Development Status of V-SUIT — The Virtual Space Suit simulation software

Abstract:
The dynamic life support system (LSS) simulation software Virtual Habitat (V-HAB) has been under development at the Technische Universität München since 2006. The MATLAB™-based V-HAB software suite dynamically simulates habitat life support systems and their interaction with a detailed human model, as well as the external environment of the habitat. V-SUIT began as a spin-off from V-HAB and enables the simulation of smaller life support systems with smaller buffer volumes and faster response times. The project goal is to enable the dynamic simulation of space suit portable life support systems. This paper presents the current development status of V-SUIT. The internal structure of the simulation is described in detail. It is modeled using a bottom up, object-oriented approach, with the smallest individual computational objects representing a low level component like a pipe or a valve. Using these low level objects, the higher level components are assembled, for instance the oxygen tank assembly and the associated regulators. A generic method of describing the interactions between the objects was developed that is based on matter flows and includes a large number of parameters such as temperature, pressure, composition and matter states.
(solid, liquid, or gas phases). To assess the capabilities and shortcomings of the current simulation configuration, NASA’s PLSS 1.0 test bed was modeled in V-SUIT. The systems and subsystems of the PLSS 1.0 model are described in detail. The simulation results are compared to published performance data of the PLSS 1.0 test bed and the differences and discrepancies are discussed. The paper concludes with an outlook on future development steps and challenges.

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