Telescope Array Control System Based on Wireless Touch Screen Platform[†][⋆]

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Abstract   Ground-based Wide Angle Cameras (GMAC) are the ground-based observational facility for the SVOM (Space Variable Object Monitor) astronomical satellite of Sino-French cooperation, and Mini-GWAC is the pathfinder and supplement of GWAC. In the context of the Mini-GWAC telescope array, this paper introduces the design and implementation of a kind of telescope array control system based on the wireless touch screen platform. We describe the development and implementation of the system in detail in terms of control system principle, system hardware structure, software design, experiment, and test etc. The system uses a touch-control PC which is based on the Windows CE system as the upper computer, while the wireless transceiver module and PLC (Programmable Logic Controller) are taken as the system kernel. It has the advantages of low cost, reliable data transmission, and simple operation. And the control system has been applied to the Mini-GWAC successfully.

Key words   telescopes—wireless communication—PLC—array control

1.   INTRODUCTION

SVOM is an astronomical satellite of China-French cooperation, with the scientific objectives to discover and observe Gamma-ray bursts (GRBs), to study the radiation properties and

mechanisms of GRBs, as well as the early universe and dark energy in terms of GRBs. Ground-based Wide Angle Cameras (simply called as GWAC) are one of the ground-based facilities of the SVOM astronomical satellite, they are composed of 36 wide angle cameras, with the major scientific objective of monitoring the optical transient radiations of GRBs and other strongly variable objects, and they are positioned in the internationally advanced rank among the similar types of large-field optical survey projects. Mini-GWAC is designed for the GRB detection of SVOM, which includes 6 equatorial instruments, 12 set telescopes and 12 CCDs, its unprecedented capability provides many research groups in the Chinese astronomical society with an opportunity to study various interesting frontier and traditional astronomical subjects other than GRBs[1]. Its worksite configuration is shown in Fig.1.

Fig. 1 Mini-GWAC telescope array

The equatorial instrument control system is an important component of the Mini-GWAC telescope, its main task is to manage and control the right ascension and declination axes of the 6 telescopes, and to realize the star tracking observation, and the routine maintenance and adjustment of the telescopes[2]. The control of equatorial instruments is mainly used in the two processes: observation and maintenance. When the telescopes work in the observing state, the telescope system on the second floor is controlled by an observer through the console computer on the first floor; while in the maintenance process of the telescopes, the telescopes are controlled by an operator using the console computer on the first floor, and adjusted by another operator on the second floor, such a complicated operation makes the maintenance of telescopes become extremely inconvenient. Hence, on the basis of this control system, an additional mobile device is used as the upper computer to replace the console computer, for the control of the telescope's equatorial instrument system in the maintenance process.

Based on the above background, and aimed at the equatorial instrument control system of Mini-GWAC, this paper has designed and developed a system which takes the touch-control integrated computer as the upper computer, and uses the wireless series communication to control the lower computers, namely the Simenz programmable logic controllers