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NEWS

UC SANTA CRUZ TO OVERSEE CREATION OF ENVIRONMENTAL MONITORING SYSTEM FOR MONTEREY BAY

Naval Postgraduate School, Monterey Bay Aquarium Research Institute, and National Oceanographic and Atmospheric Administration to collaborate on unique computer network

FOR IMMEDIATE RELEASE

SANTA CRUZ, CA—The Office of Naval Research has awarded a multimillion-dollar grant to the University of California, Santa Cruz—in cooperation with three other Monterey Bay Area institutions—for a five-year project to develop a computer network that will display dynamic pictures of marine and weather phenomena in the bay as they happen.

Meteorologists and oceanographers will use the network to understand better the flood of data they get from satellites and instruments that measure winds, temperatures, currents, and other facets of the complex interplay among air, land, and sea. With powerful computer graphics and more control over their data and instruments, researchers hope to gain new and more detailed understanding of the Monterey Bay environment, which is rapidly becoming a national center for marine studies.

The scientists will study a specific problem: how and why sea breezes develop. Accurate weather forecasts must consider sea breezes. However, other crucial tasks such as charting ocean currents and responding quickly to oil spills also hinge upon a solid grasp of how sea breezes work, because winds and currents are closely linked.

The Office of Naval Research has committed about \$3.1 million to the project for its first three years. An additional \$1.7 million of funding for the fourth and fifth years would follow a review.

Researchers at UCSC's Baskin Center for Computer Engineering and Information Sciences are in charge of the project. They will develop the complex data-handling and computer-graphics tools needed to make sense of vast amounts of environmental information. Scientists who will help design the system, provide instruments to gather data, and use the system once it is complete are at three Monterey institutions: the Naval Postgraduate School, the Monterey Bay Aquarium Research Institute (MBARI), and the National Oceanic and Atmospheric Administration's Center for Ocean Analysis and Prediction (NOAA/COAP).

"This project affirms and strengthens the bonds among research groups in the Monterey Bay Area," says UC Santa Cruz Chancellor Karl S. Pister. "It also represents another step toward building

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the research and service capabilities of UCSC for the state and the nation."

According to Patrick Mantey, chairman of UCSC's computer engineering department and the project's principal investigator, the proposed system will allow dynamic and extremely detailed studies of environmental phenomena, such as the sea breeze.

"The biggest challenge is to pull together diverse data from satellites, instruments on land and on buoys, and computer models, and put it all into a picture so a researcher can get a synthesized view," Mantey says. "Computer graphics can present lovely pictures, but they must be carefully designed so that the user gets a true understanding of the physical phenomena."

UCSC assistant professor Alex Pang will lead the effort to develop information-packed graphic images of the data. At first, Pang will consult with scientists at the Naval Postgraduate School, MBARI, and NOAA/COAP to learn their needs. As the project grows, the graphics will evolve from one-dimensional plots to three-dimensional images and "movies" of cloud cover, barometric pressures, temperature changes, wave heights, winds at various altitudes, or combinations of these and other measurements. Pang's foremost task, he says, is to move beyond visual splendor and make these images useful for scientific analysis.

The rest of the team must devise an underlying system that can cope with continuous large streams of data. UCSC assistant professor Darrell Long, one of the primary system architects, estimates that the finished network may have to handle the equivalent of 300,000 typewritten pages of new data each day, in many different formats.

The key, Long says, is creating an indexing system that will steer the meteorologists and oceanographers through their data as quickly as possible. On-line computer memory will contain the newest data, while older charts and figures will be just seconds away on magnetic disks, optical storage, or tapes. A high-speed communication network will link workstations around the bay.

The planned system will be "interactive," allowing researchers to control their sensors as they watch data come in. For example, some devices use lasers to measure wind speeds in one direction with high resolution. If a squall threatens to form, researchers may wish to focus those devices on one part of the bay.

Researchers can also give the computer system itself control over the sensors so that they need not monitor the sensors all the time. By using "machine learning" techniques, in which computers search for interesting patterns, the UCSC team hopes to create a system that can recognize important events and make the correct changes in the sensors.

The grant will cover salaries for about five graduate student researchers each year at UCSC, research staff, and summer stipends for faculty. Some new instruments will be installed by Naval Postgraduate School scientists, but most data will come from existing sensors or from sensors already planned by the three Monterey agencies. UCSC researchers will use new graphics hardware funded in March by a \$1.2 million grant from the National Science Foundation.

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