



Robotic Telescopes in the Classroom

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Telescopes From Afar, Waikaloa, HI, March 2011

GTN Project



Supported by NASA High Energy Missions

Telescopes From Afar, Waikaloa, HI, March 2011





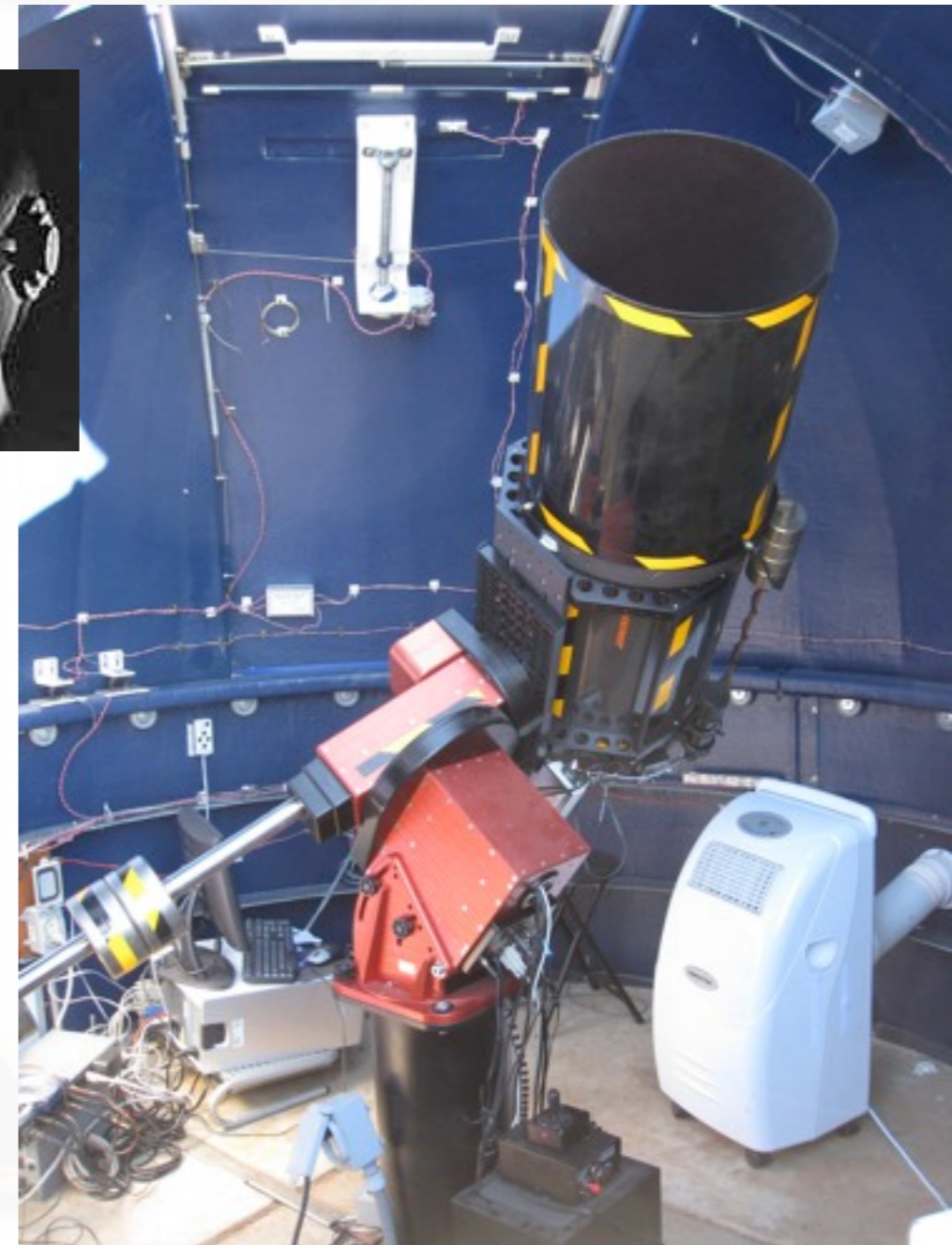
Global Telescope Network



Telescopes From Afar, Waikaloa, HI, March 2011

GORT

(GLAST Optical Robotic Telescope)



- C 14 telescope
- Apogee 1024x1024 CCD
- Remotely Operated via Internet
- Can be run by central server: SkyNet (UNC/PROMPT)



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Skynet Observing Queue



Standard way to observe is through the Skynet web interface.

Maintained by PROMPT group at UNC (D. Reichart, PI).

The screenshot shows the Skynet web interface. The browser address bar displays `http://skynet.unc.edu/index.php?selection=observations&newobs=new`. The page title is "SKYNET".

