Mayuko Shibayama

Address 7-24-1 Narashinodai, Funabashi, Chiba 274-8501, Japan
Phone +81-47-469-5430
Email shibayama@forth.aero.cst.nihon-u.ac.jp

Education

Master of Engineering, Nihon University, Chiba, Japan, 2018-current
Bachelor of Engineering, Nihon University, Chiba, Japan, March, 2018
Maebashi Girls' Senior High School, Gunma, Japan March, 2014

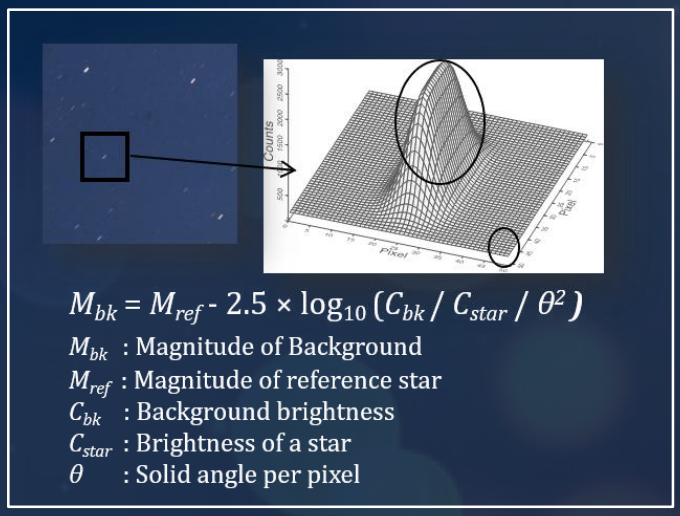
Qualification

Engineer-in-Training (Mechanical Engineering), 2017

Activity

I am a member of Hoshizora Kodan. <https://www.kodan.jp> Hoshizora Kodan are voluntary individuals who want to protect the quality of our night sky. There are over hundred members, consisting of academics, students, staff of museums, and office workers.

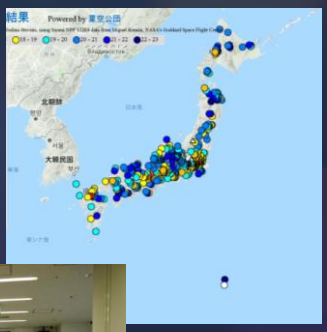
We evaluate night sky brightness in Japan using digital cameras. Anyone can submit the image data taken by digital camera to our Web-site <https://dcdock.kodan.jp> for night sky measurement. I analyze the image data and present results .
In addition, I do outreach activities such as workshops, PR through SNS <@KDN_dcdock>, etc. to promote public interest in the nighttime environment and dark skies.



$$M_{bk} = M_{ref} - 2.5 \times \log_{10}(C_{bk} / C_{star} / \theta^2)$$

M_{bk} : Magnitude of Background
M_{ref} : Magnitude of reference star
C_{bk} : Background brightness
C_{star} : Brightness of a star
θ : Solid angle per pixel

▲ Measurement Principle



▲ Map

▲ Workshop

Presentations

[1] 柴山万優子,小野間史樹,夜空の明るさの継続的な測定方法および測定結果,日本天文学会春季年会,2018,春季,pp.287,2018年3月14日,千葉大学
[2] 柴山万優子,小野間史樹,右田亜朗,夜空の明るさ測定における眼視測定の有効性検証,日本天文学会春季年会,2017,春季,pp.293,2017年3月16日,九州大学
[3] 小野間史樹,柴山万優子,原田泰典,星空診断「夜空の明るさをはかろうキャンペーン」の展開,日本天文学会春季年会,2016,春季,pp.255,2016年3月14日,首都大学東京
[4] 小野間史樹,柴山万優子,大川拓也,夜空の明るさ測定におけるSky Quality Meterの有効性検証,日本天文学会春季年会,2015,春季,pp.304,2015年3月19日,大阪大学

Research

"Deployment Analysis of Large Spinning Solar Sail"

Background

The solar power sail IKAROS (**I**nterplanetary **K**ite-craft **A**ccelerated by **R**adiation Of the **S**un) was launched in May, 2010 by JAXA, and the 14m-sized sail membrane was successfully deployed in June, 2011. Currently, JAXA is considering the next solar power sail OKEANOS (**O**utsized **K**ite-craft for **E**xploration and **A**stro**N**autics in the **O**uter **S**olar system, Fig.1), which is much larger than IKAROS. IKAROS and OKEANOS are gossamer structures characterized by large area and super lightweight. Because of those characteristics, it is difficult to conduct the ground experiments on structural dynamics, so numerical analysis is indispensable to predict the dynamic behavior of the structure in space.

