Constrained/Multi-Objective Global Optimization for Space Applications

Stage topic Description

Engineers are always able to find good solutions to problems and they often remain with the question “could I have done it better?”. One of the deepest implications of the vast amount of results coming from Operational Research and in particular from the area of global optimization is that such a question is highly likely to have one short answer: “yes”. Space engineering is no different and during this stage we are aiming at applying some of the state of the art techniques in constrained and multi-objective global optimization to problems that aerospace engineers have to face daily such as system design problems, low-thrust interplanetary trajectory problems, etc. A particular emphasis of the stage will be this last case, a problem that can be formally described as a large scale, constrained, non linear global optimization problem.

Candidate’s tasks

Characterize the search space structure of interplanetary low-thrust transfers and in particular the infeasible zones.
Test state of the state of the art techniques on constrained global optimization on increasingly difficult problems to be agreed during the stage.

The ideal candidate

Strong programming skills in one or more of the following languages: C++, Python, MATLAB
Background in operational research or applied mathematics, especially in optimization methods

References

[1] Yam, C.H., Biscani, F., Izzo, D., "Global Optimization of Low-Thrust Trajectories via Impulsive Delta-V Transcription," 27th International Symposium on Space Technology and Science, Tsukuba City, Japan, July 5-12, 2009.
[2] PaGMO project home page http://sourceforge.net/projects/pagmo/