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Innovation x Application 2017

Research Support Unit, Vocational Training Council

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Innovation × Application

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Innovation x Application Scheme

創意 x 應用大專學生獎勵計劃

Supported by the Hong Kong Industrialists Council Foundation, the Innovation x Application Scheme serves as a recognition to students' outstanding and innovative projects. The Scheme provides financial assistance for students to further develop their innovative ideas/projects into tangible outcomes and to solve practical problems encountered by different industries or community.

In AY2016/2017, nine innovative projects were awarded three Gold Prizes and six Silver Prize Awards, and received HK\$120,000 as start-up money for implementing their proposals.

創意 x 應用大專學生獎勵計劃由香港青年工業家協會鼎力支持，旨在甄選學生研發的傑出創意項目，然後提供財政支援，將學生的理念及項目，轉化為實質科研成果或解決方案。

在 2016/2017 學年，共有 9 個創意項目獲頒 3 個金獎、6 個銀獎，並獲港幣 12 萬元初創資金，協助項目啟動。

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01

Process Design for Hoist Wire Rope Measurement and Adjustment



GOLD PRIZE AWARD

A rubber tyred gantry crane (RTGC) is a mobile gantry crane that is used by Hongkong International Terminals Limited (HIT). The crane has eight wheels and four gearboxes that operate on four of the wheels. The RTGC has a trolley on top, which moves a spreader to different lines to pick up or set down containers. The spreader hangs on the trolley by a wire rope, which is attached to a wire drum. On top of the trolley, there is an engine room to provide energy for moving the wire drum.

A semi-automated system is used to measure whether the spreaders are flat or need adjusting. If the spreader is not adjusted for a long time, the wire rope lengthens and twists; it then cannot set the containers down smoothly, and accidents may happen. The aim of this project is to design a quick method for measuring and adjusting the wire rope in a semi-automated RTGC.

The designed method requires just 30 minutes to finish measuring and adjusting the wire rope. As this method does not require control adjustment afterwards, the total time required is two hours per month for each RTGC. This method reduces the time required for Land Accuracy adjustment by around 60%.

Innovator:

TSANG Yiu Wing

Higher Diploma in Mechanical Engineering
Hong Kong Institute of Vocational Education (Lee Wai Lee)

設計快速量度及調教鋼絲繩的方法



金獎

輪胎式龍門架吊機 (RTGC) 是用於香港國際貨櫃碼頭的流動龍門架吊機，4 副車輪共配備 8 條輪胎和 4 個變速箱，吊機頂部設有滑輪起重小車，負責將移動吊具移至不同線路，以此吊起或放下貨櫃。起重小車以固定於線鼓的鋼索連結吊具，頂部並設有機房，為驅動線鼓提供動能。

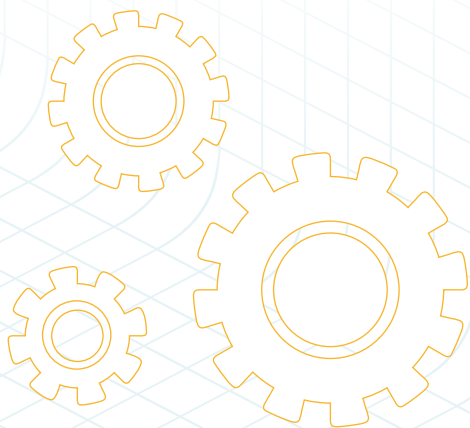
工作人員經常需以半自動系統衡量吊具，判斷其是否平坦抑或需要修正，一旦吊具長期未經修正，鋼索便會延長並纏繞，繼而影響卸貨順暢甚至引發事故。本項目正是針對這個弊端，為半自動 RTGC 設計出一套能快速測量並修正鋼索的方法。

按照設計所用的方法，工人只需 30 分鐘便能完成整個測量並修正鋼索的流程，而且事後無需控制修正，使得每部 RTGC 每月用於測量及修正的時間縮短至 2 小時，而為修正陸上精確度所需的時間也縮短 60%。

