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Investigating the Utilization of Matlab for Developing Algorithmic-Based Automatic Control Systems

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Abstract: *Investigating the utilization of MATLAB for developing algorithmic-based automatic control systems involves understanding the significance of control systems in various industries such as aerospace, automotive, chemical, and manufacturing. These systems utilize feedback mechanisms to regulate complex system behavior and ensure optimal operation. However, designing control systems becomes challenging when dealing with complex and nonlinear internal dynamics. To address this, researchers have developed automated control system design algorithms using MATLAB.*

The main objective of this investigation is to provide an overview of designing an automated control system using MATLAB. The project aims to develop a reliable and accurate control system algorithm in the frequency domain. This algorithm should be capable of analyzing and shaping the steady-state and transient response of a user-defined plant. The proposed method is easy to understand, versatile, and demonstrates impressive tracking capabilities across systems with different internal dynamics.

To validate the accuracy of the algorithm, simulations and experiments were conducted on electrical plants, manipulating their transient behavior, steady-state response, and stability using the algorithm based on user specifications. The algorithm employs Proportional Controllers, Lead Compensators, Lag Compensators, and Lag Lead Compensators to adjust the gain and phase of the plant's transfer function, achieving the desired response. Its ability to operate in the frequency domain makes it suitable for systems with complex and nonlinear internal dynamics.

Compared to traditional manual design methods, the proposed algorithm offers several advantages. Firstly, it automates the design process, reducing the need for manual intervention. Secondly, it provides accurate and consistent results across multiple experiments. Thirdly, it enables users to design and analyze control systems without specialized knowledge in control theory.

In conclusion, this investigation provides a comprehensive overview of developing an automated control system using MATLAB. The proposed algorithm is reliable, accurate, and independent, operating in the frequency domain while effectively analyzing and shaping the steady-state and transient response of user-defined plants. Its simplicity, versatility, and impressive tracking abilities make it suitable for a wide range of systems with varying internal dynamics. Through simulations and experiments, it has been demonstrated as an efficient and effective approach, offering substantial advantages over traditional manual design methods.

Keywords: Algorithmic-Based Automatic Control Systems

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