DESIGN AND ANALYSIS OF A QUADRATIC OPTIMAL CONTROL SYSTEM FOR A TYPE ONE PLANT MODEL

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ABSTRACT

Automatic control system has played a crucial role in the development of engineering and science and it has become an important and integral part of modern manufacturing and industrial processes. To get from a concrete controlled physical system there are fewsteps to be followed. First, a mathematical model of the physical system is made depending on the existing knowledge of classical physics and this mathematical model can take many forms. The second step in a control system design problem is to decide which desirable properties we want the physical system to satisfy. Very often, these properties can be formulated mathematically by requiring the mathematical model to have certain qualitative or quantitative mathematical properties. Together, these properties form the design specifications. The third, very crucial, step is to design, on the basis of the mathematical model of the physical system, and the list of design specifications, a mathematical model of the physical controller device. The problem of getting from a model and a list of design specifications to a model of a controller is called a control synthesis problem. In this paper, a state-space model has been derived from a type one transfer function plant model. Then the plant's dynamic characteristics have been analyzed and simulated. After that a state feedback controller using the LQR method and finally a rigorous simulation analysis has been done with the designed LQR system with non-zero initial state with zero external inputs.

KEYWORDS: State-Space, Controllability, Observability, Pole-Zero Map, LQR