研發學生：

曾耀榮

機械工程學高級文憑
香港專業教育學院 (李惠利)



02

Swift2Android



GOLD PRIZE AWARD

At present, there are two main mobile platforms in the world, iOS and Android. These platforms have multitudinous resistances, so that no code can compile data from the two platforms simultaneously. Therefore, to satisfy their various clients, programmers have to set codes twice for the two distinct platforms. The programmers often have to decide which platform to develop first, and researching the best option often requires a great deal of time or human resources. The main languages for building on the iOS platform are Swift and ObjectiveC, but the main language for building on the Android platform is Java. Java and Swift (or ObjectiveC) have different coding formats, and thus developing code for the two platforms is generally considered to be highly inconvenient.

This project aims to develop a compiler that can input a piece of code to change computer programmes into machine languages. This compiler can input the Swift language to compile into Android Studio, and then run in that environment. The Swift2Android can convert basic Swift code to Java in terms of basic class structure, variable declaration, or if-else options. After this operation, Swift2Android can compile the generated source code to the Android code.

Innovator:

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HO Ying Wai Jeffrey
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利用源對源編譯器實現 Swift 語言 開發安卓軟件



金獎

目前全球普遍使用的流動平台主要分為 iOS 和安卓兩種，兩個平台之間互不兼容，以至無人能利用同一套編碼同時支援兩個平台。為了滿足不同的客戶，編程人員必須撰寫兩套截然不同的編碼，而且更要決定優先開發哪套編碼。在研究並決如何取捨的過程中，往往耗費了大量的時間和人力資源。iOS 平台的主要編程語言是 Swift 和 ObjectiveC，而安卓平台的主要語言卻是 Java。Java 與 Swift（或是 ObjectiveC）的編碼格式各自不同，因此業內人士普遍認為，為兩個平台各自開發編碼極度不便。

本項目旨在開發一套編譯器，輸入編碼後便可把電腦程式轉化為機械語言。這套編譯器可以輸入 Swift 語言，然後編譯到「安卓開發室」並在該環境下運行。Swift2Android 能在基本類結構、變量聲明和 if-else 條件判斷方面，把基本的 Swift 編碼轉化成 Java。經此操作，Swift2Android 便能把現成的原始編碼編譯為安卓編碼。

研發學生：

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03

The Optimization of Conditions in Gold Nanoparticles Assisted Multiplex PCR



GOLD PRIZE AWARD

Polymerase chain reaction (PCR) is a molecular technique in which a segment of DNA is replicated to make millions of copies. PCR is commonly used in various applications such as the diagnosis and monitoring of genetic diseases, the identification of specific bacteria and viruses, and in studies of the functions of targeted segments. However, there are limitations to the PCR process, as the sample source may contain PCR inhibitors or unspecific/degrading DNA segments.

This project focuses on developing a new protocol of duplex PCR that uses optimised AuNPs-assisted conditions. A series of PCR conditions are tested, and the effects of AuNPs on the performance of duplex PCR are evaluated in terms of efficiency and specificity.

The tests find that gold nanoparticles (AuNPs) in concentrations of 0.001 nM can significantly improve the efficiency of PCR. Measurements of the intensity of the amplification band (as revealed by electrophoresis) show that specific products are significantly increased (by 93%) after as few as 20 amplification cycles, with the use of DNA templates as low as 500 fg/ul. However, no significant improvement in the reaction's specificity or sensitivity is demonstrated in this study. Another finding is that under certain conditions, AuNPs can provide both enhancing and inhibitory effects on the specificity, sensitivity and efficiency of PCR.

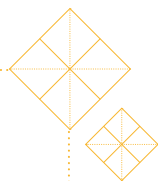
This project provides useful information for developing a new duplex PCR protocol for the rapid detection of pathogens in food and in human specimens.

