IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
Hands-on Space Education and Outreach (8)

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NANOSTAR PROJECT: STUDENT CHALLENGES & TOOLS – DEVELOPING COLLABORATIVE TOOLS FOR NANOSATELLITE EDUCATION AND CAPACITY BUILDING

Abstract

NANOSTAR emerges as a project funded by INTERREG-SUDOE through the European Regional Development Fund (ERDF) aiming to develop a leading collaborative online platform in Europe for nanosatellite hands-on education and training in space engineering. One of the major project goals was to develop a set of open-source tools for nanosatellite subsystems design, which are interconnected through a centralized database. Although the Nanostar project provides a first version of such a default tools set,

the open-source community can still adapt it to its own needs in the future. This first set of collaborative tools and modules is called "Nanostar Software Suite" (NSS), and a preliminary version has already been tested in both international and interinstitutional preliminary mission design competitions and detailed design challenges. The received student feedback has allowed to refine the NSS and to adapt it to its main target user: the students. The NSS implements a Concurrent Design Engineering methodology thanks to a set of integrated tools. These tools rely on both a strong modularity and the use of standards, which should ease incorporation of external materials. The NSS is composed of a set of modules that can easily communicate through Nanospace. Modules have been provided, developed, and supported by the different institutes of the Nanostar Consortium. The Nanospace is the NSS backbone, allowing a smooth interaction between each subsystem tool. Contrary to existing solutions, the NSS is open source, meaning that the architecture allows the integration of 3rd party tools and applications. In fact, the source code of NSS is already available online. Most of the software constituting the Suite are under AGPL v3 or MIT license. The NSS aims at getting a strong data consistency between expert software during a mission preliminary design. This paper focuses on summarizing the Nanostar project, as well as proposing future applications. Thus, it describes the work performed, detailing specific aspects of the NSS, as well as the outputs of the student challenges organized with the alpha prototype. Also, an ecosystem analysis is performed to understand the state-of-the-art solutions and services in the context of hands-on undergraduate education on small satellite preliminary design in Europe. This permits to define the value proposition of Nanostar and the NSS competitive advantage compared with existing tools for concurrent engineering in preliminary mission design. Finally, it draws conclusions about the potential of NSS for space education and proposes concrete strategies and applications for the future.