C.6. Education for Digital Natives

Education for Digital Natives. This session explores emerging issues in engineering education relevant to enticing digital natives into the systems engineering, testing, modelling and simulation workforce. Submissions are welcome that navigate topics such as the development of relevant content, improving diversity in STEM, industry-university partnerships, the research ecosystem, certification and life-long learning approaches.

Lead: Kumudu Amarawardhana, Sondoss el Sawah
Domains: Education and training, All domains welcome

Submissions Summary:

1. Uses of simulation for assessment in VET (Full Paper)
2. Enhancing Aeromedical and Tactical Combat Training using Mixed Reality Technology (Paperless Presentations)
3. Professionalising Mission Engineering in Australia: A Pilot Micro-Credentials Model (Paperless Presentations)
4. On the use of modern technology and systems engineering to operationalise theory into practice (Paperless Presentations)
5. Industry-Focused MBSE Curriculum: Role-Specific Capabilities to Meet Industry Needs (Paperless Presentations)

20750 Uses of simulation for assessment in VET

Elyssebeth Leigh 1, Katherin Coster 1, UTS, Sydney, NSW, Australia

Type: Full Paper
Stream submitted: B.1. Human systems

Overview Simulations are forms of social engineering often used in VET education contexts. However their use is not yet adequately supported by appropriate resources. Quality assessors have much to contribute to highlighting the significance of the gap and suggesting appropriate strategies for closing it. Context This research is being undertaken in the Australian VET sector with specific attention to documentation regarding assessment conditions for units of competence from Certificate 1 to Associate Degree. Purpose The purpose of this work is to identify what is available and what is needed to ensure that VET educators are provided with appropriately designed simulated environments and tools to adequately assess learning via their use. Approach Data collected from units of competence across VET sectors will be used to check that documentation employs terms such as - Skills in this unit must be demonstrated in a workplace or simulated environment where the conditions are typical of those in a working environment in this industry. A l two part literature search is being undertaken to identify - what is generally known about effective design and use of simulations in education what is available to VET educators about the use of simulations in their courses key stakeholders will be interviewed to provide guidance on the search and help with validating findings Analysis of the data collected will be summarised for presentation at the conference. Insights I have a recurring nightmare that someone will pop up and say youre wrong-look here it is! How did you miss that? At which moment I would with relief relinquish the torch Im carry and retire gracefully. I have not yet found evidence that could allow me to do so. This work will help identify what is needed to improve use of simulations in VET.

21086 Enhancing Aeromedical and Tactical Combat Training using Mixed Reality Technology

Dale N Linegar 1, Ben I Krynski 1, Real Response, St Kilda, VIC, Australia

Keywords: Simulation,BlueRoom,Mixed Reality,Medical

Type: Paperless Presentations
Stream submitted: B.4. Simulation-based Learning & Serious Games

BlueRoom is a revolutionary integration of mixed reality (MR) technology to revolutionise training methodologies for Aeromedical Evacuations (AE) and Tactical Combat Casualty Care (TCCC). This presentation explores how MR can significantly elevate the competency and preparedness of aeromedical professionals and flight crews. Our partnership with the Health Operational Conversion Unit (HOCU) at Royal Australian Air Force (RAAF) has led to the implementation of a BlueRoom simulator which creates immersive and realistic training environments. These simulations accurately replicate AE procedures and TCCC scenarios, allowing trainees to practice patient transport, in-flight medical interventions, and battlefield injury management under varied and challenging conditions. We emphasise the crucial role of trainers in MR simulations, providing them with control over every aspect of the scenario and enabling advanced debriefing and reporting. The MR technology facilitates hands-on training with medical and military equipment, simulating environments that are typically too expensive, dangerous, or logistically difficult for regular training. The presentation will also discuss the adaptability and scalability of MR platforms to meet RAAF's unique training needs, enhancing decision-making skills in a safe yet realistic setting. We will share insights into the challenges, successes, and future prospects of MR implementation within combat medical, aeromedical, and search and rescue domains, highlighting the transformative potential of MR technology.

20684 Professionalising Mission Engineering in Australia: A Pilot Micro-Credentials Model

Kumudu Amarawardhana 1, Sondoss El Sawah 1, Ugur Turhan 1, Capability Systems Centre (CSC), UNSW Canberra, Campbell, ACT, Australia

Type: Paperless Presentations
Stream submitted: C.6. Education for Digital Natives

