

A Study of Structural Damage Detection for Spacecraft In-Orbit Based on Acoustic Sensor Array

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Abstract : With the increasing of human space activities, the number of space debris has increased dramatically, and the possibility that spacecrafts on orbit are impacted by space debris is growing. A method is of the vital significance to real-time detect and assess spacecraft damage, determine of gas leak accurately, guarantee the life safety of the astronaut effectively. In this paper, acoustic sensor array is used to detect the acoustic signal which emits from the damage of the spacecraft on orbit. Then, we apply the time difference of arrival and beam forming algorithm to locate the damage and leakage. Finally, the extent of the spacecraft damage is evaluated according to the nonlinear ultrasonic method. The result shows that this method can detect the debris impact and the structural damage, locate the damage position, and identify the damage degree effectively. This method can meet the needs of structural damage detection for the spacecraft in-orbit.

Keywords : acoustic sensor array, spacecraft, damage assessment, leakage location

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