Innovator:

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優化納米金粒子所輔助的 聚合酶連鎖反應



金獎

聚合酶連鎖反應 (PCR) 屬於分子生物技術，能利用僅僅一節段 DNA 複製出數以百萬計複本。PCR 廣泛應用於不同領域，包括診斷及監察遺傳疾病、辨別特定細菌與病毒、研究目標 DNA 節段的功能等等。然而，由於樣本源可能含有 PCR 抑制因子或不明 / 會自然降解的 DNA 節段，因此這項技術目前仍有局限。

本項目旨在開發一套以優化金納米粒子為輔助條件的全新雙重 PCR 協定，過程中測試了一系列 PCR 條件，並精確衡量了雙重 PCR 在效能與特異性方面的表現。

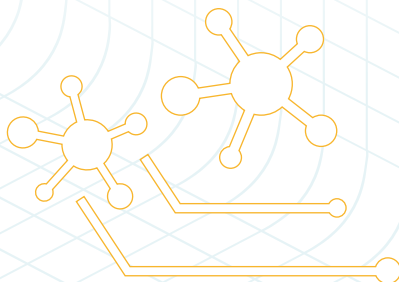
測試發現，金納米粒子濃度只需達到 0.001 個納米，便能顯著提升 PCR 的效能。從擴增帶數的強度讀數 (利用電泳顯示) 可見，只需使用低至 500 fg/ul 的 DNA 樣板，在少至 20 個擴增循環後，特定產物便會明顯增長 (增幅 93%)，不過反應特異性與敏感度並沒有顯著提升。此外，研究的另一發現是，在特定條件下，金納米粒子能夠同時提升並抑制 PCR 的特異性、敏感度及效能。

本項目的發現，將有助開發全新的雙重 PCR 協定，從而應用於快速檢測食物及人體樣本的病原體。

研發學生：

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04

Data Mining on Existing Game Selling Platforms



SILVER PRIZE AWARD

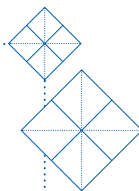
This project involves building a website to let people access game information as consolidated from a range of popular game selling platforms. This information includes not only comparisons among the prices offered on various game selling platforms, but also other information such as the publishers and system requirements. With the large amounts of consolidated data presented, this website can also provide a search area for users to find their preferred games by using specific searching criteria. The website can also analyse the consolidated data to speculate on the developmental tendencies for various games. For example, the website may suggest the type of the next game to be released on a particular game-selling platform.

Innovator:

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Hong Kong Institute of Vocational Education (Tsing Yi)

現成的電玩遊戲售賣平台內的數據探索



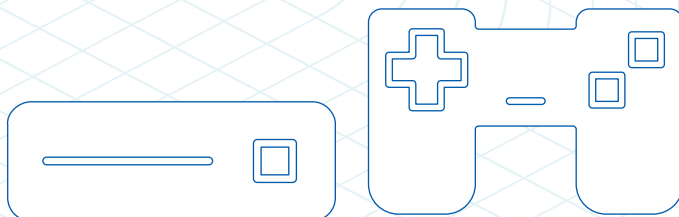
銀獎

本項目旨在發展一個單一網站平台，藉此整合及發佈多個廣受歡迎的遊戲銷售資訊，方便玩家進行比較。這些資訊不僅包括同一款遊戲在不同銷售平台上的格價參考，也會列出發行商、系統要求等訊息。由於網站擁有龐大的遊戲資訊，玩家可以在搜尋區輸入特定的搜尋條件，尋找自己心儀的遊戲。網站亦能分析整合所得的資訊，預測不同遊戲的開發趨勢，比如向玩家推薦某個遊戲銷售平台下一款推出的遊戲種類。

研發學生：

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05

Drive Care — System for Monitoring Driver's Concentration and Consciousness using Consumer Grade Electonncephalogram (EEG) Headset



SILVER PRIZE AWARD

As people increasingly drive cars for both work and personal purposes, the dangers posed by drug driving, drink driving or sleep-deprived driving are growing threats to society. Highly dangerous driving behaviour and numerous traffic accidents occur because drivers are insufficiently conscious or inadequately focused while driving. This project introduces an EEG mobile application called 'DriveCare' that can greatly reduce these problems and help to ensure driving safety.

