂光 Music Across Time》運用 VR 技術重新詮釋德布西《月光》，並追溯回當時德布西在創作此曲時的靈感詩集 Paul Verlaine, Fêtes galantes《Clair de Lune》，以此詩構築虛擬世界。

Mission: Vegetable

課程名稱：XR 跨域專題
師資：莊榮宏 謝啟民 張宏宇 王銓彰
作者：巫廷翰、徐培欽、艾奎華、楊舒云

2050 年，蔬菜有了自我意識。一顆即將被吃的蔬菜，發送訊號到蔬菜星，蔬菜星不僅發現同族遭受迫害，還得知地球的居住條件有利蔬菜星人發展，因此蔬菜星人便派出特務並給予改造地球上三大資源的指令為了移民做準備。

歡樂星情天 Happy Sunday

課程名稱：XR 跨域專題
師資：莊榮宏 謝啟民 張宏宇 王銓彰
作者：王語新、黃靖芳、洪煥璋、陳鈺祥

有一個很喜歡星空的台灣小男孩向父母表達了想看到星空的願望，父母說：「只要你認識了足夠多的星座，我們就去山上觀星吧！」。某天，小男孩的房間出現了一支望遠鏡，透過望遠鏡，小男孩認識了不同季節的星座，而他的父母也履行約定全家到山上觀星。

鯨魚之歌 Whale Requiem

課程名稱：XR 跨域專題
師資：莊榮宏 謝啟民 張宏宇 王銓彰
作者：任軒、洪煥璋、黃靖芳、王語新

『鯨魚之歌』為 VR 360 的互動詩作，基於白靈的『鯨魚之歌 - 記一九九八年十月 330 頭鯨魚在南半球沙灘擱淺一事』詩作來創作，重現詩所構成的富有想象的意境，並傳遞尊重自然、減少人為干預的環保意識。

畢業大作戰

Gradute Run

課程名稱：3D Game Programming
師資：黃世強
作者：柏叡、蘇柏凱、廖云翔

我們身為一名研究生，我們必須在被迫退學前，想辦法儘快完成學業、論文、口試、計畫、以及程式檢定，並且在這趟學習路程上，需要不斷充實自己。一旦兩年的時間一到，我們要面臨的是畢業前最後的考驗，將前面學習到的知識，轉換為攻擊，利用累積的實力，擊敗最後的大魔王，成功取得畢業證書。

逃離詛咒洞窟

Escape from the cursed cave

課程名稱：3D Game Programming
師資：黃世強
作者：陳姿羽、趙昱婷

主角來到傳說中洞窟探險，主角除了要探索未知的道路，還要躲避怪物的攻擊才能存活。玩家可以使用「WSAD」四個鍵進行前後左右的移動，並以「SHIFT」、「SPACE」鍵進行蹲下和跳躍。利用畫面中央的「十字架」形瞄準儀蒐集寶物。瞄準到怪物時可以使用「E」鍵進行射擊。當玩家蒐集完地圖中所有寶物後，抵達終點位置即可過關，血量歸零時遊戲結束。

尋覓之森

The wizard of Oz

課程名稱：3D Game Programming
師資：黃世強
作者：葉晨、成文瑄

『每個人都在這片森林中尋尋覓覓，尋找的是他們想要的，還是他們忘記的？』傳說中，只要在這座森林裡找到三把鑰匙，就能夠見到傳說中的大魔法師，實現你所有的願望。

貢丸騎士

Meatball Rider

課程名稱：互動設計與虛擬實境
師資：詹力韋
作者：黃彥鈞，吳岱容，周君睿，朱家瑤

我們利用瑜珈球來模擬在 VR 中騎乘貢丸的感覺，以不同的彈跳力道與頭部的擺動，作為我們 locomotion 的移動方式，控制貢丸的前進、跳躍與轉換跑道。並加入震動來模擬貢丸跑到不同介面時之變化，以讓使用者能有更好的體驗。玩家需在時間內盡可能的搜集道具並閃避障礙物，達到終點以解鎖快樂結局。

阿拉丁

Aladdin

課程名稱：互動設計與虛擬實境
師資：詹力韋
作者：葉晨，蘇敬堯，黃得誠，巫廷翰

我們希望透過 VR 技術，在虛擬世界中解放因疫情無法獲得自由的靈魂。故事靈感來自於知名童話故事《阿拉丁》，玩家將搭乘飛行魔毯，並跟著神燈精靈到處旅行。我們期望透過實際的物體去模擬在 VR 世界中的飛行體驗，並且透過外部的電器設備進行一個沉浸式的環境建置。

