

The Remote Access Astronomy Project

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Abstract

The Remote Access Astronomy Project is a unique telescope and data distribution system that has the potential to change the way astronomical, earth science, and physics concepts are taught to high school and undergraduate students. The project uses high resolution images and image processing techniques that appeal to the natural curiosity people have about space and astronomy. In addition, particularly at the secondary level, it serves as a forum for low cost and rapid distribution of curriculum materials among teachers and as an educational network between high schools and universities.

By using a combination of high performance microcomputers, high resolution graphics, and high speed communications technology, the project can break down the traditional classroom boundaries and allow students and teachers access to a much richer environment. The system is currently in use at the undergraduate level at UCSB, a local junior college, and several California high schools. The project is sponsored by the University of California, The National Science Foundation's Center for Particle Astrophysics, Rockwell Corporation International, and the National Aeronautics and Space Administration.

Rationale behind the project

The Remote Access Astronomy Project at the University of California, Santa Barbara originally developed out of a desire to improve astronomy education at the undergraduate level. Students were disappointed when they observed celestial objects with the small portable telescopes used in the astronomy labs. These objects appeared only slightly better than with the naked eye, and nothing like the spectacular photographs taken with the large telescopes found in astronomy text books. By mounting a sensitive CCD camera on a 14-inch telescope, students can study stars, galaxies, nebulae, and other interesting items in a more meaningful way. Moreover, by taking advantage of computer networks and operating the telescope remotely, students need not gather on the roof of the physics building late at night to do their observing.

Using the communications technology

Within the last decade, computer networks and computer bulletin board services have become very popular. The technology already existed to extend access to our computer controlled telescope to high schools via a modem link. In addition, a tremendous volume of images has become available through the NASA space missions (Voyager I and II, Magellan, Viking), Earth-orbiting satellites (IRAS, COBE, Hubble Space Telescope), and other sources. At the university we have access to a wealth of data not generally accessible by high schools, but which could be used effectively by creative teachers in a variety of science courses. Since July 1990, we have maintained the ASTRO-RAAP bulletin board to allow access to these resources and provide a forum for discussion. In December 1994, we opened a home page on the World Wide Web to make the database more accessible.

Integrating the RAAP

The strength of a program such as ours lies in its ability to expand the resources normally available to high school students and teachers, specifically the use of our telescope and our experience with astronomy. To make incorporating astronomy into a classroom as painless as possible we have developed a core of image processing exercises that are available for download. These activities use digital image processing to examine different phenomena; from the rotation rate of our sun to the Doppler shift of the cosmic microwave background. In addition to the exercises, we have made our telescope available to students who are interested in pursuing a line of personal research. Thus far, students have conducted searches for dark matter and black holes and measured the light curves of variable stars and recent supernovae. Such research, done by individual students or groups, becomes a possibility once a classroom starts to exploit the potential of our program.