

Calculation of Orbital Elements for Sending Interplanetary Probes

Authors : Jorge Lus Nisperuza Toledo, Juan Pablo Rubio Ospina, Daniel Santiago Umana, Hector Alejandro Alvarez

Abstract : This work develops and implements computational codes to calculate the optimal launch trajectories for sending a probe from the earth to different planets of the Solar system, making use of trajectories of the Hohmann and No-Hohmann type and gravitational assistance in intermediate steps. Specifically, the orbital elements, the graphs and the dynamic simulations of the trajectories for sending a probe from the Earth towards the planets Mercury, Venus, Mars, Jupiter, and Saturn are obtained. A detailed study was made of the state vectors of the position and orbital velocity of the considered planets in order to determine the optimal trajectories of the probe. For this purpose, computer codes were developed and implemented to obtain the orbital elements of the Mariner 10 (Mercury), Magellan (Venus), Mars Global Surveyor (Mars) and Voyager 1 (Jupiter and Saturn) missions, as an exercise in corroborating the algorithms. This exercise gives validity to computational codes, allowing to find the orbital elements and the simulations of trajectories of three future interplanetary missions with specific launch windows.

Keywords : gravitational assistance, Hohmann's trajectories, interplanetary mission, orbital elements

Conference Title : ICAAE 2018 : International Conference on Aerospace and Aviation Engineering

Conference Location : Paris, France

Conference Dates : October 29-30, 2018