

University Education Rooted in Metaverse How Metaverse will Reshape People's lives 大學教育紮根元宇宙世界 淺談元宇宙將如何重塑人們生活

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The Hong Kong University of Science and Technology (HKUST) has been actively accelerating highly-impact research focused in Metaverse study. Professor Pan HUI, HKUST's Chair Professor of Emerging Interdisciplinary Areas and Affiliate Professor of Computer Science & Engineering and HKUST(GZ)'s Chair Professor of Computational Media and Arts (CMA) Thrust is taking the lead on the Metaverse development goals. One of the highlighted projects, "MetaHKUST", virtually combines the Clearwater Bay campus in Hong Kong and the Nansha campus in Guangzhou to introduce various online interactive functions for students, such as the ability to read diagrams overlaid on classroom environments and to participate in classroom activities with digital identities or avatars. Metaverse is becoming an increasingly hot topic around the world. Will it be another fleeting trend, or will it indeed nurture revolutionary changes to humanity?

香港科技大學（科大）近年積極佈局元宇宙的研究領域，而科大新興跨學科領域學部講座教授兼計算機科學及工程學系附屬教授，及港科大（廣州）計算媒體與藝術學域講座教授許彬，正帶領科大進行相關研究發展。其中重點項目「MetaHKUST」結合香港清水灣及廣州南沙區校園，為學生引進各種虛擬功能，例如閱讀疊加在課室環境的圖表、以虛擬身分參與課堂活動等。最近在社會上「元宇宙」也是頗為流行的話題之一。究竟元宇宙只是曇花一現的潮流，還是會為人類帶來革命性的轉變？





Embracing the Metaverse Era Head-on

The concept of Metaverse has been proposed as early as 1992. It regained popularity across the world recently, and with the recent surge in the cryptocurrencies market, it has once again become an increasingly hot topic of discussion. Professor Hui believes that Metaverse will unquestionably play a significant part in the future growth of technology, mainly because of the rapid development of equipment and software technology in recent years providing a solid blueprint for the development of Metaverse. Examples include the successful introduction of virtual reality (VR) glasses to the consumer market, the development of chipsets that have significantly improved performance and processing speed, and the widespread application of advanced artificial intelligence (AI) technologies like face recognition used in a wide array of industries.

A transformation of content from two-dimensional to three-dimensional is made possible by the advancement of Metaverse technology, but Professor Hui suggests that Metaverse also serves as an extension from digital work to reality. For example, a traditional meeting requires all participants to agree on a location and attend on time, while a web meeting removes the limitations of location. Embracing the Metaverse thinking, the virtual meeting may also allow participants to upload the pre-record clips or even use avatars to take part in seminars. Shopping sites that incorporate camera functions, item projection in a real environment, or projection of clothing on buyer's virtual characters during their purchase decision making all juices traditional shopping process with more interaction and feelings of presence.

正面迎接元宇宙時代

元宇宙概念早在 1992 年就被提出，在近年重新進入大眾視野，加上最近在投資市場捲起的加密貨幣浪潮，重新獲得高居不下的討論熱度。許教授認為元宇宙將毫無懸念地在未來科技發展中佔有重要的地位，主要因為近年設備及軟體技術發展迅速，為元宇宙提供了實在的發展雛型。其中例子包括虛擬實境 (VR) 眼鏡成功進入大眾消費領域；晶片發展大幅推高了使用效能和處理速度；成熟的人工智能 (AI) 技術如人臉辨識功能被各行各業廣泛使用等。

元宇宙的出現讓內容經歷從平面到立體的轉化，然而許教授提出元宇宙代表的不僅是內容形式的發展，更是網絡延伸到真實世界的橋樑。例如，傳統模式的會議需要所有參與者約定好地點準時出席，網絡會議移除了地點的限制，然而在元宇宙技術引導下的會議形式或許可以容許參與者預錄不同片段，甚至使用虛擬角色參與會議。購物網站結合相機功能、投影物品在真實環境中，或在購買衣服時用戶可以將服裝投影到虛擬角色上，均為傳統購物流程新增更多互動和真實性。

Will the Metaverse Development Go Smoothly?

The Metaverse was thought to be accessible only through VR equipment, yet it is not the only stepping stone for one to delve into the vast possibilities the Metaverse enables. The potential of augmented reality (AR) and its applications in Metaverse should not be disregarded as they each provide a diverse technological environment for different markets, entertainment and lifestyle needs.

The introduction of VR and AR enhanced visual stimulation while we travel across the virtual worlds, but to create a fully immersive sensory experience in the Metaverse, an advancement in technical hardware that imitates and stimulates hearing, touch and even smell is still required. Professor Hui takes an optimistic view with reference to the technological progress achieved thus far, and believes that the public will be well equipped with suitable equipment in the market in less than 10 years. The development of VR technology in the film and game industry is already in its full swing, and with the help of Metaverse technologies spicing up our virtual lives, more investment and human resources will be secured without a doubt. Professor Hui believes that VR technology will be designed to solve more operational technical problems five years from now, such as devices with higher frame rate, boosted battery life or better portability. Such changes will usher humanity in an era of Metaverse ecosystem packed with interactive and immersive content formats.