黑森林魔法音樂冒險

Music Birds

課程名稱：互動設計與虛擬實境
師資：詹力韋
作者：許銘耘，成文瑄，戴琬庭，張瑋

魔法黑森林中有一個討厭音樂的黑影，所以居民都會透過音樂趕走黑影。但是有天家中的鋼琴不見了，結果妹妹被黑影帶走，哥哥就踏上了拯救妹妹的旅程。過程需要透過彈琴與三色鳥 - 紅鳥、藍鳥、綠鳥合作打敗黑影。操作上的主要特色是透過操控 controller 彈奏鋼琴或使用 MIDI 電子琴實際彈奏，敘事中的動畫與音效也經過精細安排與設計讓整體互動感提升。

CoachBox：羽球擊球動作評測系統

CoachBox:Badminton hitting action analyzation syst
課程名稱：CoachBox：羽球擊球動作評測系統
師資：易志偉
作者：蕭少柏、劉柏宇、邱輝傑

CoachBox 是一個隨身攜帶電腦視覺方案，且無需穿戴式設備更不需要透過雲服務。其核心技術為透過羽球對戰事件偵測，找出擊球瞬間及擊球前後的關鍵動作進行分析及檢測，其中使用羽球定位、追蹤模型 (TrackNetV2) 及人體姿態模型，透過影像動作回放與影片註解，使教練和學員能輕易了解其訓練重點及控球能力，作為有效溝通的介面。

魔鏡瑜珈

課程名稱：嵌入式系統設計概論與實作
師資：曾煜棋 吳昆儒
作者：張機智、謝承恩、許承壹

電腦視覺有各式各樣的應用，如要與運動健身做結合，可使用姿態識別的技術來分析動作。此作品利用攝影機觀察人體的姿態活動，並自動判斷所做的運動項目為何。在後防疫時期裡，當使用者於室內環境進行運動時，可利用此系統觀看肢體的活動角度。

更多介紹 https://ict-openlabs-2023.act.nycu.edu.tw/

Interdisciplinary Exhibition Open LABs

On January 9th to 13th in 2023, the Innovative Creative Technology (ICT) Center of NYCU held Open Labs Annual Exhibition. This interdisciplinary practical exhibition was categorized into three themes: "Technology and Intelligence for Sustainability", "Culture and Civilization for Sustainability", and "Life and Health for Sustainability". A total of seven practical courses from our institute participated and exhibited 17 excellent projects. Through this exhibition, we aimed to showcase outstanding works in class to all professors and students in the school through sharing this creation and accomplishment.

Project: AI & Drone Collaboration
Course Title: Introduction to Drone and Computer Vision
Advisor: Dr. Kuan-Wen Chen

This is a laboratory course. Students will learn about the necessary computer vision techniques through practical experiments. The course provides programmable and controllable DJI Tello EDU drones, and through hands-on instruction, students will be able to achieve the goal of autonomous UAV flight by the end of the semester. This practical course aims to deepen students' motivation to learn computer vision.

Project: Snake
Course Title: Digital Circuit Laboratory
Advisor: Dr. Lan-Da Van
Students: Ting-Lin Chu, Yu-An Chen, Yong-Chi Yang

In this project, students apply the knowledge acquired in class implement the classic game "Snake" through FPGA and VGA technology. By connecting the control buttons and switches on the FPGA development board with the snake in the game, students design various difficulty levels and game scenes to successfully implement "Snake" in hardware. The authors of this project are Ting-Lin Chu, , Yu-An Chen, and Yong-Chi Yang

Project: Tetris
Course Title: Digital Circuit Laboratory
Advisor: Dr. Lan-Da Van
Students: Bo-Syuan Hou, Lai Yu-An, Guan, Ting-Shiuan, Yen-Chieh Huang,

In this project, we combined FPGA and VGA technology to implement the classic game 'Tetris.' We started by incorporating the fundamental logic of Tetris, including block movement, rotation, block stacking, elimination, as well as displaying blocks, timing, and scorekeeping. Additionally, we incorporated more advanced features such as the T-spin. Also, we systematically tested each of these features individually using the interface learned in class before implementing them on the VGA screen. This project involved processing clock rates, connecting with FPGA functionality, logic design, and image refinement. Throughout this process, we took careful steps to ensure the presentation of the final project to everyone.

