

Sohbrit

Autonomous COTS System for Satellite Characterization

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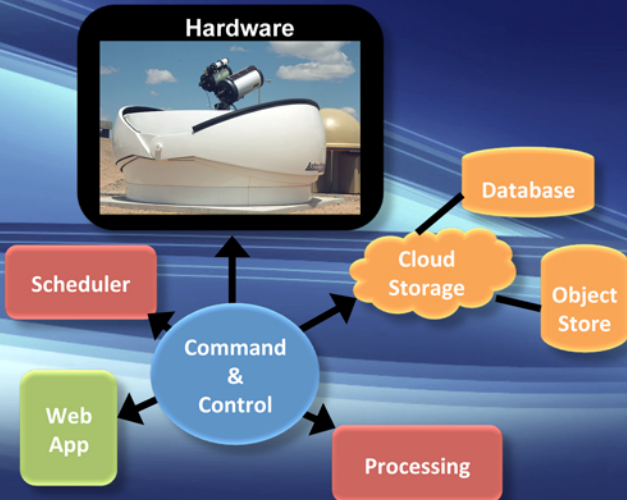


Fig. 1 Overview of the entire system architecture of the extensible and autonomous Sohbrit design



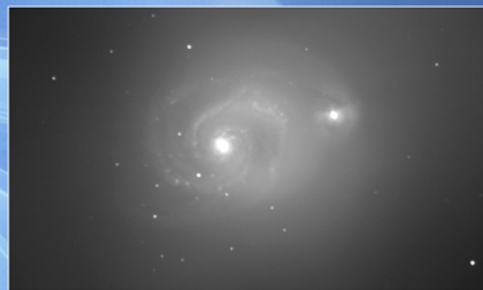
Fig. 3 Photograph of the variety of hardware Sohbrit can use including telescopes, robotic filter wheel, cameras, and focuser



Low Earth Orbit target (Yaogan) streaking through star field



Geostationary ANIK cluster through hyperspectral grading



Processed image of M-51 (Whirlpool) Galaxy

Sohbrit is an automated testbed of interchangeable commercial off-the-shelf hardware for space object characterization. The entirely autonomous and extensible system is a valuable sandbox for Space Situational Awareness (SSA) collection and processing, including Sohbrit's flagship application of using target light curves to establish patterns of life in a variety of spectral bands over time.

Automation

Sohbrit automates the complete system from scheduling to processing including:

- Filter wheel rotation between: B, V, Rc, Ic, UV
- Optimized scheduling
- Weather monitoring
- Observatory dome management
- Aligning, Focusing, and slewing the telescope
- Processing images
- Storing/disseminating the data

Extensibility

Sohbrit is generically designed for switchable components. A variety of hardware, algorithms, etc. have already been tested and integrated in the Sohbrit architecture. The current system hardware includes:

- Telescopes:
- Celestron EDGEHD 279.4mm
 - STELLARVUE SV80ST 80mm
- Camera:
- ZWO ASI 1600MM-Cool

Results

One example of the many capabilities of the Sohbrit system is below in Figures 2 & 4, produced by:

- Collecting images rotating through numerous filters
- Detecting all satellites in the field of view
- Analyzing their spectral characteristics
- Correlating targets across images into tracks
- Plotting the spectral characteristics over time

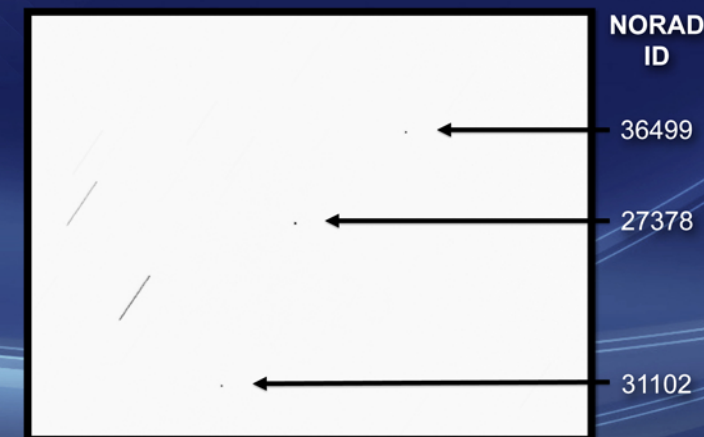


Fig. 2 Raw inverted image of NORAD IDs 36499, 27378, and 31102 with stars streaking through image

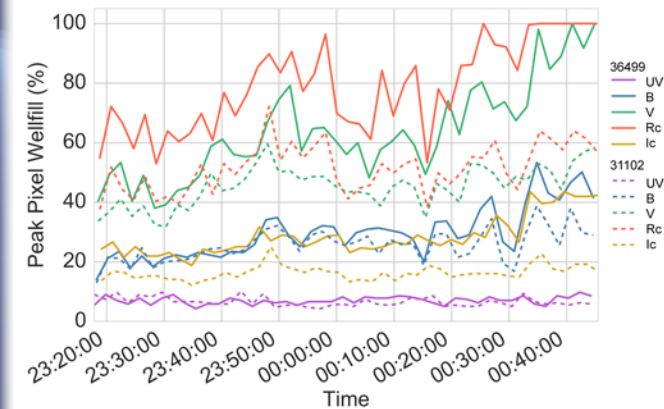


Fig. 4. Plot of pixel wellfill vs. time for NORAD IDs 36499 (top right) and 31102 (bottom left) observed in Fig. 2. above