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THERMAL CONTROL DESIGN OF REMOTE-SENSING SPACECRAFT ON ELLIPTICAL SUN-SYNCHRONOUS ORBIT

Abstract

Recently, it is required to develop type of spacecraft with observation of certain area of the Earth on SSO. but, in the case of regional remote sensing systems, the resolution in the certain observation area is required higher than in a circular sun-synchronous orbit, and in other areas an orbit is required that allows to monitor on the vast territory. For this purpose, an elliptical SSO with a low perigee and a large apogee is considered. In a previous ¡Assessment of possibility of using remote sensing satellite for regional observation in elliptical SSO¿ study, an optimal orbit was determined to monitor a region of a spacecraft in a SSO. When designing thermal control design of spacecraft on these SSO, the problem is to increase the temperature during the section of shadow on the opposite side of the Earth. Thus, thermal control based on accurate understanding and analysis of heat transfer is essential at the space environment with extreme heat. Thermal control belongs to inverse problems of heat transfer with mathematically incorrect solution, most often it is unstable. One of effective methods to stable inverse heat transfer problems for the satellites is a thermal calculation by the regularization method. The purpose of study is working out a simplified and effective thermal calculation to solve inverse problems like thermal control and identification of thermophysical properties of the material. The comparative heat transfer analysis between the obtained results by using presented methodology and results simulated by existing commercial software (TAS) is performed. These simulation data are non-steady temperature fields necessary for formulation of the inverse problems.