Project: Pikachu Playing Volleyball
Course Title: Digital Circuit Laboratory
Student: Chun-Han Cheng, Po-Kai Chang, Ming-Chi Ro, Bo-Jun Huang

In this project, students utilized FPGA and VGA technology to recreate the game 'Pikachu Volleyball.' They achieved improved visual quality by meticulously modifying each pixel. Through collaborative brainstorming sessions, they incorporated numerous features into the game, including obstacles, wind resistance, and the ability to make opponents go berserk. These additions significantly enhanced the overall playability of the game."

Course: XR Cross-domain Project
Project: The Dying Walker
Advisors: Dr. Jung-Hong Chuang, Dr. Chi-Min Hsieh, Dr. Hong Yu Chang, Dr. Chuan-Chang Wang
Student: Hsuan Jen, Yu Hsiang Chen, Ching-Fang Huang, Shu-Yun Yang

The Dying Walker" is an immersive VR360 film that explores the consequences of living in an era of technological revolution. The protagonist's relentless pursuit of wealth leads to negative consequences due to neglecting his present life. The film highlights how technology can create illusions of everything, potentially causing an unbalanced life. It suggests that individuals with technology addiction may become soulless "Dying Walkers.

Course: XR Cross-domain Project
Project: Music Across Time
Advisors: Dr. Jung-Hong Chuang, Dr. Chi-Min Hsieh, Dr. Hong Yu Chang, Dr. Chuan-Chang Wang
Student:, Ting-Han Wu, Pei-Chin, Hsu, Kuei-Hua Ai, Shu-Yun Yang

Music Across Time" utilizes VR technology to reinterpret Claude Debussy's "Clair de Lune" and traces back to the inspiration found in the poem collection "Paul Verlaine, Fêtes galantes," from which Debussy drew when composing the piece. The virtual world is constructed based on the poem.

Course: XR Cross-domain Project
Project: Vegetable
Advisors: Jung-Hong Chuang, Chi-Min Hsieh, Hong Yu Chang, Chuan-Chang Wang
Student: Ting-Han Wu, Pei-Chin, Hsu, Kuei-Hua Ai, Shu-Yun Yang

In the year 2050, vegetables suddenly gained consciousness. A vegetable, about to be eaten, sends a signal to Veggie Planet, where they not only discover their fellow vegetables being persecuted but also learn about the favorable living conditions for Veggie Planet inhabitants on Earth. Consequently, Veggie Planet dispatches a special agent and provides instructions to modify Earth's three major resources in preparation for migration."

Course: XR Cross-domain Project
Project: Happy Sunday
Advisors: Jung-Hong Chuang, Chi-Min Hsieh, Huang-Chang Hung, Chuan-Chang Wang
Student: Yu-Hsin Wang, Ching-Fang Huang, HUNG, HUAN-CHANG, Yu-Hsiang Chen

In this project, a Taiwanese boy who loves the stars expresses his wish to see them to his parents. His parents responded and said, "we will go stargazing on the mountain as long as you have enough knowledge about constellations." One day, a telescope appears in the boy's room. Through the telescope, the boy learns about constellations in different seasons, and his parents fulfill their promise by taking the whole family to go stargazing on the mountain

Course: XR Cross-domain Project
Project: Whale Requiem
Advisors: Dr. Jung-Hong Chuang, Dr. Chi-Min Hsieh, Dr. Hong Yu Chang, Dr. Chuan-Chang Wang
Student: Hsuan Jen, Huang-Chang Hung, Ching-Fang Huang, Yu-Hsin Wang

The Song of Whales" is an interactive poem in VR 360, based on Bai Ling's poem "The Song of Whales - Remembering the Stranding of 330 Whales on a Southern Hemisphere Beach in October 1998." The piece faithfully captures the rich imaginative atmosphere of the poem and conveys an awareness of environmental protection that respects nature by minimizing human activities

Course: 3D Game Programming
Project: Graduate Run
Advisors: Dr. Sai-Keung Wong
Student: Jui Po, Po-Kai Su, Yun-Ling Liao

As graduate students, we must find ways to efficiently complete our studies, which include finishing the thesis process, oral defense, projects, and programming tests before the risk of expulsion arises. Throughout this journey, we need to continually enhance our abilities. Once the two-year period is over, we will confront the final test, leading to graduation. We will utilize the knowledge we have acquired to confront and overcome the final boss-graduation certificate. "Graduate Run" is a game that symbolizes this journey.

