Galilean Moon Tour Using Simplified Trajectory Computational Techniques

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ABSTRACT

It is desired to find a trajectory for a spacecraft that will capture into an orbit about Jupiter and then subsequently capture into an orbit about each of the Galilean moons. The two main variables are the mass ratio, final mass to initial mass, and the trip time. The work was done using numerical estimation techniques in order to find the mass and trip time in using simplified analysis which is computationally fast and efficient. The transfer will be broken into three main segments: capturing into the first moon, capturing into and escaping from the moons, and transferring between the moons. Also a new steering law that increases the radius of perigee is developed to keep the spacecraft from crashing into the moons in certain situations. Once all of the individual segments have been completed the complete Galilean moon tour will be computed. It was found that using a 10 kW engine for a 1000 kg spacecraft gives a final mass of 420 kg and takes 1.62 yrs. A much larger spacecraft with an initial mass of 30,000 kg and a 100 kW engine gives a final mass of 19,861 kg and takes 10.69 yrs.