

# Eagle Eye

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The 12<sup>th</sup> Spacecraft Control System Design Contest

Team “**Stella Tune**”

(K. Nakagawa, R. Kobayashi, F. Aono, D. Ishido, T. Shibata, S. Yokohori)

# Team Introduction

We are students of **Astrodynamics and Space Systems Laboratory (ASSL)**

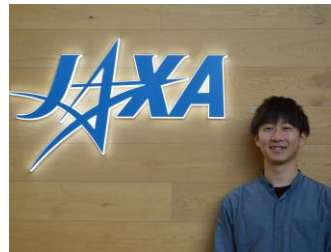
## Research

Astrodynamics (space flight dynamics) with a focus on applications to space exploration missions, which are unique to ISAS.


## Team Members



Kaho Nakagawa  
(D1)

Reiji Kobayashi  
(D1)




Fumiya Aono  
(M2)




Daichi Ishido  
(M2)




Tomoyo Shibata  
(M2)




Satsuki Yokohori  
(B4)

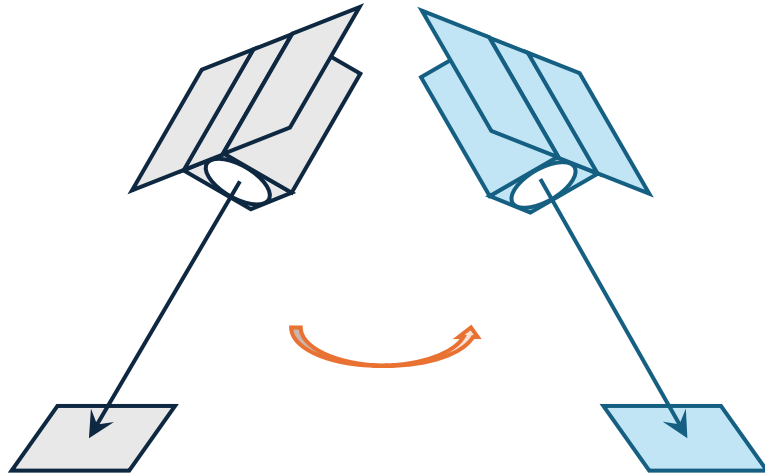


# Control Strategy

## Mode1: Attitude maneuver

→ Attitude control **to point to the next target**

Using RW × 4, MTQ

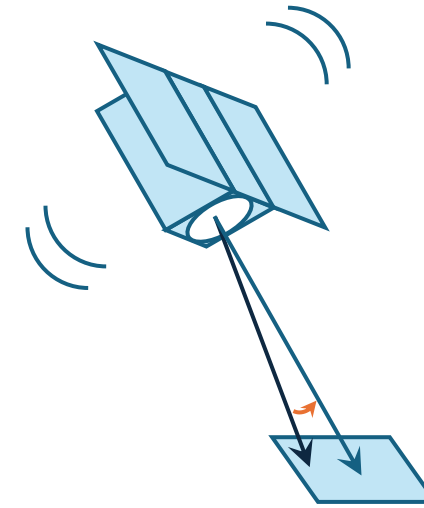


High-speed maneuver is required

## Mode2: Pointing Control

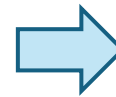
→ Attitude control **to keep pointing the target**

Using RW × 4, MTQ



High attitude stability is required.

$$\Theta < FOV$$



state transition



Once all targets  
are observed

**Control law:** Based on **PD FB control + FF control**

$$u = k_p \theta e_\theta + k_d (\omega_{cmd} - \omega) + \omega \times (I\omega + h_w) - T_{air}$$

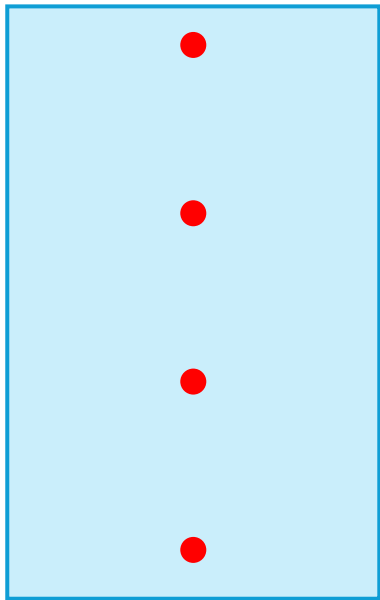
**Control law:** Based on **PID FB control + FF control**

$$u = k_p e_\theta + k_d \dot{e}_\theta + k_i \int e dt + \omega \times (I\omega + h_w) - T_{air}$$