Course: 3D Game Programming
Project: Escape from the cursed cave
Advisor: Dr. Sai-Keung Wong
Student: Tzu-Yu Chen, Chao Yu-Ting

The protagonist embarks on a legendary cave exploration, not only to discover unknown paths but also to evade monster attacks in order to survive. Players can use the "WASD" keys to move forward, backward, left, and right, while the "SHIFT" and "SPACE" keys allow them to crouch and jump respectively. By utilizing the crosshair at the center of the screen, players can collect treasures. To combat monsters, players can aim at them and use the "E" key to shoot. The game is completed when the player collects all the treasures on the map. The game ends when the player's health reaches zero.

Course: 3D Game Programming
Project: The Wizard of Oz
Advisor: Dr.Sai-Keung Wong
Student: Chen Yeh, Wen-Hsuan Cheng

"Everyone is searching in this forest. Are they searching for what they want or what they have forgotten?" According to legend, if one can find three keys in this forest, they will be able to meet the legendary mage and have all their wishes come true.

Course: Interaction design and virtual reality
Project: Meatball Rider
Advisor: Dr. Li-Wei Chan
Students: Yan-Jun Huang, Dai-Rong Wu, Jun-Rui Zhou, Zhu Jia-Yao

We used yoga balls to simulate the sensation of riding on Gong-Wan (meatball) in VR. The varying bouncing forces and head movements serve as our locomotion method to control the meatball's movement, including jumping and lane switching. Additionally, we incorporated vibrations to simulate interface changes when the meatball encounters different obstacles, aiming to provide an enhanced user experience. Players must collect items and navigate around obstacles within a time limit to reach the end and

unlock a joyful game ending."

Course: Interaction design and virtual reality
Project: Aladdin
Advisor: Dr. Li-Wei Chan
Students:, Chen Yeh, Su Jing-Yao , De-Cheng Huang, Ting-Han Wu

Through VR technology, our goal is to provide an escape for individuals whose freedom has been restricted by the pandemic, allowing them to experience liberation in the virtual world. The story draws inspiration from the renowned fairy tale "Aladdin." Players will embark on a journey riding a flying magic carpet alongside Genie. Our objective is to replicate the sensation of flying in VR by incorporating physical objects and create an immersive environment through the use of external electronic devices.

Course: Interaction design and virtual reality
Project: Aladdin
Advisor: Dr. Li-Wei Chan
Students: Ming Yun Hsu, Wen-Hsuan Cheng, Wan-Ting Dai, Wei Chang

In the magic forest, there is a malevolent black shadow that despises music, and the forest residents employ music to ward it off. However, one fateful day, the piano in the protagonist's house vanishes. As a result, his sister being abducted by the black shadow. Determined to rescue his sister, the protagonist embarks on a journey wherein he must play the piano and collaborate with three colored birds - red, blue, and green - to conquer the black shadow. The primary gameplay mechanic involves playing the piano using either a controller or a MIDI electronic piano. Careful attention has been given to the animation and sound effects in the narrative, aiming to enhance the overall sense of interactivity.

Course: CoachBox: Badminton hitting action analyzation system
Advisor: Dr. Chih-Wei Yi
Students: Hsiao-Shao Po, Po-Yu Liu, Hui-Chieh Chiu

CoachBox is a portable computer vision solution that eliminates the need for wearable devices or cloud services. Its core technology revolves around detecting events in badminton matches, enabling the identification of key movements during strokes, as well as before and after them. This is achieved through badminton localization, a tracking model (TrackNetV2), and a human pose model. By utilizing video playback and annotation as an effective communication interface, coaches and students can readily comprehend the training focus and improve their ball control ability.

Course: Introduction to Embedded Systems Design and Implementation
Project: Mirror Yoga
Advisors: Dr. Yu-Chee Tseng, Dr. Kun-Ru Wu
Students: Chi-Chih Chang, Cheng-En Hsieh, Cheng-Yi Xu

Computer vision finds numerous applications, and when combined with sports and fitness, it can facilitate posture recognition and movement analysis. This project employs a camera to observe the user's posture, automatically identifying the type of exercise being performed. Particularly during the pandemic, when users engage in indoor exercises, this system serves as a valuable tool for monitoring their body movements

Please find out more: https://ict-openlabs-2023.act.nycu.edu.tw/