The DriveCare application helps individual drivers and organisations devoted to safe driving. The need for a new method to reduce traffic accidents is great. The proposed application works on smartphones, which almost everyone owns, and provides a system for monitoring the consciousness and concentration of drivers. The application is not just for individual use, but also provides a web online system for organisations to display their full data for collective management.

Innovator:

CHO Tsz Kin
LEUNG Ho Ching
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Higher Diploma in Mobile Applications Development
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護駕 — 利用消費級可裝載腦波監測儀 實現實時監控駕駛者專注度系統



銀獎

不論是為了工作還是個人需要，不少人都愛自行駕車，但藥後駕駛、醉酒駕駛、或駕駛前睡眠不足，往往容易對市民的安全構成威脅。司機無法保持清醒或專注地駕駛而導致高危駕駛行為或交通意外，屢見不鮮。「護駕」腦電波應用程式，將有助大幅減少這些問題，協助確保駕駛安全。

由於交通意外時有發生，社會急切需要尋找新方法減少交通事故，「護駕」應用程式正好能同時協助司機個人及機構共同促進駕駛安全。這款應用可安裝於智能手機，因此幾乎可以伴隨每一位司機左右，監察他們的清醒和專注程度。這款應用程式不但適用於司機個人，也為機構設置網絡線上系統，展示全面數據，供集體管理之用。

研發學生：

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智能手機軟件開發高級文憑
香港專業教育學院(沙田)



06

Farmer's Life — An Age-friendly Toy



SILVER PRIZE AWARD

The proposed board game achieves the following objectives:

- (1) to communicate the importance of leisure activities for active ageing,
- (2) to promote intergeneration relationships, and
- (3) to improve the cognitive capacities of elderly people with mild cognitive impairment (MCI) and emotional health issues to enhance their social lives.

The intended targets and project beneficiaries are as follows:

- (1) Elderly people. The literature indicates that elderly people need to stay involved in leisure activities, including games that can promote health, build self-confidence, expand life experience, provide social opportunity and enable close relationships between active seniors.
- (2) Primary and secondary school students. Full-time games for the elderly can provide opportunities for young people to engage with older people, thereby increasing their awareness of the elderly, creating a friendly environment for interaction between people of different generations, and allowing ageing people to prepare for meeting their social and mental needs.
- (3) Elderly people with mild cognitive impairment. When older people experience losses of short-term memory, their practical difficulties in managing their normal living situations tend to increase. The literature shows that proper game activity not only slows the patient's cognitive degradation, but also improves his or her mood and outlook.

The board game involves four kinds of cards that indicate matters of fate, opportunities, scenarios and challenges, all of which are related to elderly people's daily lives. The 'Farmer's Life' has been revised to a third edition, and has been published and tested on various public or industry-related platforms for the elderly.

Innovator:

LAM Ka Lun Dragon
WAN Ching Nam
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Higher Diploma in Social Services and Community Education
Hong Kong Institute of Vocational Education (Sha Tin)

「農夫歲月」—以長者為主題的全齡玩具



銀獎

「農夫歲月」這項桌上遊戲能達致以下目標：

- (1) 傳達為活躍長者提供休閒活動的重要性；
- (2) 促進一家老幼的關係；
- (3) 協助患有輕微認知障礙及情緒健康問題的長者，改善自身的認知能力，從而提升其社交生活質量。

遊戲的目標人群及預期成果如下：

- (1) 長者—研究文獻顯示，長者需要持續參與休閒活動，其中包括能促進健康、建立自信、拓展生活體驗、提供社交機會以及讓活躍長者維繫親密關係的遊戲。
- (2) 中、小學生—為長者而設的遊戲亦能為年輕人提供接觸長者的機會，從而提升他們對長者的關懷意識，創造融洽環境讓一家老幼彼此互動，同時能滿足長者的社交和精神需求。
- (3) 認知能力輕微受損的長者—當長者經歷短期記憶喪失後，他們自理日常生活的難度會漸漸增加。研究文獻顯示，適當的遊戲不單能減慢病人的認知能力衰退速度，更能改善長者的情緒及對人生的態度。

