

Minimally Invasive Surgery Simulator — Testing Motor Skill Acquisition

ACS Technical Note 2011-3

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We have created a minimally invasive surgery (MIS) simulator to test how different training regimens influence learning. Previous research has shown that MIS simulators, both manual and robotically assisted, can be used to study motor skill acquisition, and are in their own right a potential application of improving learning schedules.

The MIS simulator, shown in Fig. 1, is similar to commercially available simulators, but has additional features that are not usually included. The design allows for any camera and display to be used, and supports the ability to record user actions, including time and errors. A top-hinged design allows users to easily access the interior of the simulator and switch tasks apparatus, as shown in Fig. 2. The top also has a mounted light to provide ample illumination.

The simulator supports tasks previously used to study MIS acquisition¹. Three sample tasks for use in the simulator are shown in Fig. 3. These are moving rubber objects between pegs, moving small handled beads between receptacles, and grasping a rope with alternating graspers.

Currently, a system of locking materials in place below the camera is under development. This will increase ease of use for the simulator as well as increase ease of changing tasks correctly. We will be using the MIS simulator to examine regimes for learning procedural skills and testing learning theories².

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2. Kim, J. W., Koubek, R. J., & Ritter, F. E. (2007). Investigation of procedural skills degradation from different modalities. In *Proceedings of the 8th International Conference on Cognitive Modeling*. Lewis, R. L., Polk, T. A., Laird, J. L., (eds.). 255-260. Oxford, UK: Taylor & Francis/Psychology Press.

This work was sponsored by ONR (#N00014-10-1-0401).



Figure 1. The simulator set up for use with Apple iMovie software.

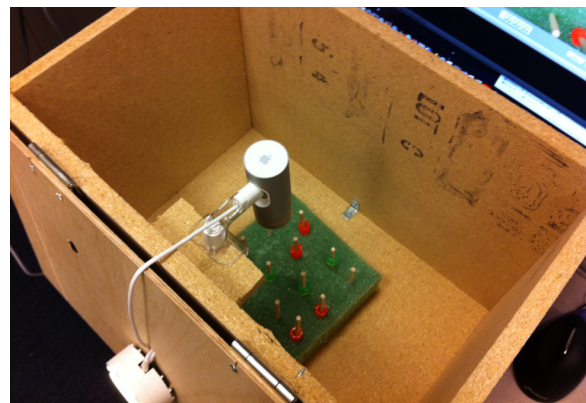


Figure 2. The interior of the simulator.



Figure 3. Example tasks.