

Talk: The role of mathematical optimisation for ESA space missions- cases and challenges

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Abstract: The talk describes the current problems encountered by missions of ESA for the mathematical community to solve. It provides an overview of the mathematical optimisers used by the agency as well a detailed explanation of the space missions that challenge the edge of current mathematical optimisation methods. The talk explains as well the ESA efforts on the analysis and assessment of global optimisation techniques and the description of roadmaps for the development of a global optimiser. The European Space Agency (ESA) has been using mathematical optimization for space missions since the 80's.

Along the years, several mathematical solvers have been funded by ESA with the purpose of optimising space trajectories, spacecraft control algorithms, spacecraft building and testing procedures, spacecraft structures, and a combination of all of the previous (multi-disciplinary mathematical optimisation).

Several of those are quite successful (TROPIC, PROMIS, CAMTOS, MIDACO) and some others have not been used a lot. Among those, the European NLP solver WORHP is the product of several years of work encouraged by the Agency and supported through various activities of DLR, ESA, FP7, Bremen University and Steinbeis Forschungszentrum, to foster European independence from US products that have dominated the market for industrial-grade numerical mathematical optimization software.