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Research In-Progress

Towards the Continuous Learning Loop for Mastering Robotic Surgical Technical Skills

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Introduction: In this work, we propose a unified and objective learning framework designed to assess and provide feedback for the mastery of robotic-assisted surgery (RAS) technical skills. This framework enables the tracking of a user's learning journey between real surgical procedures and virtual reality (VR) content and provide continuous learning feedback in a bidirectional manner. Objective Performance Indicators (OPIs) have been utilized as a measure to quantify surgical skills. This has been effectively incorporated into our product line, specifically within the Case Insights™ and Insights Engine™. This integration allows surgeons to receive objective performance criteria regarding their surgical performance and compare their performance with peers and experts.

Methods: improve skills in any surgical specialization in RAS. We decompose surgical procedures (e.g., cholecystectomy) into applicable skills (e.g., blunt dissection, needle driving) and map these to specific low-level tasks. For skill evaluation, we incorporate relevant OPIs, enabling users to track their improvement and progress. Individual score metrics, as well as OPIs, are provided through Intuitive Learning platform (See Figure).

Preliminary Results: We conducted a preliminary human factors study, consisting of 3 experienced surgeons, 3 novice surgeons and 3 naïve surgeons to establish content validity and assess the effectiveness of the framework for surgical technical skills. Initial results suggest that the skills content and current workflow (score cards, metrics, trend over time etc.) serve as effective performance indicators for all surgeon groups.

Next Steps: The next step is to validate our exercises including advanced OPIs (e.g., motion smoothness), and show the effectiveness towards continuous learning for mastery.

Continuous Feedback & Learning Timeline

