

COMPUTER VISION IN OPERATING ROOMS: DEVELOPMENT AND EVALUATION OF A SYSTEM FOR REAL-TIME DETECTION OF CRITICAL OPERATIVE EVENTS

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Computer vision technology is increasingly used in modern surgery to enhance patient safety through real-time automatic detection of critical operative events. However, challenges related to video quality, lighting conditions, and camera angles can affect system performance. This study aimed to develop and evaluate an artificial intelligence-based system for accurate real-time detection of critical operative events in the operating room. The system was developed using deep neural network algorithms and was trained on standardized surgical video recordings. The evaluation was conducted in two phases: simulation testing using 50 video recordings of standardized surgical procedures and clinical testing in 10 operating rooms. Performance metrics included precision, recall, F1-score, receiver operating characteristic (ROC) curve analysis, and user feedback from surgical teams. During simulation testing, the system achieved a precision of 93%, a recall of 90%, an F1-score of 91.5%, while ROC analysis yielded an area under the curve (AUC) of 0.95. These results indicate a high level of accuracy in differentiating critical from non-critical events. In a clinical environment, the system successfully detected 88% of expected critical events with an average response delay of 0.2 seconds and an observed 15% reduction in operative errors. Feedback from surgical team members showed that 85% found the system highly useful, especially during laparoscopic procedures. The proposed computer vision system demonstrated robust performance in both simulated and clinical settings and has the potential to improve surgical safety and team coordination through integration into clinical workflows.

Keywords: computer vision, real-time analysis, critical operative events, surgical safety, artificial intelligence, deep learning

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