

EarthTutor: An Interactive Intelligent Tutoring System for Remote Sensing

Aaron Bell bell@shai.com Stottler Henke Associates, Inc. San Mateo, CA, USA	Kristen Parton parton@shai.com Stottler Henke Associates, Inc. San Mateo, CA, USA	Elizabeth Smith exsmith@odu.edu Old Dominion University Norfolk, VA, USA
---	---	--

Earth science classes in colleges and high schools use a variety of satellite image processing software to teach earth science and remote sensing principles. However, current tutorials for image processing software are often paper-based or lecture-based and do not take advantage of the full potential of the computer context to teach, immerse, and stimulate students. We present EarthTutor, an adaptive, interactive Intelligent Tutoring System (ITS) being built for NASA (National Aeronautics and Space Administration) that is integrated directly with an image processing application. The system aims to foster the use of satellite imagery in classrooms and encourage inquiry-based, hands-on earth science scientific study by providing students with an engaging imagery analysis learning environment.

EarthTutor's software is available as a plug-in to ImageJ, a free image processing system developed by the NIH (National Institute of Health). Since it is written in Java, it can be run on almost any platform and also as an applet from the Web. Labs developed for EarthTutor combine lesson content (such as HTML web pages) with interactive activities and questions. In each lab the student learns to measure, calibrate, color, slice, plot and otherwise process and analyze earth science imagery. During the activities, EarthTutor monitors students closely as they work, which allows it to provide immediate feedback that is customized to a particular student's needs. As the student moves through the labs, EarthTutor assesses the student, and tailors the presentation of the content to a student's demonstrated skill level.

EarthTutor's adaptive approach is based on emerging Artificial Intelligence (AI) research. Bayesian networks are employed to model a student's proficiency with different earth science and image processing concepts. Agent behaviors are used to track the student's progress through activities and provide guidance when a student encounters difficulty. Through individual feedback and adaptive instruction, EarthTutor aims to offer the benefits of a one-on-one human instructor in a cost-effective, easy-to-use application.

We are currently working with remote sensing experts to develop EarthTutor labs for diverse earth science subjects such as global vegetation, stratospheric ozone, oceanography, polar sea ice and natural hazards. These labs will be packaged with first public release of EarthTutor in December 2005. Custom labs can be designed with the EarthTutor authoring tool. The tool is basic enough to allow teachers to construct tutorials to fit their classroom's curriculum and locale, but also powerful enough to allow advanced users to create highly-interactive labs.

Preliminary results from an ongoing pilot study demonstrate that the EarthTutor system is effective and enjoyable teaching tool, relative to traditional satellite imagery teaching methods.

Detailed contact information:

Aaron Bell

bell@shai.com
AI Project Manager

Stottler Henke Associates, Inc.
951 Mariner's Island Blvd, Ste 360

San Mateo, CA 94404
(650) 931-2700

Kristen Parton
parton@shai.com
AI Software Engineer
Stottler Henke Associates, Inc.
951 Mariner's Island Blvd, Ste 360
San Mateo, CA 94404
(650) 931-2700

Elizabeth Smith
exsmith@odu.edu
Research Assistant Professor
Center for Coastal Physical
Oceanography
Department of Ocean, Earth and
Atmospheric Sciences
Old Dominion University
Norfolk, VA 23529
(757) 683-5567