Computer Science

ALERT: AN ARCHITECTURE FOR THE EMERGENCY RETASKING OF WIRELESS SENSOR NETWORKS. Syed R. Rizvi, Stephan Olariu, & Michele C. Weigle, Dept. of Computer Science, Old Dominion University, Norfolk, VA 23529. When an emergency or disaster strikes, first responders work as part of a complex emergency management network that calls upon many functions, resources, and capabilities. The objective of our research is to design a real-time information system to improve emergency-response functions by bringing together information to respond to a terrorist attack, natural disaster or other small or large-scale emergency. We call this system *ALERT: An Architecture for the Emergency Retasking of Wireless Sensor Networks*. The novel contribution of this research to the emergency response strategies is the seamless integration of various wireless sensor networks by *retasking* them with explicit missions involving a dynamically changing situation. Preliminary results have shown that retasking sensor networks for emergency response is a promising new paradigm that can not only promote a wider adoption of sensor network systems in support of guarding our national infrastructure and public safety, but can also provide invaluable help with disaster management and search-and-rescue operations.

DENSE UNSTRUCTURED AND STRUCTURED MATRIX COMPUTATIONS USING MPI. Stephen V. Providence, Dept. of Computer Science, Hampton University, Hampton, Virginia 23668. Computations with dense unstructured general matrices requires $O(n^3)$ operations and $O(n^2)$ words of storage for $n \times n$ input matrices. Such matrices are encountered in applications to solving integral equations. The best algorithms involving computations with dense structured matrices require $O(n \log^2 n)$ operations and $O(n)$ words of storage with small overhead constants. MPI or the message passing interface binds to the C programming language and is used to implement parallel algorithms. The time and space complexity estimates above are for sequential algorithms involving matrix computations. We have interest in the complexity estimates for parallel implementation of the sequential versions. For p processors where $p << n$, straightforward complexity estimates are proportional to $O(n^3)/p$ operations and $O(n^2)/p$ words for parallel implementation of dense unstructured general matrix computations. Analogously, computations with dense structured matrices require $O(n \log^2 n)/p$ operations and $O(n)/p$ words for parallel implementation. We conduct experiments on a high-performance computing cluster computer system to obtain the hidden constants in the O-notation of the estimates given.

Education

THE IMPROVING GROUNDS EXHIBITION. E. G. Maurakis, R. Conti, and D. Hagan. Science Museum of Virginia. Objectives of the Improving Grounds exhibition project are to create exhibits, programs, audio and video media for mass communication, and web-based curriculum materials on how to improve health and fitness. The overarching theme is a science perspective on understanding, testing, and measuring self-improvement in health and fitness. Exhibits and programming will be

based on the 21st century learning and innovation skills (critical thinking, problem solving, creativity, innovation, communication, collaboration, visual literacy, scientific and numerical literacy, and cross disciplinary thinking) of the Institute of Museums and Library Services (IMLS), which are consistent with the Point 1 Virginia Science Standards of Learning. A curriculum integrated web portal will contain a data bank of health and nutrition facts that students, teachers and the general public can use to track their own health and fitness improvements over time and compare them with like populations. Funded in part by Health Diagnostics Laboratory, Inc.

INCORPORATING A JOURNAL CLUB EXPERIENCE IN THE UNDERGRADUATE BIOCHEMISTRY CURRICULUM. Lisa S. Webb, Department of Molecular Biology and Chemistry, Christopher Newport University, Newport News, VA. In an effort to increase student exposure to the primary literature and improve critical thinking skills, a journal club experience was incorporated into the Introductory Biochemistry courses. Students were expected to read the assigned article, conduct relevant background research necessary to understand it and place it in context, and discuss it in class. A rubric for evaluating classroom participation in the discussions was presented. In addition to discussing the articles in class, there was also a midterm and final quiz for the journal club portion of the grade. The quiz questions varied in level, with the first questions lower on Bloom's Taxonomy (knowledge, comprehension) and later questions much higher (application, analysis, evaluation). Anonymous student responses to the journal club were mixed. Many students commented on how much they learned from (and, in a few cases, enjoyed) the experience, but several complained about how hard they had to work to understand the material. Overall, it was a positive experience that will be repeated.

