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CONSTRAINED GENERALISED PREDICTIVE CONTROL WITH ESTIMATION BY GENETIC ALGORITHM FOR A MAGNETIC LEVITATION SYSTEM

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Abstract. *This paper presents the generalized predictive control under constraint coupled with Genetical algorithm applied to the magnetic levitation (MAGLEV) system. In certain process the change of a control variable affects several variables to control these interactions between the variables of the process generate very weak performances of the system to control and even provoke the instability. In this work the design of the controller that can maintain the balance between the magnetic force and the weight of the ball is based on a method of constraint reduction. A GA is proposed whose aim is to find on line the optimal values for the tuning parameters, mainly prediction and control horizon. The algorithm proposed provides a robust closed-loop magnetic levitation system which can stabilize the system over a large range of variations of the suspended mass. In order to verify the feasibility of this method the results obtained by Constrained generalized predictive control (CGPC) coupled with an estimation of design parameters by GA are compared to those obtained by CGPC control using Gradient conjuged method .*
Keywords: Model predictive control, Genetic algorithm, Magnetic levitation system, Conjugate gradient, Constrained GPC, Optimization

1. **Introduction.** The predictive control has become a very important area of research in recent years. Few of the presented schemes, however, have been realized in industrial applications so far [1]. Nevertheless, after some further progress, it can be expected that the advantages of predictive algorithms would lead to an increased number of industrial implementations in the future. An interesting approach to unify different ideas of predictive control is Generalized Predictive Control (GPC) according to [2-4]. It generates a sequence of future control signals within each sampling interval to optimize the control effort of the controlled system. This is done by minimizing a rather complex cost function. Due to the high calculation power required for GPC, real applications in drive systems are very rare. This paper presents an implementation of CGPC coupled with an estimation of design parameters by genetic algorithm applied to a magnetic levitation