這項桌上遊戲設有四款遊戲卡牌，分別代表命運、機會、情景和挑戰，全都與長者的日常生活息息相關。「農夫歲月」已修訂至第三版，推出後已在為長者而設的不同公眾及產業相關平台接受測試。

研發學生：

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07

Innovation Brick Cutting Machine



SILVER PRIZE AWARD

Currently, brick-cutting machines are just simple cutters with a protective cover, and the procedures of brick cutting are all carried out manually. This project designs a safe and efficient automated brick-cutting machine to replace the typical manual machines. The new machine reduces potential hazards to workers and accurately cuts bricks within one minute.

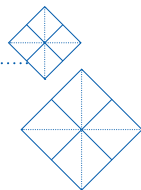
The 'innovative brick cutting machine' operates automatically, provides bricks that are accurately cut to specified sizes, and gives with additional protection for machine operators. The machine reduces the manual labour involved and yields a more accurate product in terms of brick size.

Innovator:

SIU Man Chong
YEUNG Chor Kiu
WONG Shun Ting

Higher Diploma in Mechanical Engineering
Hong Kong Institute of Vocational Education (Lee Wai Lee)

創新切磚機械



銀獎

現有的切磚機械僅由簡單的切割器和保護罩構成，而且切磚程序全經人手。本項目設計的安全、高效自動切磚機械，可望取代傳統的人手操作機械，有效降低工人面對的潛在工業風險，同時能在一分鐘內精準切割磚塊。

「創新切磚機械」屬全自動運作，能把磚塊準確切割成指定大小，並為操作人員提供額外保護。這部機械能夠減少作業所需人力，並製成大小規格更統一、更準確的磚塊。

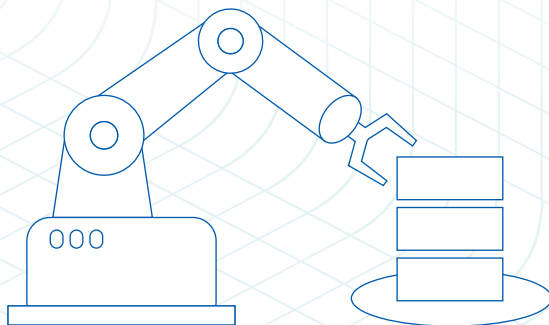
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08

Plastic Surgery



SILVER PRIZE AWARD

The idea of the 'plastic surgery' project comes from the notion of change in dress and appearance. Just as human beings can change their faces through plastic surgery, likewise their outfits can be changed by using design ideas that involve change, puzzle and technology.

Change: This design concept involves changing cut pieces so that the sizes of clothes can be adjusted.

Puzzle: By using buttons to seam all of the cut pieces, the items or pieces of clothing can be connected to each other like jigsaw puzzles. In this design process, everyone can become a designer. People can design combinations of pieces to create personalised jackets, skirts or pants according to their own preferences. In addition, the design series can also be based on individual needs for altered styles, patterns, colours and even sizes. These changes can be completely determined by the wearer according to his or her imagination.

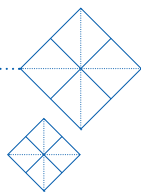
Technology: The three-dimensional printing technology used in this fashion series is increasingly common. The use of such printing technology allows wearers to get better service in selecting clothes. In addition, three-dimensional printing allows wearers to design their own pieces based on their personal preferences in materials, textures or styles.

