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Design of remote control software of near infrared Sky Brightness Monitor in Antarctica

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The Near infrared Sky Brightness Monitor(NISBM) aims to measure near infrared sky background of Kunlun station in Antarctic. NISBM mainly consists of an InGaAs detector with TEC cooling, a chopper and a scanning mirror. The scanning mirror can be controlled to rotate to scan the sky from 0°to 180°. Electromechanical control and weak signal readout functions are accomplished by the same circuit system.

Considering the harsh environment in the Antarctic, a multi-level remote control software system is designed and implemented using EPICS and WEB-based infrastructure. EPICS IOCs are developed to control each hardware module independently via serial port communication with the STM32 microcontroller in DAQ board of NISBM. The Tornado web framework and PyEpics are also introduced in the Web-based infrastructure. As a client of the EPICS framework, PyEpics is used to monitor or change the EPICS Process Variables. Tornado is responsible for the specific operation process of inter-device collaboration, and expose interfaces to the user interface to make calls. To realize automatic observation, a set of xml-based configuration format is designed and observers can make own observation plan using this format. The back-end of Tornado is designed as master-and-agent architecture. The master and agent nodes communicate with each other through the web-socket protocol, so multiple agent nodes can be deployed.

The GUI is implemented in the form of single-page application using Vue which communicates with Tornado through WebSocket and AJAX request. The web page integrates device control, data curve drawing, alarm display, auto observation and other functions together.

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Description

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