



LEGO Robotic Telescopes at the January 2008 AAS Meeting

Rob Seaman

NOAO's implementation of the VOEvent transient-alert messaging protocol from the National Virtual Observatory (NVO) was demonstrated at the Austin AAS meeting using robotic telescopes based on LEGO MINDSTORMS (*mindstorms.lego.com*) technology. Each of two interoperating telescopes was constructed of lightweight K'Nex girders driven by LEGO alta-azimuth servo motors. The second-generation MINDSTORMS NXT CPU is a 32-bit ARM microprocessor running LabVIEW. In addition to three servo ports and four sensor ports, the NXT communicates via USB 2.0 and wirelessly via Bluetooth.

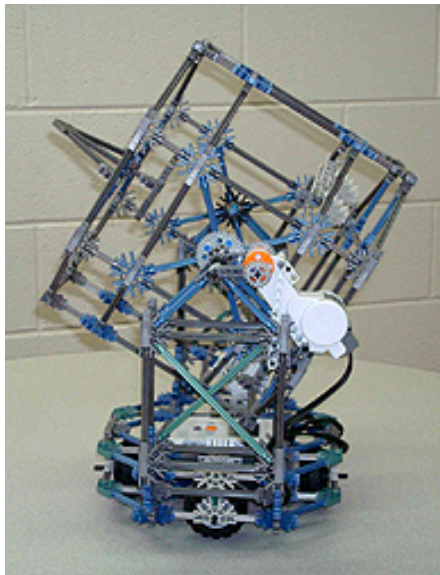


Figure 1: Model alt-azimuth telescope built from K'Nex and LEGO MINDSTORMS NXT components. Nylon bushings permit the two building systems to interoperate.

The original NXT telescope (figure 1) was developed for the workshop, "Hot-wiring the Transient Universe" (www.cacr.caltech.edu/hotwired), hosted by the NOAO Data Products Program in June 2007. We anticipate using these models for future tutorials and demonstrations of autonomous astronomy technologies such as VOEvent. Any demonstration of Virtual Observatory technology can be difficult precisely because, being vir-

continued



The LEGO telescopes, demonstrated by Rob Seaman (left), were a popular attraction at the NOAO exhibit booth during the January 2008 AAS meeting in Austin.

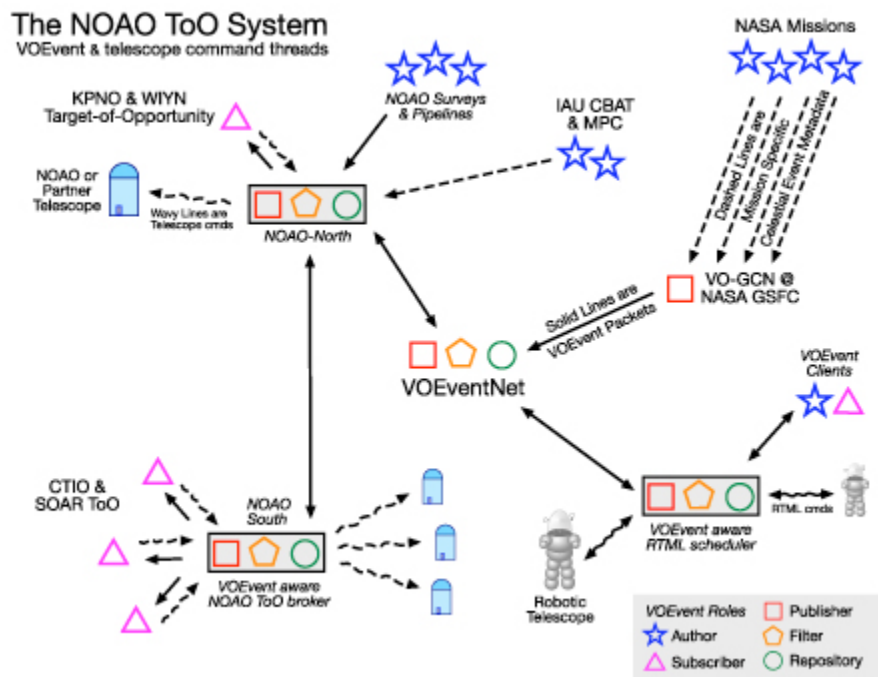


Figure 2: The NOAO Target-of-Opportunity observing system, layered on the VOEvent protocol of the National Virtual Observatory.

LEGO Robotic Telescopes at the AAS continued


tual, such a demonstration tends to be highly conceptual. Our experience with these LEGO models shows that physical models grab an audience's attention and generate discussions leading in many directions.

At the Data Products Program (DPP) area of the NOAO booth in Austin, the two telescopes were configured to play an astronomical version of the game "Simon Says." The telescope "Simon" would simulate the discovery of some transient celestial phenomenon

such as a supernova or gamma-ray burst. A message describing the location and characteristics of the discovery was then passed wirelessly to the telescope "Theodore," which would slew to the same location, simulating a follow-up observation. In the real world, for instance in the US astronomical "System," the two telescopes would be connected through the VOEventNet (figure 2).

NOAO's interest in VOEvent is both to publish events such as supernovae from the

ESSENCE survey program as well as to provide Target-of-Opportunity facilities to our observing community. Data from transient observations flow into the NOAO Science Archive (NSA). DPP is a major partner in the NVO, providing access through our Portal (nvo.noao.edu) and VO Client interfaces to NSA and community data holdings. ●



The Fourth National Virtual Observatory Summer School


Chris Miller

The National Virtual Observatory (NVO) will hold a nine-day, hands-on summer school for students to work alongside experienced NVO users and software specialists. The goal of this school is to help researchers discover, access, visualize, and analyze data from within a virtual observatory (VO) environment. The school will also have sessions on how to become a publisher of VO data and how to apply VO high-performance computing capabilities to your research needs.

Anyone interested in learning how to use the VO for astronomical research is encouraged to apply. Applications will be accepted after 15 April 2008. Please visit: www.us-vo.org/summer-school/2008/

Date and Location:

**2008 NVO Summer School
3-11 September 2008
Santa Fe, NM**



Howard Lanning
(1946-2007)
In memory of our valued and respected friend and colleague

*Staff of the Data Products Program
National Optical Astronomy Observatory*