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Nonlinear predictive control of a mobile robot: asolution using metaheuristcs

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Abstract: The basic features of model-based predictive control (MBPC) make it an interesting candidate for the control of mobile robots. However, fast solution procedures remain a challenge for nonlinear MBPC problems such as the one arising in mobile robot control. Metaheuristics are general purpose heuristics which have been successful in solving difficult optimization problems in a reasonable computation time. In this work, we present a comparison between the uses of three different heuristics, namely particle swarm optimization (PSO), ant colony optimization, and gravitational search algorithm for the solution of the nonlinear MBPC for a mobile robot tracking trajectory with dynamic obstacle avoidance. The computation times obtained show that PSO is a feasible alternative for real-time applications. The MBPC based on the PSO is applied to controlling a LEGO mobile robot with encouraged results.

Keywords : nonlinear predictive control, Metaheuristcis, mobile robots, optimization