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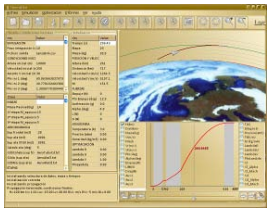
2012 research highlights

Optimisation processes

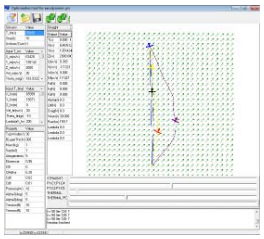
Optimisation of aerospace trajectories



The ascent optimal trajectory for small launchers can be calculated for injection at maximum orbital height with autonomous rapid corrections in real time. The angle of thrust vector -the single control- can be solved together with some system design parameters by applying an indirect optimization method iterated over the parameter space. Feasibility, accuracy and convergence of the method are part of the research, as well as throughput necessary.

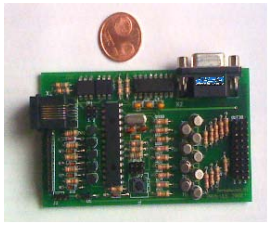
On-design and off-design performance is also investigated to help present and future designs of aero-ejected launchers.

Optimisation of airplane trajectories



Given the dependency of aircraft performance from the meteorological conditions, a research lines exploits the benefits of having a better knowledge of atmospheric conditions in real time. Thus, analytical methods (in contrast to other extended approximate solutions) are used to find best trajectories for several figures of merit, including weather forecast modifications and the occurrence of path constraints.

Control of unmanned air vehicles



Modern designs for robust control of unmanned air vehicles include commercial components and in-house developments to embed real-time algorithms, data fusion tasks and management of redundancies, reducing the workload of the onboard processors. The software includes nested loops with growing frequencies, a selection of filters for the sensor data and a variety of control algorithms.

Flight dynamics simulation

Development of flight dynamic models to be run under simulated environmental conditions and with manual or pre-programmed inputs from the user. The software is prepared:

- as a tool for engineers to test different flight configurations
- as a tool for engineers to test different control strategies
- as a tool for operators for training purposes

The aerodynamics, structural and propulsion performance of the vehicle are modelled or tested and included in the simulation.

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