

中國科技大學補助教師參加校外研習心得報告

The 16th International Conference on Frontier Computing—Theory, Technologies and Applications 國際教育科技前沿會議於115年07月06日至115年07月10日於韓國首爾東國大學 (Dongguk University) 舉行。會議主辦單位為 Institution of Engineer and Technology IET 協會。

今年度的主題演講為: Insights Gained from Next-generation Storage Solutions in AI Computing, 由南韓東國大學 (Dongguk University) 電腦與人工智慧學部的姜東賢 (Donghyun Kang) 教授主講。重點說明用次世代儲存軟體優化, 來解放 AI 的計算算力。他透過修改 Linux 核心、優化虛擬記憶體交換機制, 以及針對次世代硬體 (開發新型檔案系統與快取演算法, 成功讓大型 AI 模型不論是在資料中心的大規模訓練, 還是在智慧型手機的邊緣端推理, 都能獲得更高、更穩定的 I/O 效能。

報告人今年度以 Applying Virtual Reality to Visual Smoke Assessment Training: An Evaluation of Usability and Perceived Learning Effectiveness VR教材實作與驗證為題發表論文。



簡報摘要如下:

Traditional Training vs. The VR Paradigm <table border="1"><thead><tr><th>Traditional Training</th><th>VR Paradigm</th></tr></thead><tbody><tr><td>Highly Restricted: Limited by weather and lighting, cannot operate 24/7</td><td>Climate Control: 100% control over climate variables and lighting</td></tr><tr><td>High Cost: Extremely high costs for smoke consumables and fuel</td><td>Zero Carbon Footprint: Zero smoke consumable costs, meets sustainability goals</td></tr><tr><td>Space Limited: Training sites and observation viewing angles are restricted</td><td>Break Barriers: Break through physical space limitations, multi-angle switching</td></tr><tr><td>Assessment Difficult: Unable to 100% quantify spatial scoring criteria for examinees</td><td>Data Tracking: Fully digitized learning journey and spatial positioning tracking</td></tr></tbody></table>	Traditional Training	VR Paradigm	Highly Restricted: Limited by weather and lighting, cannot operate 24/7	Climate Control: 100% control over climate variables and lighting	High Cost: Extremely high costs for smoke consumables and fuel	Zero Carbon Footprint: Zero smoke consumable costs, meets sustainability goals	Space Limited: Training sites and observation viewing angles are restricted	Break Barriers: Break through physical space limitations, multi-angle switching	Assessment Difficult: Unable to 100% quantify spatial scoring criteria for examinees	Data Tracking: Fully digitized learning journey and spatial positioning tracking	System Architecture: The Dual Modules Stationary Sources - Targets: Factory stacks, boilers, incinerators. - Focus Area 1: Plume opacity evaluation. - Focus Area 2: Differentiation of black vs. white smoke. - Focus Area 3: Mastering observer positioning against complex backgrounds. Mobile Sources - Targets: Commercial trucks, passenger cars, tour buses. - Focus Area 1: Dynamic roadside observation. - Focus Area 2: Rapid black-smoke concentration judgment. - Focus Area 3: Real-time vehicle and license plate identification.
Traditional Training	VR Paradigm										
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Module 1: Stationary Pollution Simulation Smoke Type: Black vs. White smoke Concentration: 12 options ranging from 20% to 75% (3% intervals) Environmental Conditions: Morning, Noon, Afternoon lighting Positioning: Dynamic selection of observation points	Module 2: Mobile Pollution Simulation Inputs: 5 Vehicle Types: Commercial/Private trucks, passenger cars, tour buses 5 License Plate variations The Task: - Dynamic roadside evaluation of moving targets The Critical Threshold: 40% Concentration Students must rapidly identify when a passing vehicle exceeds the 40% enforcement limit.										
N = 28 Study Demographics & Methodology Sample: Novice environmental inspection trainees and digital media students. Scale Reliability (Cronbach's α) <table border="1"><thead><tr><th>Unit</th><th>Reliability</th></tr></thead><tbody><tr><td>Unit A</td><td>.979</td></tr><tr><td>Unit B</td><td>.946</td></tr><tr><td>Unit C</td><td>.957</td></tr></tbody></table> Conclusion: Exceptionally high internal consistency. Construct Validity (KMO) All units achieved KMO values between .687 and .864 ($p < .001$). Conclusion: Confirmed good sampling adequacy and measurement stability.	Unit	Reliability	Unit A	.979	Unit B	.946	Unit C	.957	What Drives Learning Effectiveness? The Finding: Overall material evaluation significantly predicted perceived learning objectives ($R^2 = .576, p < .001$). The Insight: Arrangement of content in a logical sequence was the most significant predictor of success. The Takeaway: Cognitive context construction and progressive pedagogical structure matter significantly more to trainees than purely pushing interface aesthetics or visual realism.		
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Qualitative Feedback & Limitations Participant Feedback - VR is viewed as a powerful supplement, not a total replacement for reality. - Trainees strongly desire integration with actual hands-on physical equipment. - Requests were made for built-in, automated retraining mechanisms for failed scenarios. Study Limitations - Small sample size (N=28) limits broad generalization. - Reliance on subjective, self-reported survey data rather than objective, system-embedded performance tracking. - High correlation among material quality dimensions requires conservative statistical interpretation.	Conclusion Feasibility Proven: VR simulation is highly feasible and widely accepted as a supplementary tool for both initial and recurrent environmental inspector training. Pedagogy > Pixels: The logical sequencing of instructional design is the primary driver of perceived learning success in VR environments. The Ultimate Ecosystem: The future of pollution control training lies in a tri-layered approach blending VR simulation, hands-on field operations, and objective AI tracking. Thank You / Q&A										

改善教學心得：

今年度前瞻技術研討會有許多 AI 跨領域應用研發之成果發表，在 XR 教學研究領域上有幾點值得借鏡思考：**On-device AI** 適用於 Quest、手機 AR、博物館離線 AI 辨識等記憶體有限場景。**AI 模型訓練與保存** Check-QZP 可降低模型 Checkpoint 檔案大小與 SSD 寫入負擔、**XR 串流與即時辨識、大量 XR 素材儲存等**。

上述數據多為各論文特定硬體、模型與工作負載中的最高改善值，不宜直接視為所有 AI 系統均能獲得相同幅度；其真正研究價值在於證明，透過跨層資料管理、I/O 平行化與智慧儲存配置，可以明顯降低 AI 運算中的資料供應瓶頸。

提升師資素養：

透過本次研習，我深刻感受到 AI 跨領域教育中發展勢。作為教師，我認為未來的精進方向不僅在於熟悉最新的數位教學工具，更在於如何將跨領域的知識與資源有效整合，設計出兼具專業性與互動性的課程。首先，教師應持續培養數位科技應用能力，讓教學能夠更貼近社會需求。教師也需要加強國際視野，關注全球教育的創新趨勢，並思考如何轉化為在地課程的養分。

報告人簽章	單位主管簽章	人事室主任簽章
年 月 日	年 月 日	年 月 日