Australia faces complex global challenges that demand a resilient and integrated defence force capability. As these challenges continue to evolve and become more intricate by the day, it is imperative to simplify the processes involved in acquiring new capabilities. Additionally, it is vital to maintain the efficiency of the defence industry to strike a balance between capability acquisition and long-term sustainability. Moreover, modern systems are increasingly complex due to technological advancements, integration, and dynamic environments, posing challenges in understanding behaviour, predicting outcomes, and managing risks. Mission engineering (ME) provides a systematic approach to optimise system design, development, and operation, integrating technical, operational, and organisational aspects. Therefore, ME is crucial in accelerating capability development, extending its influence beyond defence to various sectors like health and manufacturing. It fosters innovation and efficiency in vital sectors, enhancing national resilience and competitiveness. Professionalising ME is vital for navigating these complexities, ensuring practitioners possess the skills and expertise to achieve desired outcomes effectively. Equipped with the skills to analyse evolving risks and develop innovative solutions, mission engineers ensure responsiveness to dynamic landscapes. UNSW Canberra introduced a stackable micro-credentials model in ME, comprising fundamental, intermediate, and advanced phases, which is a significant step towards professionalising the field in Australia. Co-designed with industry, this model not only demonstrates the gradual imparting of ME competency framework but also showcases the adaptability of ME competencies beyond defence, underscoring its relevance and importance. This presentation highlights UNSW Canberra's innovative strategy for addressing Australia's need for professionalised ME. Moreover, we demonstrate the models adaptability to different sectors' landscapes by tracing the evolution of ME concepts and competency frameworks across industry boundaries. Through this initiative, practitioners acquire the competence to navigate missions across various industries, signalling a new era of ME versatility with far-reaching implications in line with Australias needs.

21069 On the use of modern technology and systems engineering to operationalise theory into practice

Sanath Darshana Kahagalage 1, Hasan Hseyin Turan 1, Sondoss El Sawah 1, Michael Shayne Gary 2, UNSW Canberra, Canberra, AUSTRALIAN CAPITAL TERRITORY, Australia, UNSW Business School, UNSW Sydney, Kensington, Australia

Keywords: Case study

Type: Paperless Presentations
Stream submitted: C.6. Education for Digital Natives

This case study outlines a master's-level course in Systems Engineering. The course focuses on learning about model-based decision support frameworks and tools under conditions of deep uncertainty. Designed to equip students with essential tools for strategic decision-making in novel and uncertain situations, the course targets individuals interested in addressing decision problems within contexts of deep uncertainty. It utilizes a System Dynamics (SD) workforce simulation model, developed from a real-life case study, alongside the Exploratory Modelling and Analysis (EMA) Workbench.The course structure emphasizes the development of students' abilities to formulate decision problems and analyse outcomes to infer decision-making insights in the face of complexity and uncertainty. Delivering the course during Semester 2, 2022 and 2023 for a diverse student cohort in terms of age, discipline (such as engineering and business backgrounds), and technical backgrounds, allowed us to identify several aspects that succeeded and the reasons behind their success. These aspects include blended teaching, real-life case studies, power of modern technology, and interactive activities. Likewise, we identified several challenges and the underlying reasons. These challenges include a little overwhelming course content and lack of consideration of diversity of student cohort at the first iteration in 2022. While it was both interesting and challenging to deliver this course for the diverse student cohort, it was also a rewarding experience for both participants and course staff. The study reveals that students' grasp of complexity and uncertainty within decision contexts has advanced significantly through practical exposure and real-life case study involvement. Additionally, practical exposure provides students with a valuable opportunity to immerse themselves in the intricacies of the problem at hand. This experience not only imparts the skills needed to navigate complex situations but also cultivates the ability to arrive at well-informed decisions, even when confronted with uncertainties.

21102 Industry-Focused MBSE Curriculum: Role-Specific Capabilities to Meet Industry Needs

Ebrahim Aly 1 2, Emiliya Suprun 1 2, Sondoss Elsawah 1 2, Capability Systems Centre, UNSW, Canberra, Australia, School of Systems and Computing, UNSW, Canberra, Australia

Type: Paperless Presentations
Stream submitted: C.6. Education for Digital Natives

Model-Based Systems Engineering (MBSE) is rapidly gaining popularity across various industries due to its effectiveness in managing complex systems. Its utility is well recognized by researchers and systems engineering (SE) practitioners alike, who acknowledge its potential to streamline processes, improve accuracy, and enhance collaboration. Despite its recognized benefits, the adoption of MBSE still faces several challenges. Research has identified several challenges related to the adoption of MBSE, categorizing them into knowledge-based, tool-based, cultural and political, cost-related, and stakeholder understanding and acceptance-related challenges. Among these, knowledge-based and tool-based challenges are deemed the most critical. These challenges, particularly the knowledge related one, are closely linked to deficient coursework and training programs for MBSE. This highlights the pressing need for structured and robust MBSE curriculum that can adequately address these key barriers to MBSE adoption and ensure its successful integration into industry practices. To effectively address the disconnect between training programs and industry demands in MBSE, it is essential to thoroughly tackle the key components affecting the workforce readiness such as skills, competencies, and training levels. Additionally, these components should not be considered in isolation; rather, they should be viewed as an interconnected network where each element influences the others. This work proposes a framework that delineates these relationships and utilize it create a cohesive and comprehensive MBSE curriculum. By clearly defining the specific skills and competencies necessary for different roles in the MBSE ecosystem and matching them with corresponding training levels, the framework ensures a systematic and coordinated educational approach. The curriculum is applied for an MBSE professional education program delivered at UNSW Canberra. By incorporating the frameworks principles, the curriculum aims to equip students with the necessary skills and competencies to effectively apply MBSE, thereby addressing the key challenges in MBSE adoption and enhancing workforce readiness.