IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Medical Care for Humans in Space (3)

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DIGITAL MULTIMOMETER VITAL SIGN MONITOR DEVICE FOR SPACE MISSIONS

Abstract

As human activities in space become more prevalent, a comprehensive means of monitoring astronaut health is required. Unfortunately, due to the prominent level of background noise in space aircraft, conventional stethoscopes are less sensitive at detecting respiratory sounds. OmnySense's thermometer-shaped device provides an innovative solution for this problem by recording respiratory sounds from within the mouth. During the 30 seconds that the device is held in the mouth, it obtains, not only oral body temperature, but also 1-Lead ECG (includes heart rate), oxygen saturation, and respiratory rate. The in-mouth microphone provides stethoscope-like functionality by listening to the respiratory sounds, while calculating the RR and I:E ratio from via breath sounds. The reflective pulse oximeter on the device body provides PR and SpO2. Future models can add additional medical parameters, including galvanic skin response (GSR), body composition, 6-Lead ECG, cardiac output, and non-invasive blood pressure. Comprehensive monitoring requires that, in addition to measuring vital signs, there is also ongoing monitoring of both cardiac and respiratory parameters – and a combined presentation of all the parameters measured (and their trends) in a unified and clear manner. During short- and long-duration piloted space missions, there is an increased need to provide continuous medical monitoring for astronauts for a variety of chronic and acute conditions. OmnySense enables this monitoring process to be managed autonomously, with physicians being able to screen for various medical conditions by remotely monitoring their vital signs, evaluating their electrocardiograms (ECGs) and their lung sounds. On-going monitoring enables insight into the health implications of space flight, including long-term space missions. This factor is of major importance for health and space policy planning Multi-parameter medical monitoring equipment is well known from the hospital environment, where a patient is typically wired-up to a series of instruments. While suitable for patients who are at rest, such equipment is too complex and cumbersome for deployment in space. Additionally, such devices are designed for continuous monitoring, which, while important for the sick, are less appropriate for people (such as astronauts) who are fit. Related devices for constant monitoring include various wristbands. However, these are limited in the range of parameters that they can measure, which are primarily cardiac parameters derived from the PPG wave as observed at the wrist. The in-flight study in spaceflight follows on-Earth research in extreme environment and zero-G trial. The proposed device is novel and revolutionary.