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## Education

- Keiaigakuen Senior High School, Chiba, Japan (2013)
- Bachelor of Engineering, Nihon University, Chiba, Japan (2019)
- Master of Engineering, Nihon University, Chiba, Japan - Current

## Project

- NEXUS development project (April 2017 ~)

## Graduate's research

- Title : Development and Evaluation of Amateur Satellite Communication Technology Demonstration Satellite "NEXUS"

- Contents :

The 1U CubeSat "NEXUS" demonstrates the amateur satellite communication technology with four mission transmitters and a bus transmitter. NEXUS(Fig.1) was launched in January 2019 and has finished the initial operation. NEXUS has seven missions and four of them has been completed so far. In this paper, the development process and the operation of NEXUS are reviewed, and the lessons learned are summarized. Finally, the major factor of the success of CubeSat developed by university students is investigated and the suggestions are given for development and operation of CubeSat in university.

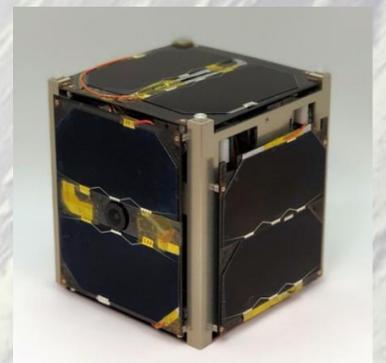


Fig.1 Appearance of NEXUS(FM)

## Master's research

Although the shape of the space structure can be qualitatively observed with the images of the on-board camera and the separated camera, quantitative measurement is essential for high functionality and improved reliability, and the trajectory is necessary when surface shape control is desired. Top surface shape measurement is essential.

For surface shape measurement, stereo vision with a plurality of camera images on the ground and a measurement method using a laser displacement meter are widely used. There is also a method of measuring the surface shape by scanning a laser displacement meter, but the larger the area, the longer the measurement. As a method to cope with these problems, there is a "Grid Projection Method" which can measure the measurement object as it is in a short time.

The "Grid Projection Method" is a method of projecting a grid of sinusoidal light and dark on a measurement target from a projector, photographing it with a digital camera, and determining the shape of an object for each pixel using the luminance value of each pixel of an image.

Feature of "Grid Projection Method"

- 1) The surface shape can be obtained as a set of coordinate values for each pixel of the captured image.
- 2) The number of shots is small.
- 3) Analysis time from taking an image to obtaining measurement results is short.
- 4) The configuration of the measuring instrument is simple and compact.

Fig.2 shows one of the analysis images when using "Grid Projection Method" for the spin spreading film experiment in a large vacuum chamber.

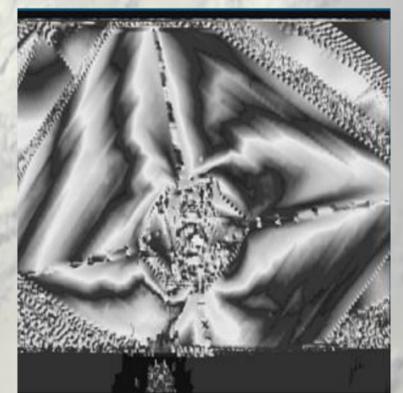


Fig.2 Example of applying "Grid Projection Method" to spin spreading film



Fig.3 Deployment experiment under micro gravity

Our laboratory is planning to carry out micro gravity experiment using aircraft in 2020. In this experiment, we will deploy and measure the self deployable membrane surface structure developed in the laboratory. In the master's research, the theme is to apply "Grid Projection Method" to this experiment and evaluate "Grid Projection Method" from analysis results.

Fig.3 shows the deployment of the self deployable membrane surface structure in the micro gravity experiment using an aircraft conducted in June 2016.