

the \mathcal{H}_2 norm of the error signal $\|e\|_2$ is bounded by the \mathcal{H}_2 norm of the disturbance $\|d\|_2$ multiplied by the \mathcal{H}_2 norm of the transfer function $\|G\|_2$. This is a well-known result in control theory, and it shows that the \mathcal{H}_2 norm of the error signal is a measure of the system's robustness to disturbances. The \mathcal{H}_2 norm of the error signal is also a measure of the system's performance, and it is often used as a performance index in control design.

The \mathcal{H}_2 norm of the error signal can be calculated using the following formula:

$$\|e\|_2 = \sqrt{\text{trace}(\mathbf{E})}$$

where \mathbf{E} is the error covariance matrix. The error covariance matrix can be calculated using the following formula:

$$\mathbf{E} = \mathbf{G} \mathbf{G}^T$$

where \mathbf{G} is the transfer function of the system. The \mathcal{H}_2 norm of the error signal is also a measure of the system's robustness to disturbances, and it is often used as a performance index in control design.

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