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Robotic Telescopes all over the World

Tadashi MORI
President, Media i Corporation

1. Preface

I had a dream of building my own observatory, having my own large telescope to watch celestial bodies at any time. But the meaning of “owning an observatory” or “owning a telescope” may be changed these days.

There are several systems that allow people to operate telescopes via the network. CATS-III which Media i Corporation, Goto Optical Mfg.,Co., AstroArts, Hitachi Cable Ltd. and Yamanashi Prefectural Science Center jointly developed is one example^[1].

Today I would like to introduce the outline, some of those projects and future development plan of Remote and Robotic Telescope system.

2. Robotic Telescopes

Since one of the earliest projects of robotic telescopes are proposed such as Bradford telescope^[2] (begun operations in 1993) and Iowa Telescope system^[3] (developed in 1997), many researchers, educators and enterprises have been trying to make efficient, reliable and robust network observatory systems around the world.

Now you can find more than 80 systems on the globe^[4]. However the purposes of those systems vary very much. One major purpose of the system is Gamma Ray Burst observation. The Gamma Ray Burst phenomena are not predictable and vanish in short time period. So quick and just in time observations are required. The robotic telescopes are suitable for such kind of astronomical phenomena.

Another purpose is sky surveys. Robotic telescopes could find novae, new comets or asteroids effectively. There is a Near Earth Objects monitoring observatory in Japan. This is one example of sky survey systems.

And also an important purpose of the system is the education, especially teaching the real-time science.

I would like to discuss here the education purpose

as our CATS system was mainly developed for pupils and students in classrooms.

As well as the CATS system one of the most aggressive projects for education is the U.K. Faulkes Telescopes project^[5]. Under this project they build two 2m diameter telescopes, which one is located in Hawaii and the other is in Australia. The Hawaii telescope, called Faulkes I started operation in March 2004 and Faulkes II located in Australia will be in operation within a year. Students of the U.K. can register to use the telescope and submit observation requests through the web site. They will receive telescope images later and if they would like to, they can make image processing. School kids could see till the edge of the universe using these 2m Faulkes telescopes.

3. Coordination and Cyber network for astronomical observatories

Grid computing is one of exciting issues of the computer technology. We can use the system in case we need huge computer processing ability, or when we handle huge data. Also this is applicable to astronomical observatories.

The eSTAR project^[6] of the U.K. using the grid proposes a very interesting system. Intelligent Agents with Globus behind the GUI connect to the grid and database. Researcher can order observation programs and just wait until the agent gives a reply. I think this system is also useful for educational purposes.

If we connect several astronomical observatories around the world each other, we would be able to use the telescopes all day and night. We would be able to utilize the telescopes in our planetarium domes. We would be able to show real-time images of celestial bodies to the audience.

4. Future Plan

Considering about these technology developments, we plan to develop the fourth generation remote telescope system with the following system expansions.

- Connecting to the grid network.
- GUI interface to agents.
- Robust and reliable robotic operation
- Applications to larger aperture telescope

I plan to construct the astronomical observatories grid so that anyone who would like to observe celestial bodies could submit observation requests and get images. Using this grid, users could make

huge scale image processing, sky surveys by huge amount of image data or they could view automatically updated digital map of the universe. By connecting to the astronomical observatories grid many planetarium visitors would be able to enjoy the result of front line astronomy researches. If we use AccessGrid with the observatories grid, we would be able to make world wide video conferencing referring to the data and analysis. I would call this the Planetarium Grid.

A dream that I had ever may become true in a different way.

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- [4] Links to Robotic Telescope Project (MONET Homepage)
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- [5] Faulkes Telescope Project
<http://faulkes1.astro.cf.ac.uk/>
- [6] eSTAR Project
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[notice] Goto Optocal Mfg.,Co. changed the corporate name as Goto Inc in May 2004.