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整容



銀獎

這個名為「整容」的項目，理念源自衣口與外表恆常變化的概念。正如整容能改變人類的容貌，在設計中引入變化、拼貼和科技的概念，也能令服裝煥然一新。

變化： 這個設計概念涉及改變裁布的尺寸，使衣服的大小得以調整。

拼貼： 利用鈕扣接合所有剪裁布料，把各個部件或布塊像拼圖般連接起來。在這個設計過程中，人人都能充當設計師。服裝的主人可以嘗試不同的布塊組合，按照自己的喜好製成獨一無二的外套、短裙或長褲。此外，這個設計系列亦可基於個人需要，更改服裝風格、圖案、顏色甚至尺寸。所有的這些變化，完全可以按照穿口者的想像而實現。

科技： 這個時裝系列應用了立體打印技術。有了這種技術，穿口者可在挑選衣服時更加隨心所欲。此外，立體打印也能讓穿口者根據自己在物料、質感和風格上的喜好，設計出獨有的服裝。

研發學生：

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香港知專設計學院



09

Smart Elderly Care Robot



SILVER PRIZE AWARD

According to the Hong Kong Population Projections for 2015 to 2064 (Census and Statistics Department), 15% of the local population was aged 65 and over in mid-2014, and this percentage will increase to 19% by mid-2019.

This project aims to design a companion robot to take care of elderly people's social and mental needs. A movable robot, named the 'Intelligent Elderly Care Robot', is built to serve this purpose. The robot uses currently available technologies, including simultaneous localisation and mapping (SLAM), face recognition, voice dialog with machine learning AI, and an Android application for direct, easy user control. As the robot is built on a Linux-based system, existing ready-to-use software modules can be plotted and used directly in the system. The well-known Arduino and Raspberry Pi 3 hardware platforms are applied, such that the overall cost of the system is kept as low as possible relative to other commercial robot systems.

With the robot's existing functions, family members can use the Android application to contact elderly persons through the robot. The robot also allows the elderly to enjoy various services. With help from this robot, the effort required of family members to care for elderly members can be relieved. The robot may enable younger family members to take employment in the labour market. In the long term, it is probable that increasing numbers of robots or artificially intelligent devices will appear in society, particularly to help meet the needs of the elderly. This low-cost, smart, elderly care robot provides an important remedy for the issues of an ageing population.

Innovator:

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智能長者護理機械人



銀獎

根據政府統計處對 2015 至 2064 年香港人口所作的預測，2014 年中本港有 15% 本地人口為 65 歲以上的長者，到了 2019 年中，比率還將升至 19%。

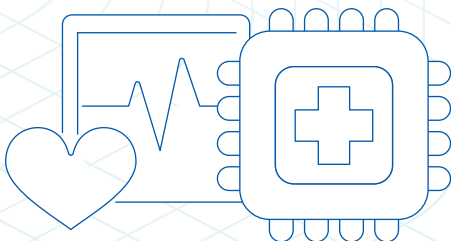
鑒於未來的長者服務需求殷切，這個項目旨在設計一款名為「智能長者護理機械人」的機械夥伴，以滿足長者的社交及精神需要。機械人配備多項現有科技，包括同步定位與地圖構建 (SLAM)、臉部辨識、配備人工學習智能的語音對話、方便使用者直接操作的安卓應用程式等。由於機械人以 Linux 系統為平台，因此能支援現有的即插即用軟件模組，直接透過系統使用。設計也使用了為人熟悉的 Arduino 及 Raspberry Pi 3 硬件平台，因此能盡量控制總體成本，使其低於其他盈利性質的機械人系統。

機械人目前兼具多項功能，長者的家人更可使用安卓應用程式透過機械人聯絡長者；機械人亦能讓長者享受不同服務。在機械人的幫助下，家人照顧長者的壓力大大降低，亦能令年輕家庭成員抽出時間投身職場。長遠來說，社會為了滿足照顧長者的需求，很有可能推出更多的機械人或人工智能裝置，而這款成本低廉、具備智能的長者護理機械人，可為舒緩人口老化問題提供解決良方。

