A Surgical and Fine-Motor Skills Trainer for Everyone?
Touch and Force-Feedback in a Virtual Reality Environment for Surgical Training.

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Introduction
Access to the laboratory component of a class is limited by resources, while lab training is not currently possible for distance learning. To overcome the problem, a solution is proposed to enable hands-on, interactive, objectively scored and appropriately mentored learning in a widely accessible environment. The proposed solution is the Virtual-Reality Motor-Skills trainer to teach basic fine-motor skills using Haptics for touch and feel interaction as well as a 3D virtual reality environment for visualization.

Goal
The goal of this interdisciplinary research is to move toward an understanding of human performance in skills development through computer assistance as well as to increase laboratory access and distributed learning.

Conclusion
The Virtual-Reality Motor-Skills trainer created, is designed to teach baseline fine-motor skills used in surgery. Performance measures include speed, accuracy and efficiency of motion. Dominant, non-dominant hands working in tandem can be trained and evaluated. The surgical simulator is based on the SPRING software framework.

Basic training for grasping and transfer skills involving both dominant and non-dominant hands. Beads are moved from right to left. Bimanual interaction is required to open the hinged cup.

Endoscopic training with the endoscope on the non-dominant hand. The dominant hand is holding the laparoscope. Limited lighting requires to move endoscope and laparoscope in tandem.

Microscopic training with narrowed surgical field to limit tool movement. Scenarios include a hinged cup as well as blood suction. The beads target area is specialized to increase difficulty. Foot pedals enable zooming.

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