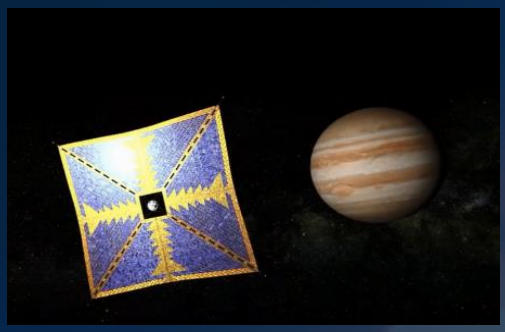


Fig.1 OKEANOS

Graduation Research

"Validity Evaluation of Lumped Mass Approximation for Solar Sail Analysis"

It is effective to employ the lumped mass approximation for the increase of the computation speed in the numerical analysis. However, such an approximation does not guarantee calculation accuracy. Therefore, I focused on the numerical accuracy of the lumped mass approximation for the spinning solar sail model. The natural vibration analysis of the sail in steady spin state is performed in the case of consistent mass and lumped mass, and the results in those cases are compared with each other as shown in the Fig.2. As a result, it becomes clear that the lumped mass approximation is valid.

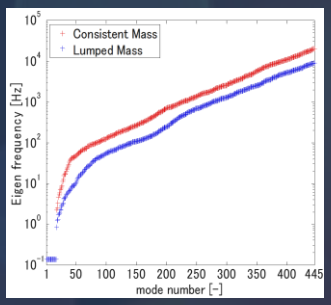


Fig.2 Eigen frequency

Current Research & Future Plan

Configuration and deployment process of spinning solar sail (IKAROS and OKEANOS) are shown in the Fig.3. The points to study are below.

Assurance of Deployment
Prediction of Deployed Shape

I want to clarify the effect of each design parameter on deployed shape, especially the shape of bridge, tip-mass, and edge-mass. In addition, it is need to obtain the nominal deployment status for understanding of deploying motion. Currently, We are creating the analysis program of full model as shown in the Fig.4. After it's been completed, I will analyze of nominal deployment by full model and conduct parametric study. Furthermore, I will continue to speed up the computation by the lumped mass approximation and parallel computation.

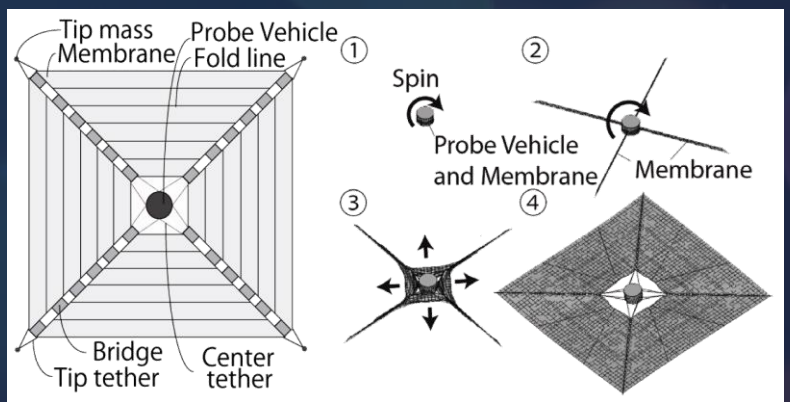


Fig.3 Configuration & Deployment process

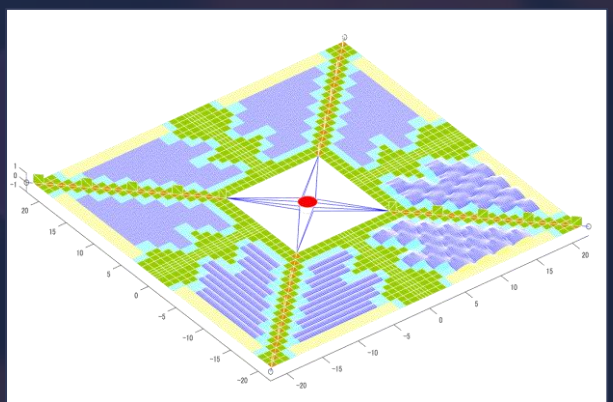


Fig.4 Analysis Model