Accelerating the Transition of Wearable Display Technologies into Combat Medicine Training Systems

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ABSTRACT

Large-Scale Combat Operations (LSCO) and Prolonged Casualty Care (PCC) environments require military medical personnel to make complex treatment decisions under prolonged, resource-constrained conditions. Unfortunately, many current training technologies are not optimized for training these types of missions. For example, current AR/VR/MR technologies are too fragile for use during field training exercises. Similarly, manikin-based trainers with static moulage cannot dynamically represent injury progression or treatment consequences in real time. Fortunately, the recent emergence of low-cost, conformal display technologies presents a significant opportunity to transform field combat medicine training exercises by merging the real-time visual representation of MR technology with the ruggedness of a physical manikin.

Transitioning these technologies from laboratory demonstrations into rugged, field ready training systems presents engineering, integration, and human factors challenges. In this presentation, we propose a novel approach to address these challenges through a closed loop medical training ecosystem that combines low profile flexible displays, real time reactive scenario control, physiologically informed injury progression, and unobtrusive machine learning enabled human performance assessment. We also discuss key lessons learned related to system integration, ruggedization, scalability, compatibility with existing training workflows and infrastructure, and supply chain stability.

This effort reflects a broader shift within the larger Modeling and Simulation community toward rapidly integrating emerging, low-cost COTS technologies into practical, mission-focused training systems that improve readiness and measurable performance outcomes. By combining wearable visualization displays, reactive capabilities, intelligent training analytics, and operational integration into a unified architecture, advanced medical simulation technologies can move beyond isolated technical demonstrations to directly support medical readiness, training modernization, and future operational requirements.