SO MANY PLANTS - SO LITTLE TIME. E. G. Maurakis, University of Richmond. Objectives of this project are to heighten awareness of indigenous knowledge of plants and their uses, and archive the interplay of culture, plants, and animals in the US Virgin Islands. Studies over three years yielded a children's book, *Musical Seeds and Medicine Leaves* and a 27-min film documentary, *So Many Plants – So Little Time*. In the children's book, a teenager from New York City discovers the natural treasures that the island of St. John USVI has to offer through unexpected circumstance, curiosity, and exploration which lead to discover of the "old ways" that have been forgotten. He then comes to realize how much fun he can have "unplugged" while still learning about his heritage and the environment (Flesch Kincaid reading ease=87.2; Flesch Kincaid reading level=3.3 and up; with an accompanying DVD of plants encountered in the book). The documentary, *So Many Plants – So Little Time*, explores the relationship between peoples and local flora and fauna of St. John USVI, and how the loss of the knowledge base of plants and their uses are related to the changing island culture. Funded by the Kantner Family, University of Richmond, and the Virginia Academy of Science.

RENEWABLE ENERGY CURRICULUM MATERIALS USING MULTIPLE MEDIA FORMATS. David B. Hagan, Science Museum of Virginia, 2500 W. Broad Street, Richmond, VA 23220. This project arose from a challenge to present curriculum content on energy sources and consumption in Virginia, made possible by

a grant from the Dominion Foundation. Science Museum of Virginia is a center of informal science education, generally defined as "science teaching and learning that occurs outside of the formal school curriculum in places such as museums, the media, and community-based programs." (NSTA Position Statement: Informal Science Education). The museum presents different content components in several forms of media focused on alternative and conventional energy sources. These include: a 2' x 3' original, detailed poster map of Virginia *(Energy Virginia)* showing sites of sources of energy and delivery mechanisms, including alternative and conventional sources. *Question Power* is an original six-minute video presenting the challenge of discovering clean, abundant energy sources. Eight one-minute videos display advantages and disadvantages of each of the major energy sources (wind, water, solar, geothermal, uranium, coal, oil, natural gas). The *Watt Wall* is a large computer-driven100 square-foot display showing global energy demand and consumption. In addition, there is a K-12 Teacher Guide for these curriculum materials.

SERVICE LEARNING AND SUBSEQUENT COMMUNITY ENGAGEMENT IN A FIELD MAPPING CLASS. Dr Julia A. Nord, Atmospheric, Oceanic & Earth Sciences, & Dr Thomas C. Wood, New Century College. George Mason University. Fairfax, VA. Student feedback on experiential learning (EL) activities in a Mason, upper division Field Mapping Techniques course, provided insight in line with literature confirming the value of EL. This course was revised using service learning, and community learning pedagogies to improve student knowledge and affect domains. We surpass our traditional field oriented activities, provide services to the partners, and engage students through active learning projects and reflection. Teams create maps working with various techniques and equipment from GPS, GIS, and transits to pace-and-compass. All projects include field reconnaissance, mission planning, equipment check, data collection and processing followed by the creation of the map. The final project entails meeting with the Director of Environmental Studies on the Piedmont to discuss spatial information needs. Students design and develop projects that enable them to collect data and present usable maps and suggestions back to the Director. We utilize Kolb based EL to engage current, real world issues with repetitive, reflective practice. Students work at the upper levels of Bloom's revised Taxonomy and use at least seven of Gardner's multiple intelligences. We hypothesize, students will increase interest, capacity and ability to apply their knowledge and consequently improve. The NSF developed Student Assessment of Learning Gains instrument will measure these outcomes.

Environmental Science

COMPARISON OF THE NI RIVER AND MASSAPONAX CREEK IN SPOTSYLVANIA, VA. D. Gutierrez, M. Recta, and M.L. Bass, Department of Earth and Environmental Sciences, UMW, Fredericksburg, VA 22401. The purpose of this research was to compare the water quality of the Ni River and Massaponax Creek, in Spotsylvania County. The Ni River is located in the more rural areas of the County while Massaponax Creek flows through more urbanized areas. Planned development of the Ni Village community will be occurring around the Ni River in the next few years and we expect the stream to be impacted like Massaponax Creek. Three different