Magnifying light reveals more about the cosmos

By using the same technique that recently revealed two planets more than 5,000 light years away from Earth, Ohio State University researchers could again potentially uncover new celestial bodies.

The technique, called gravitational microlensing, is based on one aspect of Einstein's theory of relativity: gravity bends space. When two stars align almost perfectly with Earth, the gravity of the star closest to Earth temporarily bends and magnifies the light from the more distant star. The closer the stars are to a straight line the greater the magnification, and the more intricate and complex the data.

Andrew Gould, Ph.D., a professor of astronomy at The Ohio State University, and his colleagues are using the Ohio Supercomputer Center to decipher data collected by a team of international astronomers from such a microlensing event last year.

"The light curve had two sharp spikes, so we knew almost immediately there is a planet," Gould said, "because stars without planets produce smooth, bell-shaped light curves." However, after many weeks of intensive calculations, a single-planet model just didn't fit.

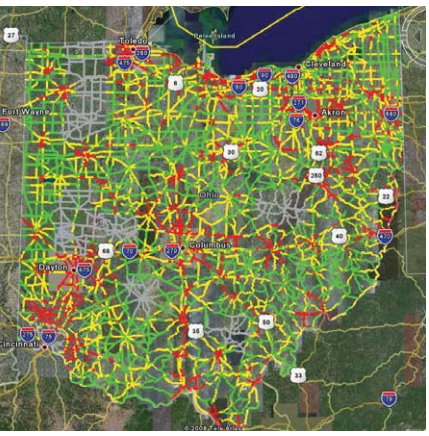
"That means there must be a second object orbiting the star," Gould said. To identify the object, Gould and Ohio State graduate student Subo Dong are testing more than 100 million different models on OSC's supercomputers.

"No matter what our answers turn out to be, this is exciting," Dong said. "We just need to figure out if the second orbiting object is another star, or a new planet." ■

Project lead: Andrew Gould, Ph.D., The Ohio State University
Research title: High magnification microlensing: Theory & planet detection
Funding source: National Science Foundation

Computer models predict traffic accident 'hot spots' for Ohio

Project lead:
Christopher Holloman, Ph.D., The Ohio State University
Research title:
Predicting crashes and crash causes on Ohio roadways
Funding source:
Statistical Consulting Service at The Ohio State University Department of Statistics



An Ohio State University statistics expert used the powerful machines of the Ohio Supercomputer Center to design a program that identifies traffic accident hotspots on Ohio's roadways. Christopher Holloman, Ph.D., produced color-coded computer models to tell state troopers where fatal and injury accidents, especially those from speeding and drunk driving, are most likely to occur.

"We started out evaluating a couple of hundred miles worth of roadway in five major cities in Ohio," said Dr. Holloman. "The Highway Patrol found the information I provided extremely helpful, so it asked me to include all of Ohio."

"Crashes are going to occur — it's a matter of when and where," said Lt. Anthony Bradshaw of the Ohio State Highway Patrol. "If we're able to predict a crash, then we're better able to prevent it."

> "We already had the code, we just needed a more powerful computer that would fit such a large model. We basically had two options — either go to OSC or start from scratch and rewrite the program." *–Christopher Holloman, Ph.D.*

Dr. Holloman's program analyzed every traffic accident in the Highway Patrol's databases that occurred on Ohio highways over a five-year period. Predictions were made under two types of road conditions: good or bad. Also, each roadway had predictions for each of five different categories of days: Monday through Thursday, Friday, Saturday and Sunday, the day before a long weekend, and holidays. In addition, Dr. Holloman's program breaks out results by factors such as age group, alcohol status, speed and class of vehicle.

The Ohio State Highway Patrol used the program to help position its cruisers during major holidays. The research team also combined the program with Google Earth, which Dr. Holloman said makes the tool even easier to use. ■