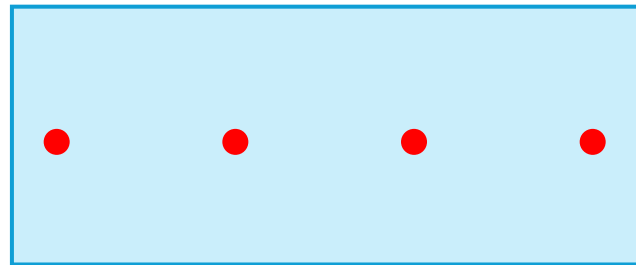
# Plan Strategy

## 1: NS sweep / EW sweep

→ When the observation area is narrow in the east-west or north-south direction



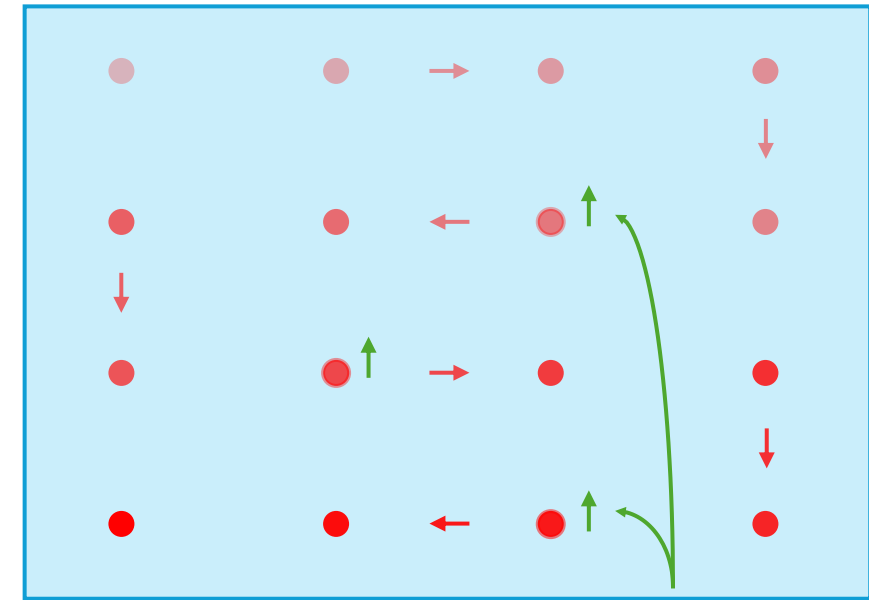
NS sweep



EW sweep

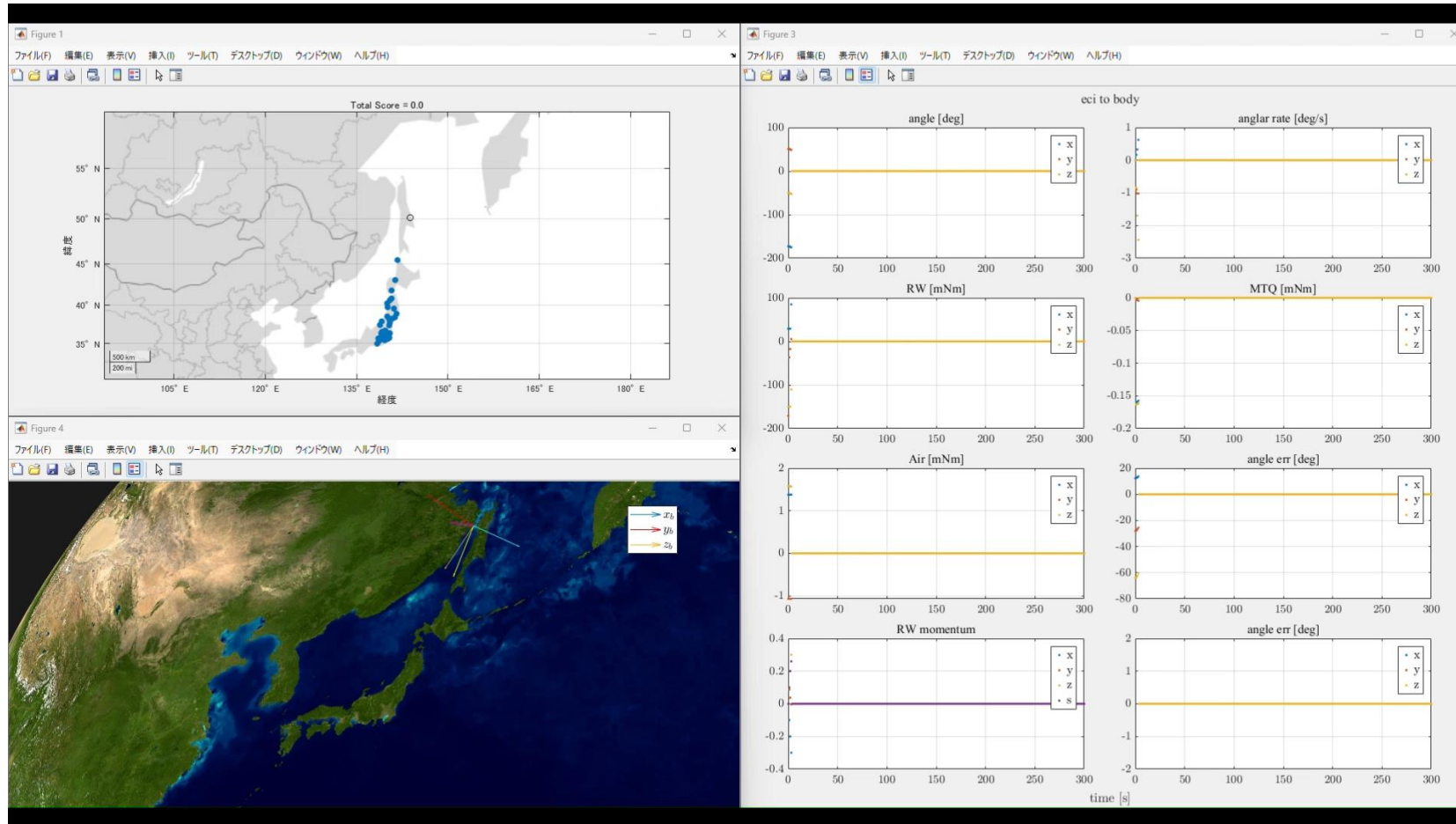
## 2: ZigZag sweep

→ When the observation area is wide from east to west, north to south, and south to north.



*Shift the target point to the north to minimize overshoot.*

# Verification of the user code



Visualization of attitude and actuator state variables makes code verification easier.