

Automated AI Inspection for Surgical Instruments in Sterile Processing

Computer-vision system automates surgical instrument identification and defect detection to reduce assembly errors and labor costs in hospital sterile processing.

Sterile processing departments struggle with slow, manual instrument identification and inspection, leading to tray assembly errors, missed defects, and costly rework in hospital workflows. This technology introduces an integrated computer-vision approach that performs fine-grained, model-specific recognition of surgical instruments alongside unsupervised anomaly detection—eliminating the need for large labeled defect datasets. Compared to today's manual checks and generic industrial vision tools, it delivers objective, repeatable results that reduce labor, cut errors, and increase throughput; quantitative gains are expected pending clinical pilots. A lab prototype has demonstrated proof-of-concept (TRL 3) for both identification and anomaly detection using off-the-shelf hardware and deployable software. If validated in clinical environments and integrated with hospital IT, the system can materially improve SPD efficiency, safety, and compliance while creating auditable inspection records. The approach aligns with ISO 13485 workflows and can be advanced toward 510(k) clearance with bench accuracy data, usability studies, and pilot-site validation.

Technology Validation

A benchtop prototype in a controlled lab setting has demonstrated fine-grained instrument recognition and unsupervised anomaly detection on real surgical instruments, establishing proof-of-concept performance. Validation to date is lab-based; application-relevant testing in hospital SPDs and usability studies are planned to substantiate real-world KPIs.

Advantages

- Fine-grained, model-specific recognition rather than broad category classification, reducing tray assembly errors.

Technology ID

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Category

Artificial Intelligence & Machine Learning/AI-Integrated Imaging Systems & Industrial Vision and Inspection

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- Unsupervised anomaly detection that avoids costly labeled defect datasets and scales across instrument types.
- Integrated workflow (capture ID anomaly UI) for objective, repeatable results and audit trails.
- Deployable with off-the-shelf hardware and compatible with ISO 13485 environments and hospital IT.
- Expected reductions in labor and increased throughput, with compliance support for quality assurance. (expected pending pilots)

Applications

- Hospital sterile processing departments (SPDs) for tray assembly verification and defect screening.
- Operating room supply and quality teams for pre-case instrument readiness checks.
- Ambulatory surgery centers and third-party reproprocessors for high-throughput QA.
- Medical device manufacturers for incoming inspection and production-line QA of reusable instruments.

TRL: 3

Intellectual Property:

Provisional-Patent, 2025-09-08, United States