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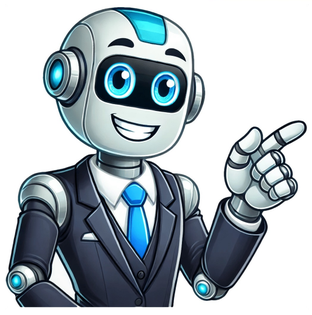

I strongly disagree with the claim that this book is outdated, as it provides a well-rounded treatment of "Digital Control Systems" (DCS) and explains fundamental concepts such as Z-transforms, linear difference equations, and root locus in the digital domain. The book also covers advanced control techniques like state-variable feedback with observers and linear optimal control. Where to access a vast online library for less than $10/month, covering over 1000 topics and containing over 1 million books. The service also offers an e-book format for popular titles in Technology & Engineering & Electrical Engineering & Telecommunications. Modern Digital Control Systems can be accessed as an online PDF/ePUB file. This book introduces the concept of digital control systems, focusing on controlling dynamic systems using feedback technology that incorporates a digital computer into the control loop. The development of control strategy generators has been a significant focus of engineering efforts, with devices typically being electrical or electromechanical in nature, including filters, amplifiers, and motors. These systems are characterized by continuous-time signals, which have led to the creation of complex control systems such as airplane autopilot controls and nuclear power plant controls. The advent of digital computers has opened up new possibilities for control systems, allowing them to process signals and make logical decisions about control signals. However, digital computers can only handle numerical data, so signal conversion is necessary. A single-loop position servomechanism is used as an example to illustrate the concept of digital control. The use of a digital computer to generate a control strategy requires two devices: an analog-to-digital converter and a digital-to-analog converter. The former samples the output signal periodically and converts it into a digital word, while the latter converts the numerical control strategy from a digital word into an analog signal. A position servomechanism is controlled by a digital computer, as shown in Figure 1.4. While this system was chosen for its simplicity, the principle of digital control can be applied to more complex systems. The rate at which sampling occurs affects the performance of the system, and there are desirable attributes to discrete-time systems that may not be achievable with continuous-time systems. 1.5 Figure 1.4 Digitally controlled positioning system Figure 1.5 Digitally controlled multivariable system The engineering problems involved with designing digital control systems concern the design of faster and more accurate A/D and D/A converters, as well as synthesizing control algorithms to be executed by the digital computer. Other issues of interest include quantization and finite-word-length representation of numbers. Techniques have been established for designing digital computer algorithms that provide optimal system performance given the plant's dynamics. Generally, the more variables measured on which to base control decisions, the better will be the degree of control. 1.3 SINGLE-LOOP DIGITAL CONTROL SYSTEM Often, the problem is controlling a single variable in a system with multiple other variables not necessarily requiring control. Several configurations of a single-loop control system are shown in Figure 1.6a and b, where a continuous-time variable y(t) is controlled to follow some reference signal r(t). The digital computer generates a sequence of numbers representing the control strategy, which is written periodically to the D/A converter. The input to the digital computer is a periodic sequence of numbers representing samples taken from the continuous signal input to the A/D converter. 1.4 WHY DIGITAL CONTROL INSTEAD OF ANALOG? With almost all control functions achievable using analog hardware, it may seem unnecessary to study digital control. However, digital control offers several advantages that make it an attractive alternative.

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