ACS 2025 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

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Research In-Progress

A Framework for Evaluating Surgical Simulation Performance

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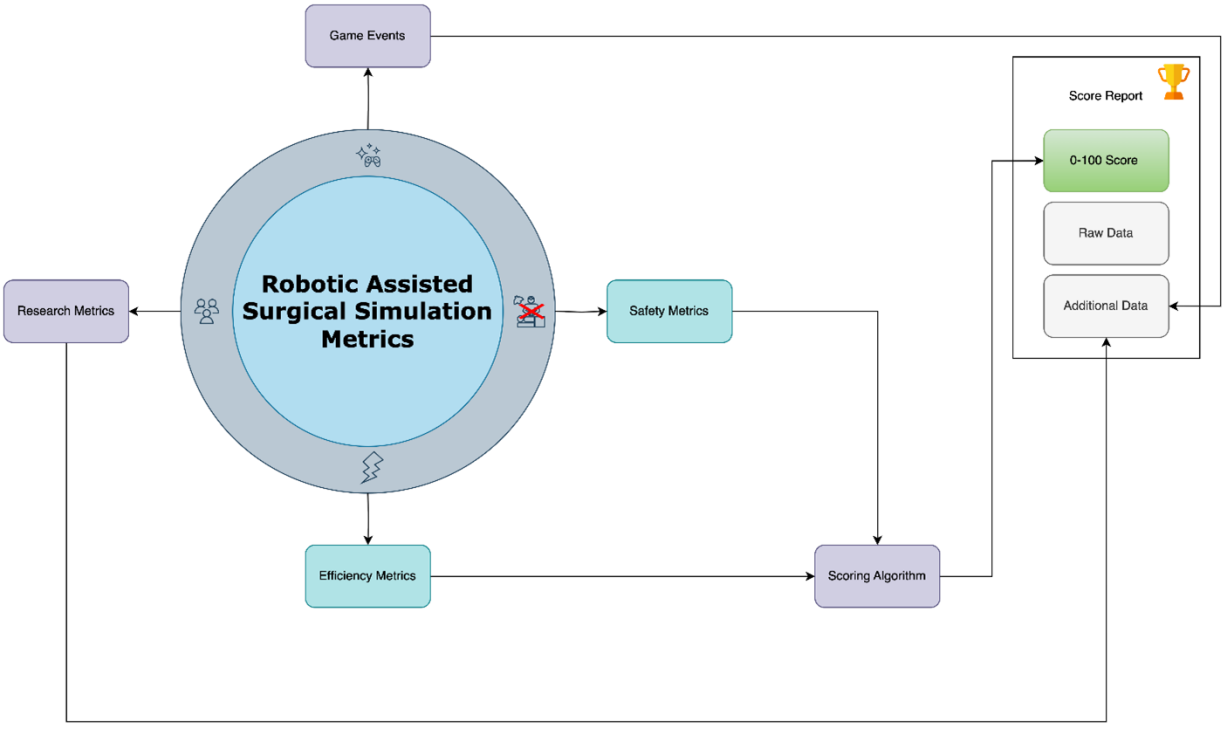
Introduction: Surgical simulation is an essential tool for training surgeons and evaluating their skills within a controlled and risk-free environment. As simulation technology advances, the development of robust evaluation metrics is crucial for ensuring patient safety and improving surgical outcomes. Traditional evaluation methods of a user's technical skill predominantly emphasize basic skill acquisition, and often fail to comprehensively assess the complexity of surgical technical performance.

Methods: We propose a novel framework for evaluating surgical simulation technical skills to provide a holistic assessment of a surgeon's basic technical capabilities. Our framework is categorized into four key domains: Safety Metrics, Efficiency Metrics, Game Events, and Research Metrics. Safety Metrics assess errors and deviations from best practices, whereas Efficiency Metrics focus on the use of time and resources during the exercise. Game Events capture exercise statistics and events, and Research Metrics offer quantitative data for in-depth analysis. These metrics are applied to exercises that increase in difficulty through repetition, thereby challenging surgeons to demonstrate competency across various surgical scenarios. A safety and efficiency-based score, ranging from 0 to 100, is generated to provide a digestible evaluation of the surgeon's skill. Surgeons can review their performance in each scenario, identifying areas for improvement by analyzing failed exercise repetitions and incurred penalties.

Preliminary Results: Preliminary results from internal surgical experts at Intuitive indicate that our framework more effectively identifies strengths and areas for improvement compared to traditional methods. This approach facilitates a more detailed and accurate assessment of surgical performance, enabling educators to tailor training to individual needs.

Next Steps: Implementing this framework in surgical education programs can enhance the quality of training, ultimately leading to improved patient outcomes. Further research will focus on refining the metrics and expanding the framework to cover a broader range of surgical specialties, ensuring its applicability across diverse surgical scenarios.


Game Events
Score Report
0-100 Score
Raw Data
Additional Data
Robotic Assisted Surgical Simulation Metrics
Research Metrics
Safety Metrics
Efficiency Metrics
Scoring Algorithm