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SMALL SIZE DECENTRALIZED AUTONOMOUS ENVIRONMENT SENSORS TO REALIZE MULTI-POINT ASSESS OF MANNED SPACE SYSTEM

Abstract

To ensure healthy and long-term space habitation, it is essential to assess and control air conditions, such as the temperature, humidity, and concentrations of oxygen, carbon dioxide, and hazardous gases. To design and control air situations, it is necessary to assess local air conditions as well as the entire

system because airflow is affected by various items placed in the habitation space and the motion of humans, which serve as not only obstacles against airflow but also generators of carbon dioxide and hazardous gas. To meet this requirement, we developed small-sized decentralized autonomous environment sensors that utilize Internet of Things technologies. Two of the environment sensors will be launched the Japanese Experiment Module Kibo in 2025 and will get multiple point environment information such as CO2 contents, odor, temperature and humidify. The sensors will automatically acquire environment information intermittently. Acquired information will be recorded internal memory and transmitted to on-orbit file server through WiFi communication network, therefore we can access the information semi-real-time manner. Because a camera and an IMU unit are installed in the sensors, the position that the data is acquired can be identified using Visual-SLAM technologies. Acquired data is utilize to verify air flow mode under the microgravity condition and future designing air conditioning of future microgravity habitation. This paper outlines the small-sized decentralized autonomous environment sensors and the experiment in the Kibo experiment module.