fundamental researches regarding the essential parts of KASIOPEA has been done by author. The numerical integration module of the KASIOPEA is the most sensitive part in the precision of the final output in general. There is no silver bullet in the numerical integration in an orbit propagation as a non-stiff ODE case. Many numerical integration method like single-step methods, multi-step method, and extrapolation methods have been used in overly populated orbit propagator or estimator. In this study, several popular methods from single-step, multi-step, and extrapolation methods have been tested in numerical accuracy and stability.

■ Session III-2 : Payloads 1
Wednesday, 22 October [16:30-17:30]

[III-2-1] Discussion of Preliminary Design Review for MIRIS, the Main Payload of STSAT-3

Wonyong Han[1], Ho Jin[1], Jang-Hyun Park[1], Uk-Won Nam[1], In-Soo Yuk[1], Sungho Lee[1], Youngsik Park[1], Sung-Jun Park[1,2], Dae-Hee Lee[1], Chang H Ree[1], Woong-Seob Jeong[1], Bongkon Moon[1], Sang-Mok Cha[1], Seoung-Hyun Cho[1], Seung-Woo Rhee[3], Jong-Oh Park[3], Seung-Heon Lee[3], Hyung Mok Lee[4], and Toshio Matsumoto[4,5]

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KASI (Korea Astronomy and Space Science Institute) is developing a compact wide-field survey space telescope system, MIRIS (The Multi-purpose IR Imaging System) to be launched in 2010 as the main payload of the Korea Science and Technology Satellite 3. Through recent System Design Review (SDR) and Preliminary Design Review (PDR), most of the system design concept was reviewed and confirmed. The near IR imaging system adopted short F/2 optics for wide field low resolution observation at wavelength band 0.9~2.0 um minimizing the effect of attitude control system. The mechanical system is composed of a cover, baffle, optics, and detector system using a 256 x 256 Teledyne PICNIC FPA providing a 3.67 x 3.67 degree field of view with a pixel scale of 51.6 arcsec. We designed a support system to minimize heat transfer with Muti-Layer Insulation. The electronics of the MIRIS system is composed of 7 boards including DSP, control, SCIF. Particular attention is being paid to develop mission operation scenario for space observation to minimize IR background radiation from the Earth and Sun. The scientific purpose of MIRIS is to survey the Galactic plane in the emission line of Paα (1.88 μm) and to detect the cosmic infrared background (CIB) radiation. The CIB is being suspected to be originated from the first generation stars of the Universe and we will test this hypothesis by comparing the fluctuations in I (0.9~1.2 um) and H (1.2~2.0 um) bands to search the red shifted Lyman cutoff signature.

[III-2-2] Tolerance Analysis of Compact Imaging Spectrometer (COMIS) for a microsatellite STSAT3

Eun-Sil Kim and Jun Ho Lee

Kongju National University

The STSAT-3 satellite was initiated in October 2006 and will be launched into a lower sun-synchronous earth orbit (~ 700km) in 2010. COMIS takes hyperspectral images of 30m/60m ground sampling distance over a 30km swath width. The payload will be used for environmental monitoring, such as in-land water quality monitoring of Paldang Lake located next to Seoul, the capital of South Korea. An extensive sensitivity and error budget analysis of COMIS optical system have been performed. As way of estimating aggregate effects of all tolerances, a Monte Carlo simulation is used.

[III-2-3] Simultaneous imaging and radiometric performance simulation for computer generated GOCI optical system with measured characteristics

Soomin Jeong[1], Yukyeong Jeong[1], Dongok Ryu[1], Jinhee Yoo[1], Seonghui Kim[3], Seongick Cho[4], Sun-Jeong Ham[1,2], HeongSik Youn[3], Sun-Hee Woo[3], and Sug-Whan Kim[1]