Left sidebar:

- Log off
- mclin
- Feb 25 20:12:40 UTC
- 2455618.34213 JD
- Tools and Info
 - Skynet
 - sunlight map
 - Nightly image count
 - Total image counts
 - Telescope activity plots
 - Observation planner
 - Skynet Live
 - Recent images
 - View idle times
 - CTIO Weather
 - CTIO Satellite
 - CTIO Webcam
 - Prompt webcam
 - Authorship policy
- NSF logo
- Funded by NSF

Main content area:

New Observation

[Back]

Look up object coordinates by name:

Observation Name:

RA: (HH:MM:SS, J2000) : :

DEC: (DD:MM:SS, J2000) ° ' "

Priority: **Max Airmass:**

Group:

Max Sun Elevation:

Don't start before (UTC):

Select filters:

<input type="checkbox"/> U	<input type="checkbox"/> Blue
<input type="checkbox"/> B	<input type="checkbox"/> Rc
<input type="checkbox"/> V	<input type="checkbox"/> Ic
<input type="checkbox"/> R	<input type="checkbox"/> rprime
<input type="checkbox"/> I	<input type="checkbox"/> iprime
<input type="checkbox"/> Lum	<input type="checkbox"/> Halpha
<input type="checkbox"/> uprime	<input type="checkbox"/> zprime
	<input type="checkbox"/> OIII
	<input type="checkbox"/> Open
	<input type="checkbox"/> Red
	<input type="checkbox"/> Green

Visibility of RA 11:04:27.31, Dec 38:12:31.80 (next 24 hours)

The graph plots Elevation (deg) on the left y-axis (from -90 to 90) and Airmass on the right y-axis (from 1.0 to 6.0) against Time on the x-axis (from 20:00 to 20:00). The legend indicates five telescopes: CTIO (orange), Hale (green), DSO (blue), Morehead (purple), and Doolittle (yellow). The Doolittle telescope shows the highest elevation and lowest airmass, peaking at approximately 85 degrees elevation and 1.05 airmass around 06:00. The CTIO telescope shows the lowest elevation and highest airmass, peaking at approximately 15 degrees elevation and 3.0 airmass around 06:00.

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Who Uses GORT?

College Students...

Observing classes

Individual Research Projects

ASTRO 101 Courses

Summer Internships and Other
Employment (generally not
remotely)

Regular users include
SSU, Chicago State,
Portland State



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Who Uses GORT?

High School Students... In class

Norridge, Ill

Astronomy Course - Variable stars



Antioch, CA

Astronomy Course - Variable stars, AGN, asteroids, track moons of Jupiter, observing notebook, stellar evolution image catalog

Most projects are photometry-based, with some astrometry as well.



Who Uses GORT?

High School Students...
Summer Interns

Part of an SSU/Sonoma County Office of Education program for Sonoma County High School students.

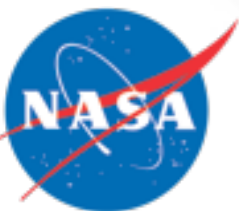
NASA E/PO sponsors two students each summer.

Have done AGN monitoring for the past two summers.

Students present results at a symposium held in September.



See our poster on this program
(No. 27)



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Who Uses GORT?

High School Teachers...
Professional Development

NOAO - Image processing
workshops, multi-color
imaging.

SSU - EA Training, testing of
new products.



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In addition to these users, we have others who
connect via Skynet, but we don't keep track of
them or their projects.



Barriers to Use

- Science Standards/Testing
 - Astronomy is not tested, so is not taught.
- Teacher Preparation
 - Teachers are unfamiliar with astronomy concepts and data reduction procedures.
 - They often don't have extra time to learn this material.
- Lack of computers and software
 - Commercial products are expensive
 - Free software is difficult to use
 - Internet access can be a problem

We are working on a pipeline to make data reduction easier for high school students and teachers.



Summary



- Robotic Telescopes have given unprecedented opportunities for students in high schools and small colleges to obtain their own astronomical images.
- This has allowed for dramatic changes in the way science (astronomy) can be taught at the undergraduate and secondary levels. Sadly, this potential is not being widely realized.
- Lack of resources (at the secondary level) have so far stymied the potential of remote telescopes in high school classrooms,.
 - A lack of computer hardware and software means students cannot work with images.
 - Teachers typically lack expertise in data processing, and they lack the time to gain this expertise. Furthermore, there are often disincentives for them to do so. [How can we change this?]
- Things are better at the college level, where these previous two points are much less applicable... But perhaps inertia can be a problem.



Last Word



“Your willingness...to let my Astronomy students use a real research telescope for two observations was a key element for transforming the class from a straight lecture format to a student-centered, lab-focused experience. The majority of the students I teach are math-phobic but excited to learn about the cosmos.”

-Jack C. Straton
Associate Professor of Physics
Portland State University

More information:

<http://gtn.sonoma.edu>



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