Center for Analysis Systems and Applications

Developing next-generation analysis capabilities

CASA

Creating a Telescopic Data Acquisition and Analysis System from COTS Products

Alex Bertels, Missouri University of Science and Technology;
Evan Ott, University of Texas at Austin

Project Mentors: Mark Bastian and Tony Romero, 5564

SAND2013-6031P

Problem Statement:

Our project originated from the desire to use Commercial Off-The-Shelf (COTS) telescope and imaging products to collect high-resolution astronomical data. Our goal was to design a system to control the telescope and camera remotely, automatically generating tasks based on the locations of interesting celestial objects as judged by an end user.

Objective and Approach:

We implemented a RESTful web service to control the telescope and camera, allowing a person or external application to submit and view tasks in a highly structured, robust way. To determine ideal viewing candidates, we created an application that allows users to select viewing time, location, and other parameters that determine visible objects. We used the open source Astrometry.net service to perform final data analysis. The service uses background stars to provide an angular grid, which is used to analyze the streak resulting from the satellite's motion during image capture.

Auto tracking telescope

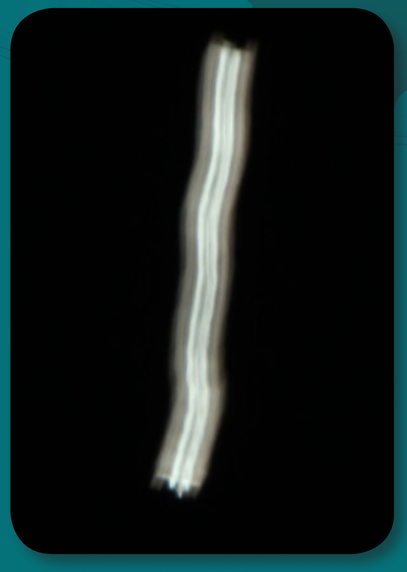


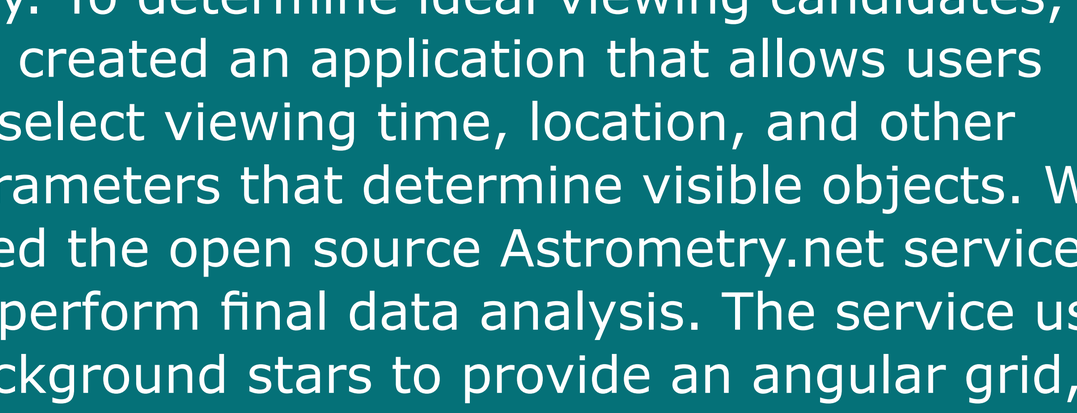
Image streak of the International Space Station (ISS).

Results:

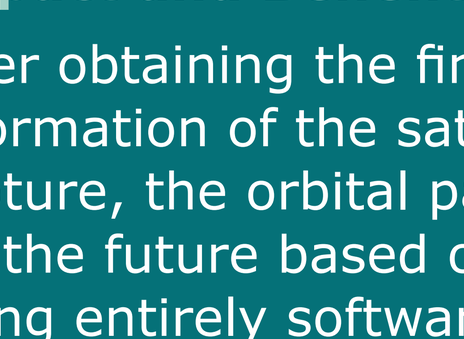
While work continues on the data analysis portion of the project, the remotely-controlled web service for the telescope system is fully functional, as is the scheduling algorithm which uses data produced by NORAD daily.

Impact and Benefits:

After obtaining the fine-tuned coordinate information of the satellite during the image capture, the orbital path can be calculated for the future based on existing algorithms. Using entirely software-based solutions, our team created a platform for data acquisition and analysis, tethering together several commercially-available technologies, potentially providing a cheaper solution for extracting satellite orbital elements than custom hardware.



User application, showing visual magnitude for a particular satellite given time and location.



Saturn, showing the quality of images obtained from the telescope and camera.

Sandia National Laboratories

LOCKHEED MARTIN

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2013-XXXXC.

U.S. DEPARTMENT OF ENERGY

NNSA National Nuclear Security Administration