Development of automatic pointing camera system for sprite observatio

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1. Introduction

An automatic pointing camera system based on direction information of each thunder was developed for sprite (TLE) observation. By using fixed CCD cameras, optical observations of sprites and meteors have been carried out at Kochi University of Technology (KUT) in East (since January 2005) and North directions (since January 2007). Combining 14 high schools in western Japan area, a SSH (Super Science High-school) consortium was established in December 2006. In cooperation with 14 high schools, the KUT has been leading the SSH consortium for obtaining triangulation imaging result of sprites since then. Team observation of sprites by SSH consortium has been successfully carried out. For example, more than 100 TLE events a year were obtained at one of the 14 observation sites (See the JpGU poster session by high school students). However, we can only detect a fraction number of sprites with respect to a number of total occurrences mainly by a limitation of field of view of the fixed camera system. In order to take the TLE images efficiently, we began to develop the automatic pointing camera system in 2005. The developed camera system is introduced in below.

2. Development of an automatic pointing system

Electromagnetic wave (VLF) observation of thunders has been carried out at KUT with participating in the SonotaCo network (a group of observers in the same field) by using a simple detector of StromTracker (Boltek Co.) and software of NexStorm (Astrogenic Co.), resulting the nationwide triangulation experiment in quasi real time on internet for obtaining each thunder position. In our system, by using direction of each thunder given by the VLF data, an automatic rotating camera can operate continuously for 24 hours with controlling direction of the camera according to the number of occurrence of thunders every ten minutes. A high-sensitivity CCD camera of WAT-100N (Watec Co.) can be horizontally rotated by servomotors within 180 degrees range for northward by 6 divisions of each 30 degrees bin. Combining with data acquisition software of NSList, software to calculate averaged horizontal direction of thunders during the most resent 10 minutes period was developed in order to control the rotator in quasi real time. Control signal to a motor drive circuit is provided through USB port. RC servomotors (made by SANWA company and mini studio company) are used for obtaining appropriate torque and rotation speed. The system was designed with 2 axes (azimuth and elevation) control ability for future application.

3. Summary

In this paper, a summary of the automatic pointing system and some results of feasibility test in comparison with a fixed camera system will be discussed. Sprites have typical characteristics of appearing several times at the same place, therefore, the automatic pointing system is expected to have an advantage to obtain more TLE images.