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Titel des Beitrags: A New Human Thermal Model for the Dynamic Life Support System Simulation V-HAB

Abstract: The Virtual Habitat project (V-HAB) at the Technical University of Munich (TUM) aims to develop a dynamic simulation environment for life support systems (LSS). Within V-HAB a dynamic human model interacts with the LSS by relevant metabolic inputs and outputs based on internal, environmental and operational factors. The human model is separated into five sub-models (called layers) representing metabolism, respiration, thermoregulation, water balance and digestion. As V-HAB is evolving, new requirements emerge for the human model, as it is used for the simulation of both short term (e.g. EVA) and long term (e.g. space station) missions. These requirements call for different fidelity levels for each of the layers of the model (to allow for faster or more detailed simulations) and a more precise calculation of heat production and heat exchange within a subject and with its environment. The current version of the thermoregulation focuses on the trunk temperature and warmer environments, containing six thermal nodes. However, for a scenario like EVAs, the resolution of this model especially in the extremities is too low. Therefore, the Wissler thermal model was converted from Fortran to C#, also introducing a more modularized structure and a standalone graphical user interface (GUI). Currently, an initial interface to V-HAB is being implemented, making it possible to use the model in V-HAB. To fully integrate the Wissler model with the V-HAB simulation, the fluid and thermal solver framework in V-HAB has to be used to solve the equations provided by the Wissler model. This will allow a close interaction between the human thermal layer and the environment defined in V-HAB. This is necessary to allow using the model not
only in normal environments, but also connect it to e.g. the model of the liquid cooling garment implemented in V-HAB. While this integration is ongoing, the currently implemented arm model and initial validation results are presented.

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