Screen resolutions, computing speed and battery life are some of the major hardware stepping stones found on the road to VR technology growth. Three fundamental hardware requirements must be met for the immersive digital environment in the Metaverse to function properly - a 16k screen resolution which is close to that of the human eye; terabytes of storage space for medias to be played smoothly and without latency, and finally, VR glasses that have long battery life. Metaverse upholds interactivity. The fulfillment of the Metaverse places heavy burden on today's VR hardware configuration and performance, causing problems with synchronization and discontinuity due to network delays and low computing speed. Most online concerts that have emerged in recent years only allow for unilateral interaction initiated by either the audience or the idols, such as performers taking song requests and fans sending gifts to idols. The process has demonstrated real interactive limitations amongst participants explained by underperformed hosting services and poor network speed. From a hardware standpoint, Professor Hui believes breakthroughs in digital hardware development, which aims to ensure users could obtain a synchronized, mesmerizing visual experience, will be the key for Metaverse to flourish.

元宇宙的發展會一帆風順嗎？


VR 設備被視為踏入元宇宙世界的入場券，但 VR 並不是元宇宙的全部面向，擴增實境（AR）在元宇宙的潛力也不容忽視，它們各為不同的市場、娛樂和生活需求提供多元化的科技環境。

VR 及 AR 的誕生雖提供了視覺上的刺激，但成就元宇宙世界如親歷其境的極致官能體驗需更好地研發刺激聽覺、觸覺甚至是嗅覺的技術硬件。許教授對目前的技術開發進度感到樂觀，相信不出十年大眾便能輕易在市場上獲得相宜的裝備。VR 技術在影視與遊戲產業的發展如火如荼，在元宇宙概念的推波助瀾下更會獲得更多的資金和人力資源。許教授相信五年後的 VR 技術將會解決更多運作上的技術問題，例如改善畫面幀率、電池續航力、設備可攜帶性等方面，真正迎來虛實整合的新時代。

現時 VR 技術的發展瓶頸多在像素、計算機運行數度和電池續航力上。要打造元宇宙的沉浸式體驗，硬件上需達成三大基本條件：一、接近人類眼球解像度的 16k 屏幕；二、影片流暢播放以 TB 容量單位計算；三、容許長時間使用的 VR 眼鏡。元宇宙強調互動性，對現今 VR 硬件設備造成頗大負擔，衍生因網絡速度延滯和電腦計算緩慢而出現同步不連貫等問題。近年興起的線上演唱會大多只能容許觀眾和偶像之間的單方面互動，如向偶像點唱和送上禮物等，然而觀眾之間的互動則因伺服器及網絡速度等技術而受到限制。許教授相信硬件設備發展是元宇宙概念能否夠長遠發展的關鍵，旨在確保用戶使用 VR 進入虛擬世界時能獲得與畫面同步的沉浸體驗。



Blockchain is also one keyword frequently associated with Metaverse discussion. The mainstreamization of the Metaverse requires steady economic activity with sufficient crowd size and a high level of socialization to keep the virtual community active. Economic activities in the virtual world are not confined to one's purchasing and selling virtual goods. Many active users in the Metaverse constantly trade currency or use blockchain to make payments in the Metaverse, originating new business ecosystems and reinforcing the close connection between the virtual and real worlds.

While the technology industry and investors are all getting excited about Metaverse, it faces technical difficulties in terms of equipment standard hence poses new societal concerns. Metaverse is virtual and intangible in nature, therefore the users and their behaviors are extremely challenging to regulate under existing local internet regulations. Identity theft, security of personal information, and service providers' being able to access excessive and sensitive information are all issues that need to be addressed. There is still disagreement over whether virtual violence constitutes a crime in the real world, and the definition of injury is still unclear. This is only one of many areas where the growth of the Metaverse has to be monitored until it fully matures. Governments all across the world will unconditionally face new challenges in defining and legislating regulation in the virtual arena. 

在討論元宇宙概念時，區塊鏈也是經常被提及的主題之一。元宇宙的成功需要受穩定的經濟活動加持，以保證足夠的人流活動和社交，保持虛擬社區的活躍。在虛擬世界進行的經濟活動並不受限於虛擬物品的買賣，有不少的元宇宙用家都在元宇宙進行貨幣交易或使用區塊鏈付款，此舉促成了虛擬和現實世界之間的緊密連結，為社會建構全新的商業生態環境。

儘管科技界和投資者對元宇宙趨之若鶩，但元宇宙除了面臨設備技術上的困頓，也會為社會帶來許多新的問題。礙於元宇宙的虛擬特性，用戶和他們的行為難以受到各地互聯網的法律監管。元宇宙的虛擬角色身分盜用、個人資訊安全、服務提供者獲取過敏感資訊等都是各界需要面對的難題。元宇宙發展在許多方面仍有待補足，然而目前社會對虛擬暴力等行為是否在真實世界構成犯罪還存在爭議，在取證和界定傷害的界線依然含糊。如何在虛擬世界中定義和立法進行監管，對各地政府來說都將是一個全新的課題。 