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RESEARCH ON AN INNOVATIVE HIGH-RELIABILITY ATTITUDE MEASUREMENT UNIT OF
MICRO/NANOSATELLITE**Abstract**

In recent years, micro/nanosatellite has gradually become a research hotspot. To obtain real-time satellite attitude information, selecting an appropriate attitude sensor is necessary. Traditional attitude sensors, such as sun sensors, gyros, and magnetometers, are used by micro/nanosatellites. The Attitude Measurement Unit (AMU) is developed to reduce the complexity of the attitude sensors configuration. AMU integrates a sun sensor, three-axis gyroscope, three-axis magnetometer, temperature sensor, and high-performance processor in a small size (45mm45mm10mm), which can independently measure the attitude information of spacecraft in real-time and provide high-performance and highly reliable real-time output of attitude information. In addition, it dramatically simplifies the design process of the attitude determination system. OpenHarmony Real-Time Operating System (RTOS) is used to improve reliability. OpenHarmony is a free RTOS with a small LiteOS-m kernel (less than 10kb) and is very suitable for space applications. Regarding AMU software design, according to OpenHarmony, priority preemption and round-robin scheduling mechanisms are adopted to ensure timeliness. Besides RTOS, Error Checking and Correcting (ECC) of hardware and Error Detection and Correction (EDAC) of software are used by AMU. Meanwhile, a program redundancy backup design is adopted to achieve three-mode redundancy. AMU is the first satellite subsystem that uses OpenHarmony. In 2022, several micro/nanosatellite missions adopted AMU for spacecraft attitude determination.