Poster Presentation

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Virtual X-Ray Laboratory for Teaching Crystallography and Other Courses

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Contemporary research equipment is not only extremely complex and very expensive, it is typically fully computerized and most tasks are executed without student participation. This creates a number of substantial educational drawbacks and limitations. The paper presents a virtual multifunctional X-ray laboratory (v-Lab) that helps overcome the above mentioned problems, addresses the demands of distance and blended education and meets learning habits of today's students. The v-Lab enables students to practice concepts, tasks, and equipment operations in a manner that can't be achieved on actual equipment. It employs virtual X-ray equipment that realistically imitates the functionality and design of actual equipment and also includes educational analytical software. Virtual data can be exported to popular software as well. Highly interactive online experiments using virtual equipment have been created for undergraduate students to learn fundamental principles underlying the analytical x-ray methods and become familiar with the design and operation of the X-ray equipment. A variety of visual, audio and traditional learning and assessment resources were integrated with virtual experiments to provide students with "just-in-time" learning opportunities. The virtual equipment has also been used for preparing undergraduate and graduate students to perform various research studies including but not limited to: X-Ray diffraction study of phase transitions in ferroelectric ceramics and nanoscale thin films, qualitative phase analysis of various compounds, nanostructured materials and human kidney stones, etc. Examples of virtual experiments used for teaching crystallography and other science and engineering courses at several US and Russian universities are presented and discussed. An easy-to-use authoring tool enables instructors to customize existing virtual experiments, and create new ones, as well as to add their own samples into the sample collection.

Keywords: education, training, distance learning