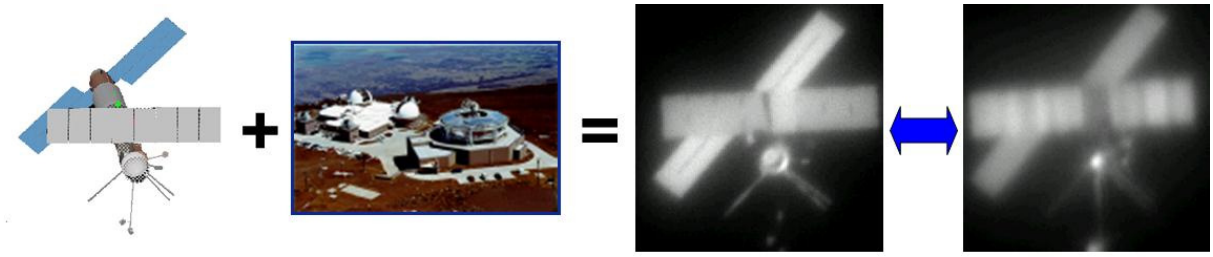
DOD HPC DEPARTMENT OF DEFENSE HIGH PERFORMANCE COMPUTING MODERNIZATION PROGRAM

MAUI HIGH PERFORMANCE COMPUTING CENTER
DOD SUPERCOMPUTING RESOURCE CENTER
DSRC

# Distributed Time-domain Analysis Simulation for Advanced Tracking (TASAT) Software on the HPCMP Portal

TASAT was first developed to perform detailed simulations of low earth orbit (LEO) satellites, under passive and active illumination conditions and using ground-based imaging systems. TASAT has since evolved to support space-based imaging and illuminator platforms for passive (solar, lunar, earthshine) and active (laser) illumination of the target. TASAT provides radiometrically sensitive two-dimensional (2D) renderings of detailed three-dimensional (3D) Computer Aided Design (CAD) satellite models in simulated Earth orbits. The renderings are performed using ray tracing techniques and a database of satellite geometric and material optical properties. Each element of the 3D CAD model has its own material properties so that appropriate optical, polarization, and scattering effects may be determined for each surface. Rendered image fields are then convolved with the imaging system point spread function (PSF) and degraded with sensor spatial sampling and noise models to provide realistic satellite image simulations for the defined scenario as a function of time. TASAT uses a library of the multispectral optical properties of satellite materials to generate radiometric signatures for specific targets and observation scenarios. These materials have been previously measured at various wavelengths and viewing geometries and are stored in terms of optical quantities, such as spectral reflectivity and bidirectional reflectance function (BRDF) values for a limited number of wavelengths.

An understanding of space object phenomenology (such as object surface “glints”) is enhanced using TASAT’s simulation of space object images and associated radiometric accuracy. AFRL is working with TASAT to develop a physics-based, detailed understanding of the imaging of space objects. Through the generation of simulated image data for differing target scenarios and for a wide range of optical sensors (visible to long wavelength infrared) a knowledge base supporting satellite identification and characterization is developing. This knowledge is being used to perform analysis on the imagery to determine the best approaches for exploiting image information.




**Satellite Model** **Sensor Description** **Simulation** **Field Data**

***Distributed TASAT***

***HPC Batch Processing Provided***

- **Server**
- **Batch Nodes and Agents**
- **Matlab UKF**

For additional information, contact info@mhpcc.hpc.mil