Control Box for Atsa Suborbital Telescope

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Abstract

One of the major obstacles for observational astronomers is the Earth's atmosphere. By sending telescopes outside of the atmosphere we can overcome this problem. However, this can be quite expensive, especially with billion dollar telescopes such as the Hubble. Reasonably, astronomers do not want to risk burning out the charge-coupled device (CCD) on the valuable telescope by pointing it near the sun. Solutions such as using Black Brant rockets have arisen, yet still cost millions of dollars. By utilizing commercial spaceflights offered by XCOR Aerospace, we can cut this cost to less than a couple hundred thousand dollars and retrieve the telescope at the end of the flight. Developing a telescope that can fit onto the passenger side of the spacecraft, is the first step to proving this is possible.

What is Atsa?

Atsa is a project under Dr. Faith Vilas at the Planetary Science Institute. Currently, Atsa is in its developmental stage which is being headed by Dr. Luke Sollitt at the Citadel. Atsa's goal is to introduce a new cost effective way of looking at near Sun objects by incorporating the private spaceflight industry. Atsa is currently working with XCOR Aeropsace in order to accomplish this goal by designing a telescope that can be operated by a passenger during a spaceflight.

As of now, the most efficient way to look at near Sun objects is to send a Black Brant Rocket with an automated telescope. This costs more than $600,000[1] and the rocket is destroyed when the flight is over. The Atsa project will be able to launch a telescope into suborbital space for approximately $150,000. Although the flight will only last 5 minutes compared to the Black Brant's 20 minutes[2], the cost efficiency will allow for multiple flights that will easily allow us to exceed the time limit of the Black Brant. We also are able to retrieve our telescope at the end of the flight as well as send a person with it.

Fig 1: Atsa Team at XCOR Aerospace

Control Box

One of the elements necessary to making this happen is a control box to control taking pictures, changing the filters in the telescope, and recording at what time each action happened. This control box had to be compact enough to fit inside the limited space of the vehicle but big enough so that it could be operated by astronaut gloves.

The creation the control box required three main tasks: the physical creation of the control box, programming the control box, and creating a program on the computer that would accept input from the control box. Because the CCD's and the filter wheel of the telescope both have computer programs that control them, I designed a program to work with the filter wheel and CCD programs. By creating the system in this fashion, the flexibility of the system increases.

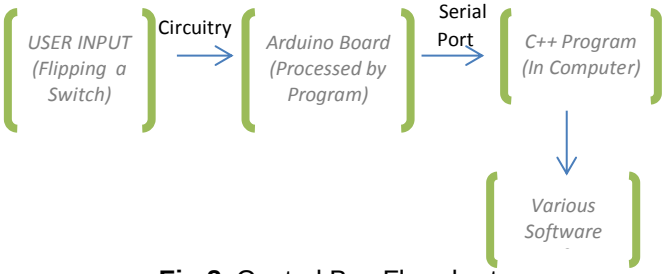

Fig 2: Control Box Flowchart

Conclusion

The control box regulates the CCD and the filter wheel of the telescope. The control box system consists of the control box communicating to a program inside the computer which controls the CCD and filter wheel program. This system is easily adaptable to any type of filter wheel system or CCD. Through Atsa, it is possible to reduce the cost of observing near Sun objects by utilizing the private space industry.