The solution of nonlinear optimal control problems in motion planning by non-AI-based methods

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The simulation of motion of multibody systems requires a formulation by DAEs or the derivation of the Euler-Lagrange equations in minimal coordinates. We aim at optimal control of motion with respect to arrival time or some type of minimizing a quadratic functional. The resulting optimal control problem is tackled by a first discretize then optimize procedure. The optimization process requires the solution of a complex, high dimensional, nonlinear optimization problem. To find a feasible initial solution to the boundary value problem is often difficult to accomplish. Even very sophisticated optimization codes fail if not given suitable initial guesse.

We aim at improving the beheaviour of the optimizer by 2 approaches. First we try to divide the problem in simpler parts where the solution is obtained by the optimizer even with a very rough initial gues. Second, we use a cascade of finer and finer grids to obtain a final solution. We conclude with numerical examples and comparision of the two approaches.