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Challenges in Surgical Education

Utility of Virtual Reality Game Development Engines in Surgical Training

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Background: Game development engines such as Unity and Unreal Engine have undergone remarkable improvements, evolving from tools for simple game development into sophisticated platforms with diverse capabilities. As developers explore more advanced endeavors with these platforms, there is an opportunity to design immersive environments for surgical skill development, offering trainees a safe space to practice complex procedures. The delayed incorporation of these platforms into specialized surgical training has resulted in most operations being carried out with obsolete skills or significant safety risks.

Current Challenges: Surgical education is confronted by the intricacy of diverse procedures and the varying skill sets required. Traditional training methods often lack the precision and immersive realism necessary to adequately prepare surgeons for intricate surgeries. Furthermore, the constraints of time, patient safety, and ethical considerations hinder the exposure of trainees to a wide array of cases.

Need of Innovation: The Unity and Unreal game engines present promising avenues for addressing these challenges and fostering innovation in surgical training. Leveraging several imaging databases and modalities, developers can build virtual environments replicating targeted procedures' anatomical intricacies, including patient-specific anatomic variations. This high level of realism allows trainees to interact with virtual instruments and anatomical structures, gaining practical experience without risk to patient safety. Both Unity and Unreal engines offer integration with haptic feedback, hand-tracking devices, and procedural learning modules. These features facilitate deliberate skill acquisition through practice and track various technical metrics for improvement. The engines' adaptability enables the creation of procedure-specific scenarios that cater to trainees' skill levels. Developing procedure-specific surgical simulations using the Unity or Unreal game engine holds immense potential to transform surgical education. By offering tailored, immersive, and realistic training experiences, simulations powered by these engines can bridge the gap between didactic learning and practical experience, ultimately empowering surgical trainees to excel in their specialties.