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A CALCULATION MODEL FOR POWER OF SOLAR ARRAY ON MULTIPLE COMBINED SPACECRAFT AND PARAMETERS IDENTIFICATION

Abstract

Combination is the development tendency of large spacecraft such as space station or space telescope system, of which the structure comes more and more complicated along with the expanding of functions. Thereby a series of difficulties in design and analysis of power system will be met. Its key issue is to calculate the power of solar arrays. The attenuation caused by occlusion between each spacecraft body and solar array should be considered, besides, the change of some corresponding parameters in actual orbit is also influential. In this paper to solve these problems above, firstly an algorithm to calculate the shadow on solar arrays based on virtual vision was proposed. Then the other factors which influence the power of solar arrays were list and a semi-empirical model was put forward. Lastly identification method of parameters in the model by spacecraft's actual data in orbit was discussed, which specially included an optimization method to calculate the incident solar vector by output of solar arrays. The simulation examples showed that the model's precision is high enough and the unknown parameters can be effectively estimated by actual data. The model and algorithm proposed in this paper have well engineering and research value, which can be applied in general planning of combined spacecraft's power system, as well as state monitoring and fault diagnosing during the spacecraft's operation period.