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Hunting GRBs with LSTs: Automatic Telescope Control System Commissioning

The Large-Sized Telescope 1 (LST-1) is a 23-meter atmospheric imaging Cherenkov telescope designed to achieve gamma-ray sensitivity down to energies of tens of GeVs. The first prototype has been constructed and is currently undergoing commissioning at the northern site of the Cherenkov Telescope Array Observatory (CTAO) at La Palma, Spain. Three additional LSTs are currently under construction and are expected to be commissioned within the next two years.

The telescope control system of LST-1, known as the Telescope Control Unit (TCU), integrates all major subsystems, including active mirror control, the drive system, the camera, CCDs, and others. It is developed in accordance with CTAO telescope API guidelines and is based on the ALMA Common Software (ACS) framework, originally designed for the Atacama Large Millimeter Array (ALMA). Each subsystem is represented by an independent OPC UA server, which provides access to data points and control methods, enabling monitoring and centralized control through the TCU. The TCU itself is operated via a dedicated web-based engineering graphical user interface (eGUI), which includes AutoOperator. During the commissioning phase the AutoOperator software serves as the primary interface for handling transient event alerts, including gamma-ray bursts (GRBs). Upon receiving an alert, the LST-1 software autonomously processes its visibility, reconfigures the telescope, repoints the telescope to the new target, and initiates data acquisition. This fully automated workflow ensures a rapid response without the need for human intervention.

TCU, eGUI, and AutoOperator are used by LST-1 operators for routine nighttime operations. The software has demonstrated robustness, ease of use, and full compliance with the CTAO central control system. Out-of-box the software will support new LSTs currently in construction to operate these telescopes in a stereo configuration to even more increase the sensitivity.

Collaboration(s)

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