An Augmented Reality Training App For the Introduction of a Novel Robotized Laparoscopic Instrument.

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Objective

- **HandX®** is a hand-held laparoscopic, software-driven, robotic platform, used to manipulate fully articulating 5mm instruments.
- The system enables surgeons to perform complex tissue manipulations at difficult angles and in narrow, hard-to-access, spaces.
- To gain proficiency with the **HandX®**, surgeons can practice in a box trainer, which relies mostly on self-evaluation.
- **Human Xtensions LTD** has developed an **augmented reality (AR) app** for laparoscopic skills acquisition, which provides a layer of objective evaluation, and an interactive experience.





Figure 1 – Game screen of the AR app



Figure 2 – Mentoring app setup

Technology

- We used artificial-intelligent (AI) and computer vision techniques to automate a laparoscopic skills task and create an engaging and “gamified” practice environment.
- We trained machine-learning (ML) models to analyze the surgeons’ performance, technical skills, and ergonomics in real-time, to provide insights to surgeons (Figure1).
- Unlike most virtual reality (VR) training systems, our practice platform, including the physical instrument and the app, maintains haptics of using the actual surgical devices in a physical environment (Figure 2).

Preliminary results

- The app was tested with a mix of surgeon and non-surgeon users, and found to be very engaging and user friendly.
- We intend on expanding the app’s usage to include various clinical scenarios and making it an integral part of the HandX® proficiency gaining process.

Discussion

- The app may improve skill acquisition and the surgeon’s experience by making practice more engaging, providing benchmarks, and objective performance evaluation.
- The app provides an opportunity to create a portable practice station, which can increase surgeon engagement, and collect training data for future development, at a cost of a Tablet computer.

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