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Education

Master of Engineering (expected), Nihon University - Chiba, Japan 2020

Bachelor of Engineering, Nihon University - Chiba, Japan 2018

Kanagawa prefectural Oppama High School - Kanagawa, Japan 2014

Qualification

Amateur Third-Class Radio Operator.

Research Overview

Research theme

“Sensitivity Analysis of Design Parameter of Large Spinning Solar Sail”

Background

The solar power sail IKAROS was launched In 2010 by JAXA, and demonstrated the design method and spin deployment technology for large membrane structures. Due to the success of IKAROS, designing a bigger next solar sail OKEANOS than IKAROS is currently underway. What we need to ensure the successful deployment of these solar sails is to understand how design parameters affect deployment behavior of solar sail in more detail.

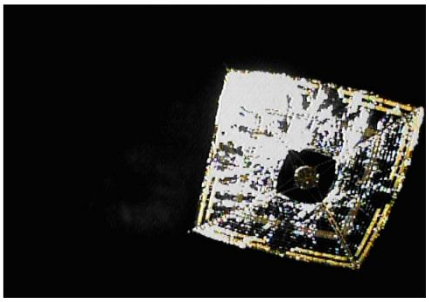

Fig.1 IKAROS (http://www.jaxa.jp/press/2010/06/20100616_ikaros_j.html

Approach

Mode decomposition is effective for understanding the deployment behavior of solar sails. This is because it is possible to know what kind of motion the deployment behavior of the membrane is composed.

In this research, I focus on dynamic mode decomposition, which is one of multiple mode decomposition methods. Dynamic mode decomposition is a method of decomposing a certain motion into multiple modes with a single frequency. I think that it is a method suitable for a membrane space structure in which low frequency and high frequency motion coexist.

- The principle of DMD

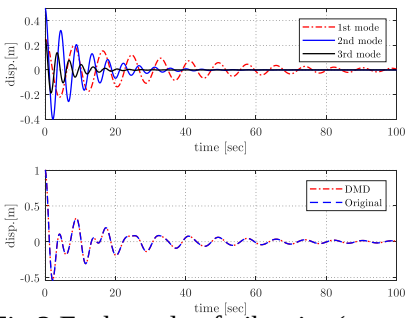

Fig.2 Each mode of vibration(upper) displacement of mass(bottom)

DMD is a method of defining a state transition matrix A representing the time change of the state vector x and obtaining its eigenvalues (natural frequency) and eigenvectors(natural vibration mode). Fig.2 shows an example of applying DMD to the Spring Mass Dumper system with 3 degrees of freedom. Fig.2(upper) shows the vibration mode 1st to 3rd order of the mass, and Fig.2(bottom) shows the sum of all modes. you can see that the vibration can be decomposed properly.

Development

☐ HEPTA-Sat Training Program

When I was in my first year undergraduate, I learned satellite system and development process using HEPTA-Sat. And when I was in my 4th year, we designed the HEPTA-Sat ver.2 aiming to become a teaching material more suitable for users to use by improving the power supply system and structure system. In design improvement, I was mainly in charge of circuit design.

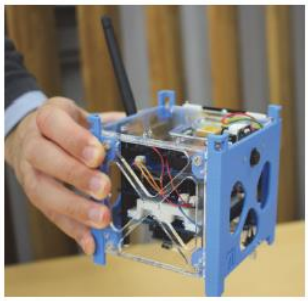

Fig.3 Overview of HEPTA-Sat

- Concept of Training

Understanding basic satellite system architecture & Experiencing the pico-satellite development process

- Goal of Training

Experiencing the development process of ultra-small satellites in a short time and acquiring the basic knowledge of space engineering.

So far, we have held many Workshops in japan and overseas, and in August this year we will held CanSat Leader Training Program 9 (CLTP9) at our university. The picture below is CLTP8 (Fig.4 left) held at our university in September 2017, and Workshop in Kathmandu University, Nepal in November 2017 (Fig.4 right).

Fig.3 Hands-on Training
CLTP8(left), Kathmandu Univ. Nepal(right)

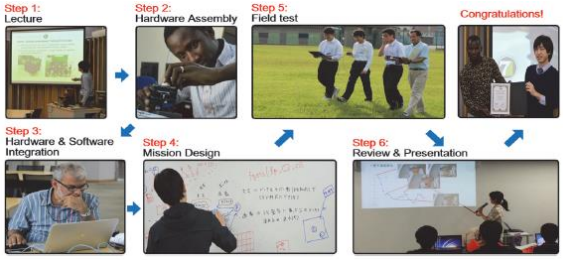

Fig.4 Flowchart of Hands-on Training

☐ 6U-Satellite “Prelude” Project

I am participating in the development project of the ultra small satellite “Prelude”. Prelude aims to predict the earthquake by global observation and aims to realize the probabilistic earthquake forecast which covers the entire satellite at all times and cooperates with the ground observation after ten years. In this project, I am mainly in charge of designing satellite structure. Prelude is under development of BBM now.

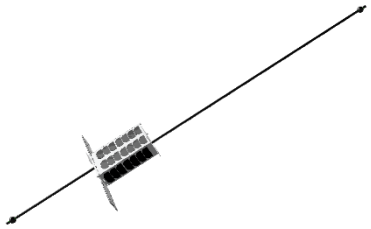

Fig.5 Overview of Prelude

- Mission of Prelude

1. Manufacture sensors with the same function as DEMETER with consumer goods at low cost.
2. By acquiring the VLF band waveform data before the earthquake, identify the cause of the preceding phenomenon.
3. Aim to discriminate preceding phenomenological electric field fluctuation in (Semi) real time from VLF sensor data.