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## AN INNOVATIVE HIGH-RELIABILITY SUN SENSOR OF MICRO/NANOSATELLITE

**Abstract**

With the development of space exploration, micro/nanosatellites with low cost, high functional density, short development cycle, and flexible launch mode have become a hotspot in the current. The sun sensor provides attitude information to the spacecraft's Attitude Determination and Control System(ADCS). There are two kinds of sun sensors, and they are digital sun sensors and analog sun sensors. The digital sun sensor is easy to use but less reliable for it needs a processor and complicated circuits. Therefore, how to make the sun sensor high-performance and high reliability under size, mass, and power consumption constraints is very important. An innovative high-reliability digital sun sensor is designed. For the hardware design, it has a high-reliability digital output interface and a high-performance processor, which can measure the attitude information of the micro/nanosatellite in real time. For the design of software, a new Real-Time Operating System (RTOS),OpenHarmony, is used to improve reliability and performance. OpenHarmony is a free RTOS with a LiteOS-m kernel of only 6Kb, which is very suitable for subsystems with MCU that always have less memory. With OpenHarmony, the average response speed of the sun sensor is improved. And the response time is only 75.78 percent compared with the sun sensor with No RTOS. Besides, Error Checking and Correcting(ECC) and Error Detection and Correction(EDAC) of memory are used to improve reliability. As of early 2023, several micro/nanosatellite missions has used the digital sun sensors in space.