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Designing, Manufacturing, Programming, and Deploying Environmental Sensing Instruments
using Visible and Infrared (IR) Cameras for the Mauna Kea Observatories (MKO) All-Sky
Infrared & Visible Sky Analyzer (ASIVA)

The MKO ASIVA, maintained and supported by Canada-France-Hawaii-Telescope (CFHT), is a weather sensing instrument composed of an IR camera, a visible-light camera, multiple temperature sensors, and a machine-learning system to automatically identify cloud conditions. Real-time cloud detection is essential for assessing sky quality and choosing appropriate observing programs, especially for the remote observatory operations of MKO. However, ASIVA's visible-light camera was down and in need of replacement. Additionally, the IR camera and computer were outdated. Finally, upgrading ASIVA's custom-made components to standard, well-documented equipment would allow for easier upkeep. This project was performed in two parallel stages: (1) replacement of the visible-light camera on the ASIVA instrument, and (2) development of a backup system to replace the IR camera in case of failure. First, to restore the visible camera functionality, a new, independent system was created using a commercially available all-sky visible camera and a small linux microcontroller to collect, process, and send data to the CFHT network. A custom modular bracket system was designed and manufactured that allowed the new visible camera system to readily integrate into the ASIVA. A combination of a commercial IR camera with a specialized frame-grabber and custom software to integrate into the CFHT infrastructure provides the backup solution to the ASIVA IR camera. Additionally, the effort to renovate the ASIVA spawned the concept and design of a new, fully portable ASIVA-like instrument that could act as a backup for the original or be installed in other locations to supplement research and environmental sensing.