

Advanced Software Techniques for Resilience Against Error Upsets in Space

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ASTRAEUS project aims to improve the use of Commercial-Off-The-Shelf (COTS) devices in space telecommunication applications. The goal is to develop specialized radiation mitigation techniques for both hardware and software components with a special focus on the latter. The aim is to demonstrate the feasibility and reliability of these techniques, enabling their future use in telecommunication payload processing units. The SIHFT (Software Implemented Hardware Fault Tolerance) approach will be enforced, where some proper modification to a conventional compilation toolchain, will make possible the identification of temporary faults and the adoption of fault tolerant solutions. The successful implementation of this project will de-risk the use of software-based radiation mitigation techniques and foster the adoption of high-performance while cost-effective COTS in space applications. The key objectives of ASTRAEUS are:

- Developing and prototyping fault mitigation functions for selected high-performance processors embedded in System on Chip (SoC) components.
- Validating these prototypes through fault injection and radiation tests, ensuring their dependability.
- Enabling a significant increase in computing performance and advanced features for commercial components compared to current space-specific data processing technology.

The software named ASPIS³, developed by POLIMI, is a LLVM-based tool that automatically injects SIHFT approaches into the Intermediate-Representation of the code [1] and it will be enhanced and validated during the project on a SDR application provided by Argotec.

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References

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³ <https://github.com/HEAPLab/ASPIS>