An editor to create integrated tutors for a modular set of mixed reality simulators

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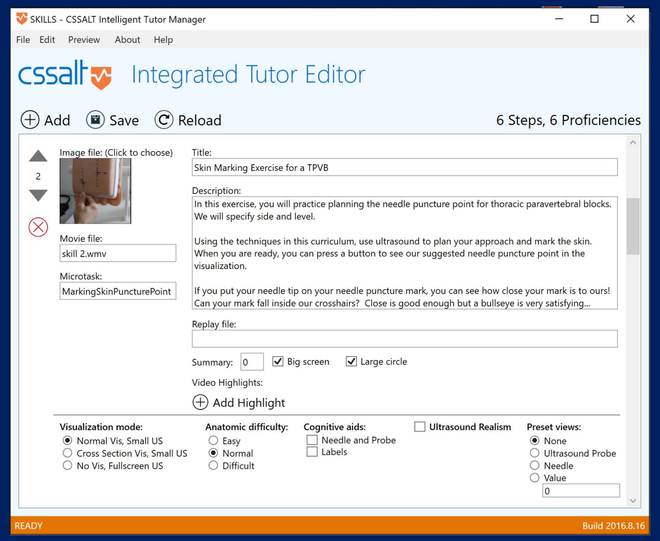
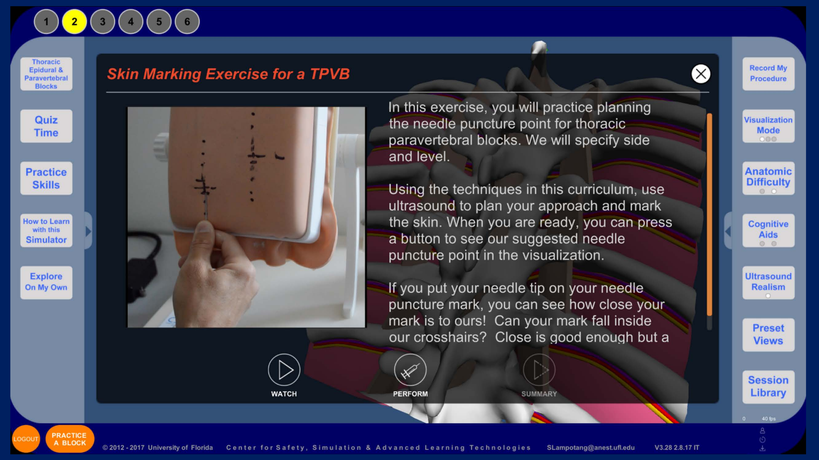
Background

We have developed procedural simulators[1-3] that can work in austere conditions and thus can be deployed to theater to train frontline clinicians in acquiring or maintaining skills. Deployed clinicians tasked with treating warfighters will most likely not have instructors available. An integrated tutor (IT) embedded into a simulator can compensate for lack of instructors in austere environments, allowing for self-paced self-study and self-debriefing after a simulator session.

In addition, simulators often lie idle because of a lack of instructors to teach with them. An IT facilitates self-study and self-debriefing allowing learners to acquire skills on the simulators even when instructors are unavailable.

We designed the IT to be tightly integrated into mixed reality simulators that adhere to the SMARTS (System of Modular Augmented Reality Tracking Simulators) rapid simulator development platform. To facilitate and speed development of ITs for multiple, future procedural simulators that will eventually be developed on the SMARTS platform, we developed an IT Editor that empowers non-technical persons to implement an IT based on input from subject matter experts (SME).





Methods

The IT Editor is a Windows desktop application that provides an intuitive tab-based layout for content creators and transfers content using XML and a custom data structure to SMARTS-compliant simulators. A standard data template ensures that the IT editor can be used across different applications and procedures. We use continuous backups to keep two copies at almost all times to minimize data loss and markdown files to quickly edit the instructions for using the editor.

Results

The IT Editor decouples content creation and simulator development, facilitating faster overall development.

An Edit mode enables users to modify curricula, add videos and pictures to each deconstructed step of a procedure, specify a summary point for videos, and simulator settings that apply to a step. This mode further simplifies curriculum development by enabling addition, deletion and rearranging of steps.

A Preview mode lets the IT creator preview how the content will appear on the simulator display monitor, boosting confidence while editing the IT about how the screens will actually display.

A backup model enables users to discard changes and revert to a previously saved checkpoint at any time. This assures retention of all changes made in case of system failure. Users have an option to continue working on a recovered file or from the last save after recovering from a system failure.

Conclusion

To date, an undergraduate pre-med student has used the IT Editor to implement two integrated tutors, one for a thoracic regional anesthesia simulator and one for a central venous access simulator, offloading the task of content creation and assembly from the SMEs who, as clinicians, generally have limited time availability. The IT Editor is a reliable program that offers an efficient way to integrate videos, text summaries, graphics, as well as simulator presets, settings, visualizations and modes. The IT Editor enabled responsive rearrangement of modules as per evolving SME requirements. Additionally, the preview mode allowed frequent content review before finalization. The estimated time to assemble an IT using the IT Editor depends upon curriculum complexity and ranges from 20 to 30 minutes. With all content finalized, the above time estimate is to copy and paste files and text into the IT Editor.

References

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2. *Simulation in Healthcare* 2014;9:56-64
3. Sappenfield et al, submitted to *Anesthesia & Analgesia*, 2017

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