Paper ID: 103699
interactive
student

28th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Late Breaking Abstracts (LBA) (LBA)

Author: Mr. Julio Cesar Tello Rojas
Universidad Nacional Mayor de San Marcos, Peru

Mr. Luigy Zidane Moreno Perez
Universidad Nacional Mayor de San Marcos, Peru
Ms. Marisol Ramos Camacho
Universidad Nacional Mayor de San Marcos, Peru
Mr. Omar Obregón Cevallos
Universidad Nacional Mayor de San Marcos, Peru
Mr. Jeremy Hanks Reyes Huaman
Universidad Nacional Mayor de San Marcos, Peru

INTELLIGENT CONTROL SYSTEM FOR LIFE SUPPORT AND ENERGY MANAGEMENT IN MOONAL HABITATS USING TINYML AND DUAL MICROCONTROLERS

Abstract

The development of lunar habitats requires autonomous and low-consumption systems that maintain internal environmental stability with minimal human intervention. The paper, conceived at the National University of San Marcos in Peru, presents the design of a prototype intelligent system for energy control and life support in lunar habitats, based on a dual microcontroller architecture. One microcontroller is responsible for acquiring environmental internal parameters of the lunar habitat such as air quality, humidity and temperature using COTS sensors, as well as controlling actuators. In parallel, the STM32 performs autonomous inference through TinyML to recognize environmental deterioration patterns and activate adaptive measures without internet connection. The results show adequate energy performance and enhanced fault resilience, validated through physical simulations and software. This modular, economical and intelligent solution can reinforce the robustness of a lunar habitat in technical compartments.