

Tugas II sistem pengaturan Berjaringan

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1. Blok diagram for this closed-loop system

A picture containing text, clock, screenshot

Description automatically generated

Output closed-loop system is.





Analysis:

The figure above illustrates the effect of delaying in the system, the blue graph is a system without delay while the orange graph is a system with delay. The blue system clearly looks like it can get to set point 1 in a span of 25 seconds, the system with a delay of 10 seconds but until 25 seconds the system does not go to the desired set point.

1. The figure below illustrates bode plot from system with delay and without delay.





Analysis:

Systems with delay and without delay look different if the system given with delay with magnitude is at -27.7 dB while for systems without delay at -0.414 dB. The phase angle in systems with delay is at -3.41e+03 deg while for systems without delay -33.8 deg. The conclusion of the bode plot is that the magnitude of the system with a delay is higher than the system without delay and viewed from the angle of the phase of the system without delay is lower than the phase with delay.

1. Analysis for time response and bode plot:

The time response of a control system using the Smith Predictor will be affected by the time delay, the controller gain, and the process dynamics. The Smith Predictor adds an additional delay to the control system, which can cause instability or oscillations if the controller gain is too high. However, if the controller gain is too low, the response time of the control system may be slower than desired. Here controller gain use .

The Bode plot of a control system using the Smith Predictor will show a phase shift at the frequency corresponding to the time delay. This phase shift can cause the system to become unstable if the gain margin and phase margin are not properly designed.







1. There are two examples of delays:

* Air travel delays: One common example of a delay that is not related to networked systems is an air travel delay. There can be a variety of factors that contribute to air travel delays, such as bad weather, mechanical problems with the aircraft, or airport congestion. These types of delays can cause significant disruptions for travellers and can sometimes result in missed connections or other travel-related issues.
* Shipping delays: Another example of a delay that is not related to networked systems is a shipping delay. This can occur when there are issues with the transportation of goods, such as a delay in loading or unloading cargo, problems with customs clearance, or issues with the transportation infrastructure. Shipping delays can be particularly problematic for businesses that rely on timely delivery of goods to meet customer demand.

1. Because in networked systems, the delay is often assumed not to be more than the sampling period because the system operates based on regular sampling intervals, and any delay in the transmission of data beyond the sampling period can result in data loss or corruption. This can be particularly problematic for real-time systems where data needs to be transmitted and processed in a timely manner to avoid system failure or other negative consequences.

If this assumption is not satisfied, it can result in several issues such as:

* Data loss: If the delay in transmission is greater than the sampling period, the data may not be received in time for processing, resulting in data loss.
* Increased latency: Delay beyond the sampling period can increase the latency of the system, making it slower to respond to changes or updates.
* System instability: Delay beyond the sampling period can also result in system instability or failure.

1. "Stability analysis of networked control systems with time-varying delay and uncertain network-induced delay" by Shengnan Li, Jun Yang, and Zhongsheng Hou, published in the journal ISA Transactions in 2020.

In this paper, the authors investigate and explain the stability of a networked control system with time-varying delay and uncertain network-induced delay. They propose a novel control scheme based on an adaptive sliding mode control method, which is designed to compensate for the effects of the uncertain delay on the system's performance. The authors begin by describing the mathematical model of the networked control system with time-varying delay and uncertain network-induced delay, which consists of a plant, a controller, and a communication network. They then develop a Lyapunov-Krasovskii functional to analyze the stability of the system and derive conditions for the stability of the closed-loop system. Next, the authors propose an adaptive sliding mode control method to compensate for the effects of the uncertain delay on the system's performance. They show that the proposed control scheme can effectively stabilize the system, even in the presence of uncertain delay. The authors then conduct simulations to validate the effectiveness of the proposed control scheme. They compare the performance of the proposed method with that of a conventional sliding mode control method and show that the proposed method achieves better tracking performance and disturbance rejection in the presence of uncertain delay. Overall, the paper provides a comprehensive analysis of a networked control system with uncertain delay and proposes a novel control scheme that can effectively compensate for the effects of the uncertain delay on the system's performance. The results of the paper have implications for the design and implementation of networked control systems in real-world applications, where uncertain delay is a common challenge.