



Singular perturbed problems and Julia package in optimal control.

Heads:

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Laboratory: CIMI & INP-ENSEEIH-IRIT.

Keywords: Optimal control, Singular perturbation, Numerical optimization, git, JULIA language.

3rd year internship. Duration of 6 months and salary of 600 euros per month.

Context. This internship is a part of the CIMI project: Singular perturbed problems [5, 3, 7] and JULIA [1] package in optimal control. The objectives of this project is to solve numerically with a good precision singular perturbed optimal control problems and to develop a package in julia for solving optimal control problem by direct and indirect methods with a good connexion between theses methods. This last point will be integrated in the ADT project of INRIA, named **Control Toolbox (CT)**.

Work to do.

- Test softwares in JULIA and MATLAB for solving singular perturbed optimal control problems on simple examples.
- Develop in JULIA an interface to the HamPath [4, 6] code developed by the APO team of IRIT.
- Integrate this work in the NUTOPY [2] project.

Ability and knowledge.

- Good bases in applied mathematics.
- Good bases in programmation. This project will be made in a git environment with the generation of the documentation, the unitary tests and continuous integration.
- Bases in MATLAB or JULIA.

Future. This internship could be continued in a PhD. For this, the student would candidate to PhD grant of CIMI and IRIT.

REFERENCES

- [1] <https://julialang.org>
- [2] <https://ct.gitlabpages.inria.fr/nutopy>
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- [4] J.-B. Caillau, O. Cots & J. Gergaud, *Differential continuation for regular optimal control problems*, Optimization Methods and Software, OMS special issue dedicated to 60th birthday of Andreas Griewank Taylor & Francis Group, **27** (2012), no. 2, pp 177–196.
- [5] E. Trélat, E. Zuazua, *The turnpike property in finite-dimensional nonlinear optimal control*, J. Differential Equations, **258** (2015), no. 1, pp 81–114.
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