

A comparative survey of software computational tools in the field of optimal control

Stepan Ozana, Akshaya Raj, Tomas Docekal, Jakub Mozaryn

Abstract: The paper gives an overview of various ready-to-use numerical software solutions capable of solving optimal control problems (OCP). It summarizes basic properties, licensing policy, approach and formulation of OCP. The paper presents a particular case study which compares chosen SW tools in terms of achieved results. This is done for a mathematical model of a single pendulum on the cart which represents a highly complex and nonlinear system that is suitable to be used as a benchmark. The motivation of this paper is to give a brief overview of some of the software tools available in the market that are used to solve the optimal control problem (OCP). In recent years, the interest in solving the optimal control problem has led to the development of various software tools. The goal is to ultimately provide the user with sufficient knowledge of the toolbox, problem formulation and certain other aspects to know which toolbox fits their problem definition. When a dynamic system is considered, the process of determining its control and state trajectory over a finite amount of time, to optimize the cost function is known as optimal control. Solving it analytically turns out to be quite a challenge as the variables and complexity of the system increases. Hence, the numerical approach is considered better. The numerical method is divided into two classes: indirect and direct methods. Both direct and indirect methods have completely different outlook. Indirect approach solves the problem by converting the optimal control into a boundary value problem.

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- 1) Stepan Ozana, Associate Professor: Faculty of Electrical Engineering and Computer Science, Department of Cybernetics and Biomedical Engineering, VSB-Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava, Czech Republic (CZ), stepan.ozana@vsb.cz.
 - 2) Akshaya Raj, M.Sc.: Faculty of Electrical Engineering and Computer Science, Department of Cybernetics and Biomedical Engineering, VSB-Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava, Czech Republic (CZ), akshaya.raj.st@vsb.cz.
 - 3) Tomas Docekal, M.Sc. (Ph.D. student): Faculty of Electrical Engineering and Computer Science, Department of Cybernetics and Biomedical Engineering, VSB-Technical University of Ostrava, 17. listopadu 2172/15, 708 00 Ostrava, Czech Republic, Czech Republic (CZ), tomas.docekal@vsb.cz.
 - 4) Jakub Mozaryn, Ph.D.: Warsaw University of Technology, Faculty of Mechatronics, Institute of Automatic Control and Robotics, Pl. Politechniki 1 00-661 Warsaw, Poland (PL), jakub.mozaryn@pw.edu.pl.