

ASTRODYNAMICS SYMPOSIUM (C1)
Guidance, Navigation & Control (1) (1)

Author: Dr. Fuyuto Terui
Japan Aerospace Exploration Agency (JAXA), Japan, terui.fuyuto@jaxa.jp

ACCURACY OF POSITION CONTROL OF HAYABUSA2 IN ASTEROID PROXIMITY PHASE

Abstract

A new asteroid exploration spacecraft “Hayabusa2” as a follow on of “Hayabusa” was launched on 3rd of December 2014 from Tanegashima Space Center located in the south part of Japan. It is now in “cruising phase” flying to the asteroid “Ryugu”.

Hayabusa2 will reach the asteroid in July 2018 and will leave it in December 2019. This period is called “Asteroid Proximity Phase” and the planned missions in this phase are scientific observation of the asteroid, releasing small rover and lander to the surface of the asteroid for scientific and engineering purposes, releasing explosive called “Small Carry on Impactor” to the asteroid in order to make a crater on the surface of the asteroid and multiple times of touchdown including “pinpoint touchdown” toward the newly created crater in order to get “fresh” material underneath the surface of it.

For each operation in “Asteroid Proximity Phase” accuracy of position control around the asteroid is primary concern for its success. Accuracy requirement depends on each operation and Guidance, Navigation and Control (GNC) scheme is also dependent on relative distance, altitude, from the asteroid surface.

This paper explains GNC strategy for each operation such as station keeping phase (keeping almost same position relative to the asteroid with altitude of e.g. 20km), approach phase (e.g. from 20km to 40m altitude) and final descent phase (e.g. from 40m to touch down). Then the result of analysis for position control accuracy will be shown through Monte Carlo simulation.