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STUDY ABOUT THE PERFORMANCE FOR SIMULTANEOUS DEPLOYMENT OF THE CABLES FROM GEO STATION UNDER THE SPACE ELEVATOR CONSTRUCTION

Abstract

Understanding of cable dynamics of space elevator under construction is one of the most important issues in designing space elevator. There are some studies on the cable dynamics of space elevator under construction, but, they assumed the cable deployment with rising the space station to the orbit higher than GEO in order to keep the center of the orbit in GEO. Such method has disadvantage that large propellant is necessary to rise the space station to higher orbit. We propose a new method to construct the space elevator in which cables are simultaneously deployed upward and downward from the main space station in keeping it in GEO and balancing upward and downward cables. Such method will have a possibility to reduce their total propellant mass required during construction of the space elevator. The analysis is performed by the cable dynamics model originally develiped by our group. The model is a two-dimensional lumped mass model, in which tether is modeled as a series of mass points connected with each other by springs and damper and are pull out from GEO station. In this study, the cable dynamics and the cable stress are analyzed for assumed deployment conditions of the cables at first, then the total impulse during cable deployment, that is necessary to keep the main station in GEO and to control the cable deployment speed not to exceed the maximum stress of the cable, is obtained. The results are also compared with the preceding method for the same conditions. The initial result shows that the total impulse that is necessary to control cable dynamics with keeping GEO station in GEO in our cable-deployment method can be decreased about one-third compared with that is necessary to rise the main station to higher orbit and to control cable dynamics in preceding cable-deployment method. The detail analytical results will be presented at the conference.