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10

Hugus



CERTIFICATE OF MERIT

Hugus is a pair of fluffy dolls designed for two parties who need to spend extended time periods separated by distance. Each of the parties owns one of the dolls. To connect the Hugus, all the parties have to do is to link up their smartphones with the Hugus App via Bluetooth, and set up a reunion date with a pairing code. Using the built-in LED display in the fluffy dolls, a bonding relationship can be created through interactions with the Hugus, allowing the parties to mend their anxious and lonely hearts during their days of separation. In addition to serving couples, the Hugus design is appropriate for other target users such as mothers and children, parents and students who study abroad and close friends. The parties can also play mini-games through the Hugus in real time. Interactions through the Hugus can help to build bonded relationships between people who are separated by time and distance.

Innovator:

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哈格斯



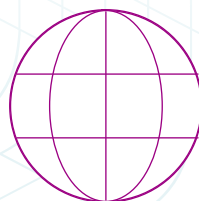
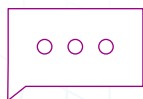
優異獎

哈格斯是一對兩隻的毛毛玩偶，專為長期分隔異地的人而設計。二人雙方各擁一隻哈格斯玩偶，以智能手機透過藍芽接入哈格斯應用程式，再以配對碼設定相聚的日期，就能連結彼此的哈格斯。利用哈格斯玩偶內置的 LED 顯示屏，兩人可以透過哈格斯彼此互動，維繫感情之餘，也能傾訴離別的相思。哈格斯除了適合情侶或夫婦外，家長與子女、又或到海外升學的學生與摯友等不同人士也很合用。使用雙方更可以共同參與實時遊戲，以種種方法跨越時空的隔膜。

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11

Waterloon



CERTIFICATE OF MERIT

Living in a metropolitan city like Hong Kong, people tend to prefer lighting devices with high flexibility to suit their personal needs such as privacy in shared environments. Flexible lighting devices are especially relevant for members of the younger generation. This project involves designing a lighting device that maximises fun and entertainment and also provides high placement flexibility that enables users to engage in various activities in their own living environments.

The Waterloon (water x balloon) lighting system design allows flexible placement of lighting in a fun and entertaining way. This system is

- ▶ Portable (small and lightweight)
- ▶ Adjustable (in both light intensity and direction)
- ▶ Flexible (in placement)
- ▶ Stylish (in design)

Innovator:

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凝光 — 共用居住環境的燈光設計



優異獎

生活在香港這樣的大都會，市民往往要因應個人需要而經常調節燈光，比如在共同居住的環境中保持私隱，而年輕一族尤其重視燈光能否滿足不同需要。本項目設計的照明設備，就能充分融合趣味和娛樂元素，同時能靈活安裝於不同地方，讓用家在自己的生活天地中從事各種活動。

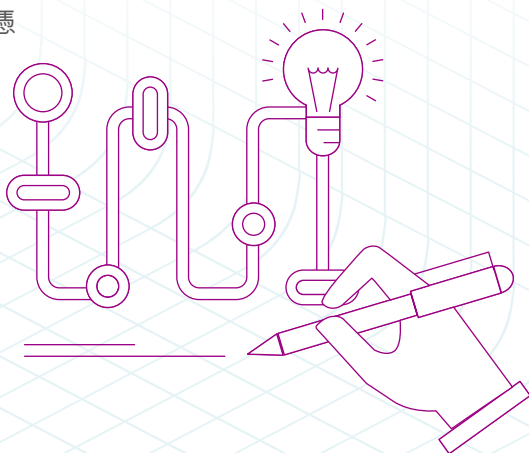
凝光燈光系統的設計兼備趣味和娛樂元素，而且十分靈活，可以安裝於家中不同角落。系統的特點包括：

- ▶ 輕便易攜（細小輕盈）
- ▶ 調節靈活（光線強度與方向）
- ▶ 容易安裝（位置選擇）
- ▶ 時尚美觀（外型設計）

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Contact us to learn more about the Innovation x Application Scheme or to explore the potential for future collaboration:

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