

A New Approach to Virtual Microscopy for Training and Skills Assessment

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ABSTRACT

Those seeking to assess microscopic skills in learners or practitioners have long sought practical electronic tools for this purpose. The challenge is to provide the user with a realistic simulation of slide exploration using sufficient sample size to provide context (including focal plane context) for the observations. While whole-slide imaging systems are capable of these tasks, they present several practical difficulties because they require the storage and delivery of gigabytes of data from special web servers to special web viewers. Users often complain about waiting for data to load, and delivery of focal plane imaging is said to be prohibitive. Alternative media was designed that would address these shortcomings and facilitate the creation of electronic training modules.

Using robotic microscopes built from surplus equipment and controlled by custom computer code, we prepare media that is easily delivered in megabyte and kilobyte quantities of data using ordinary web servers and standard technologies. Thus, the media is easily embedded into interactive web-based exercises designed to challenge skills. The media offers focus simulation employing images collected at different planes along the z-axis (z-stacks). Key hardware

and software design criteria are presented. Three example applications for learning and assessment are discussed. In hematology and body fluid analysis, large stitched mosaics made up of 500 overlapping frames are mapped to 500 corresponding z-stacks to allow for x, y, and z sample exploration. The images are presented within an interactive web page that provides a case study experience. For urinalysis, wet prep z-stack photography allows visualization of hard-to-see elements. A large number of focusable fields are presented within an interactive case study. In all examples, the user is challenged to identify significant findings as they would in practice. Performance feedback is provided along with guidance, emphasizing the critical thinking aspects of microscopy, via a screencast by experts reviewing the case.

Note for the committee:

A short silent video of a body fluid teaching exercise can be found here.

http://alliedhealth.lsuhs.edu/ClinicalLaboratory/bodyFluids/lsuhsc_demo.mp4

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