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In this study, we report a new Monte Carlo ray tracing technique for estimating GOCI (Geostationary Ocean Color Instrument) radiative transfer characteristics and imaging performance simultaneously. First, a full scale GOCI optical model was constructed with measured characteristics at the component level and placed in the geostationary orbit. An optical model of approximated GOCI target area centered at the Korean penninsular was then built using the USGS coastal line data and representative land and sea surface reflectivity data. The light rays launched from a simulated sun model travel to the Earth surface, where they are reflected and scattered. Some of the light rays that are headed to the GOCI model in the orbit were selected and

traced, as they have entered into the GOCI aperture. As they pass through each GOCI optical part, the ray path and intensity are adjusted according to the measured characteristics for reflection, transmission, refractive index and surface scattering. The ray-traced imaging and radiative transfer performance indicators confirm that the computer generated GOCI optical system with measured characteristics can be used for in-orbit operation simulation following the designed measurement sequence. The computational technique and its implications as a operation support tool are discussed.

[III-2-4] Current progress in development of full 3D earth model for integrated ray tracing simulation of planetary disk averaged spectra

Dongok Ryu[1] , Kiljae Jung[1], Eun-song Oh[1], Ki-Beom Ahn[1], Soomin Jeong[1], Yukyeong Jeong[1], Jinhee Yu[1], Jae-Min Lee[1], Eric(JS) Hong[2], and Sug-Whan Kim[1]

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Detection of spectral bio-signatures from extra terrestrial planets has received an increasing attention from the astronomy and space science communities in recent years. In an attempt to better-understand disk averaged spectra of the only know terrestrial planet i.e. Earth, we are constructing a scale-able 3D earth model with surface reflectance and scattering properties. The USGS coastal line data were used to form coastal line segments and they were then stitched to generate continuous coastal lines to represent major continents and large islands. As the first stage of model verification, wavelength dependent ocean and land reflectance data and scattering characteristics were defined over the land and sea surfaces respectively. We then performed ray tracing based imaging and radiometric transfer simulations using a hypothetical optical payload receiving the reflected and scattered sun lights from the earth. The model concept, computational details, the simulation results are discussed as well as the future development plan.

■ Session IV-2 : Satellites 1
Wednesday, 22 October [17:40-18:40]

[IV-2-1] Star Visibility Analysis for a Low Earth Orbit Satellite

Jo Ryeong Yim, Seon-Ho Lee, and Ki-Lyuk Yong

Department of Satellite Control System, Korea Aerospace Research Institute

Recently, star sensors have been successfully used as main attitude sensors for attitude control in many satellites. This research presents the star visibility analysis for star trackers and the goal of this analysis is to make sure that the star tracker implementation is suitable to the mission profile and scenario and satisfies the requirement of attitude orbit control system. As a main optical attitude sensor imaging stars, accomodations of a star tracker should be optimized in order to improve the probability of the usage by avoiding the blinding (the unavailability) by the Sun and the Earth. For the analysis, a statistical approach and a time simulation approach are used. The statistical approach is based on the generation of numerous cases, to derive relevant statistics about Earth and Sun proximity probabilites for different lines of sight. The time simulation approach is performed for one orbit to check the statistical result and to refine the statistical result and accomodations of star trackers. In order to perform simulations first of all, an orbit and specific mission profiles of a satellite are set, next the earth proximity probability and the sun proximity probability are calculated by considering the attitude maneuvers and the geometry of the orbit, and then finally the unavailability positions are estimated. As a result, the optimized accomodations of two star trackers are suggested for the low earth orbit satellite.

[IV-2-2] Contamination Control of Optical Observation Satellite

Chang-Ho Lee, Choon-Woo Lee, Young-Jun Cho, and Do-Soon Whang

Korea Aerospace Research Institute

Contamination has the potential for degrading the performance of the optical payload beyond the limits defined by mission requirements, therefore it must be considered a risk to system performance and must be mitigated. To mitigate contamination problem, contamination budget is allocated according to the contamination requirements which is derived from contamination effect analysis. Once the contamination budget is allocated, prediction for on-ground and in-orbit contaminants amounts and cleanliness control is performed. In this article, typical contamination control for observation satellite is described.

[IV-2-3] Satellite FEM Validation test for High Frequency Jitter Analysis

Shi-Hwan Oh and Ki-Lyuk Yong

Department of Satellite Control System, Korea Aerospace Research Institute

The aim of the test is to provide an experimental basis to