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THE GOLDCREST MISSION AND THE ON-BOARD COMPUTING REQUIREMENTS NECESSARY TO GENERATE THE DELAY-DOPPLER MAPS REQUIRED TO DETERMINE SOIL MOISTURE CONTENT

Abstract

The overall system and computational requirements necessary to achieve the payload objectives of a low-Earth orbit Earth Observation nano-satellite entitled GOLDCREST, are investigated. GOLDCREST is a 1U satellite designed by the first students of the Interdisciplinary Space Master students at the University of Luxembourg. All subsystems are designed to support a Global Navigation Satellite Systems Reflectometry payload to determine the soil moisture content of the Earth's land surfaces using components readily available, "off-the-shelf". The primary system bottleneck addressed in this paper is related to the on-board computing requirements necessary to generate delay-Doppler maps, the primary satellite deliverable required to determine soil moisture content. In this work, a feasibility study for the on-board generation of delay-Doppler maps with the SatBus-3C2 processor was investigated. The throughput processing, memory, and timing requirements for Matlab-based algorithms were first determined and then extrapolated to the SatBus-3C2 processor. Although an introductory study, it has been found that many improvements can be made to reduce the computational load necessary to meet mission requirements when porting the desired functionality to the selected processor.