EECS 16B
Designing Information Devices and Systems II

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Department of Electrical Engineering and Computer Science

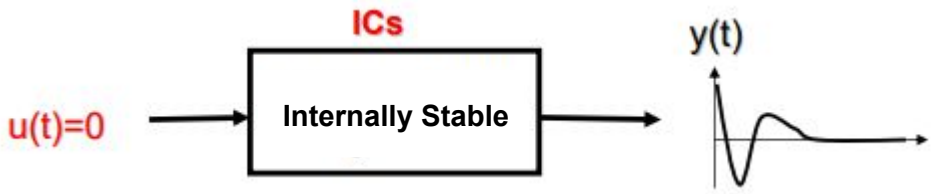
Announcements

- Please complete our mid-semester survey, due Monday 3/18 @11:59pm

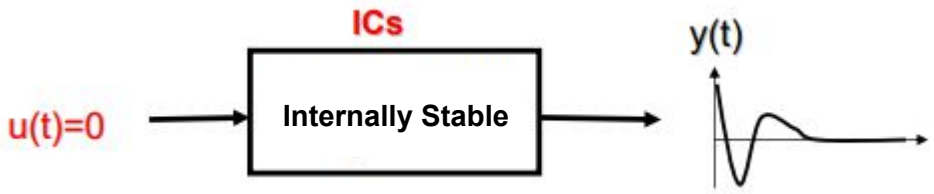
Today

- Review - stability
- Controllability
  - Reachability

State Space (“Internal”) Stability



State Space (“Internal”) Stability



System may be:

- stable
- unstable
- marginally stable

BIBO Stability

BIBO Stability

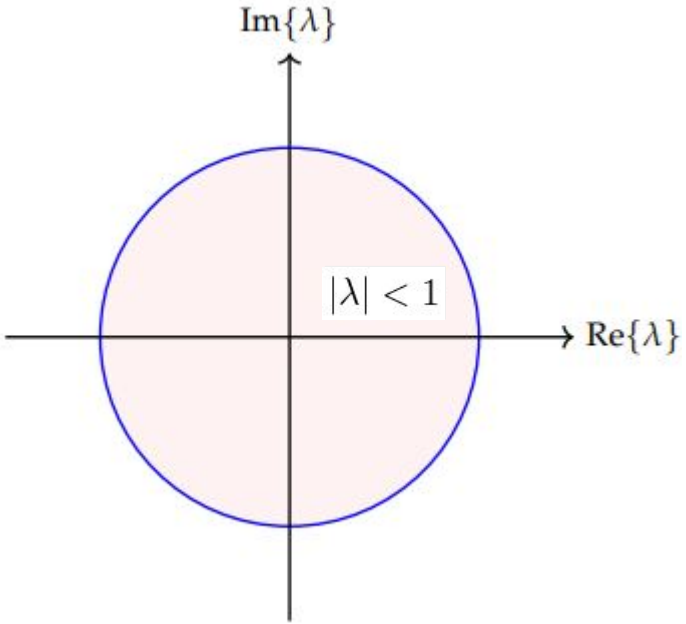
System may be:

- stable
- unstable

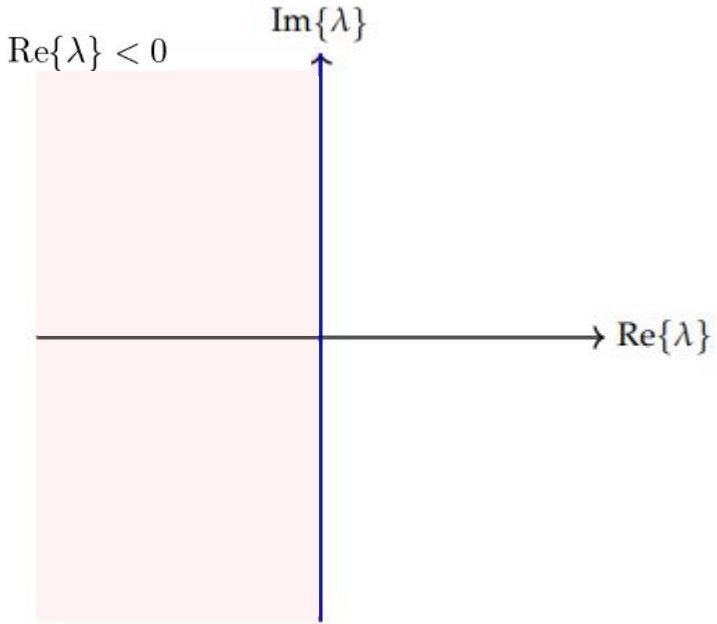
To determine if a system is stable, one must look at:

1. the ***A*** matrix only
2. the ***B*** matrix only
3. both the ***A*** and ***B*** matrices
4. the ***A*** and ***B*** matrices for BIBO stability but only the ***A*** matrix for internal stability

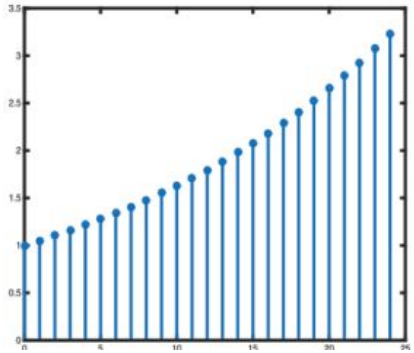
Stability - Discrete Time System



Stability - Continuous Time System



A real-valued DT system generates the following state trajectory:



The above response is associated with which of the following:

1. a negative real eigenvalue λ, with $|\lambda| > 1$
2. a positive real eigenvalue λ, with $|\lambda| < 1$
3. a positive real eigenvalue λ, with $|\lambda| > 1$
4. a pair of complex conjugate eigenvalues λ_i, with $|\lambda_i| > 1$

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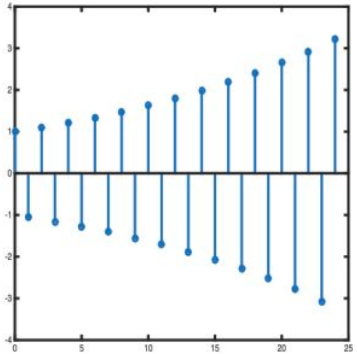

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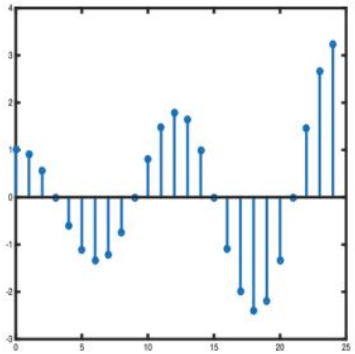

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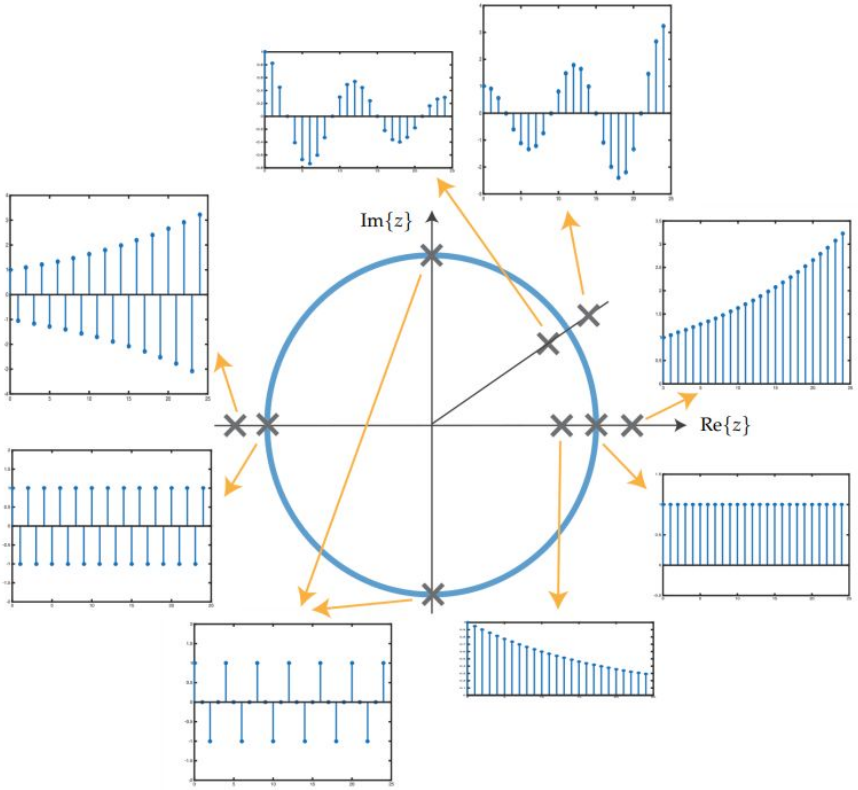
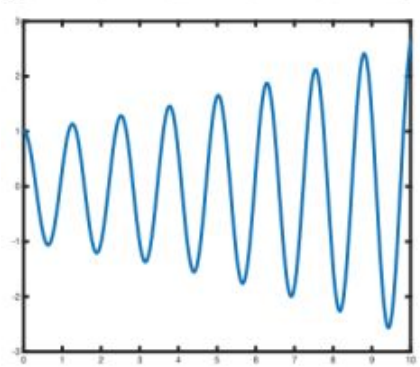
Stability - Eigenvalues for DT System



note: only the real part of the response is shown

A real-valued CT system generates the following state trajectory:



The above response is associated with which of the following:

1. a real eigenvalue λ, with $\lambda < 0$
2. an eigenvalue λ at the origin ($\lambda = 0$)
3. a pair of complex conjugate eigenvalues λ_i, with $|\lambda_i| > 1$
4. a pair of complex conjugate eigenvalues λ_i, with $\mathrm{Re}\{\lambda_i\} > 0$

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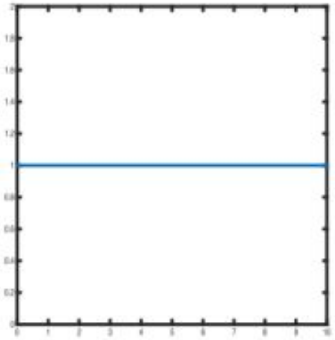

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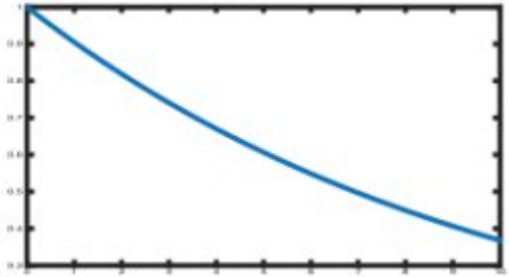

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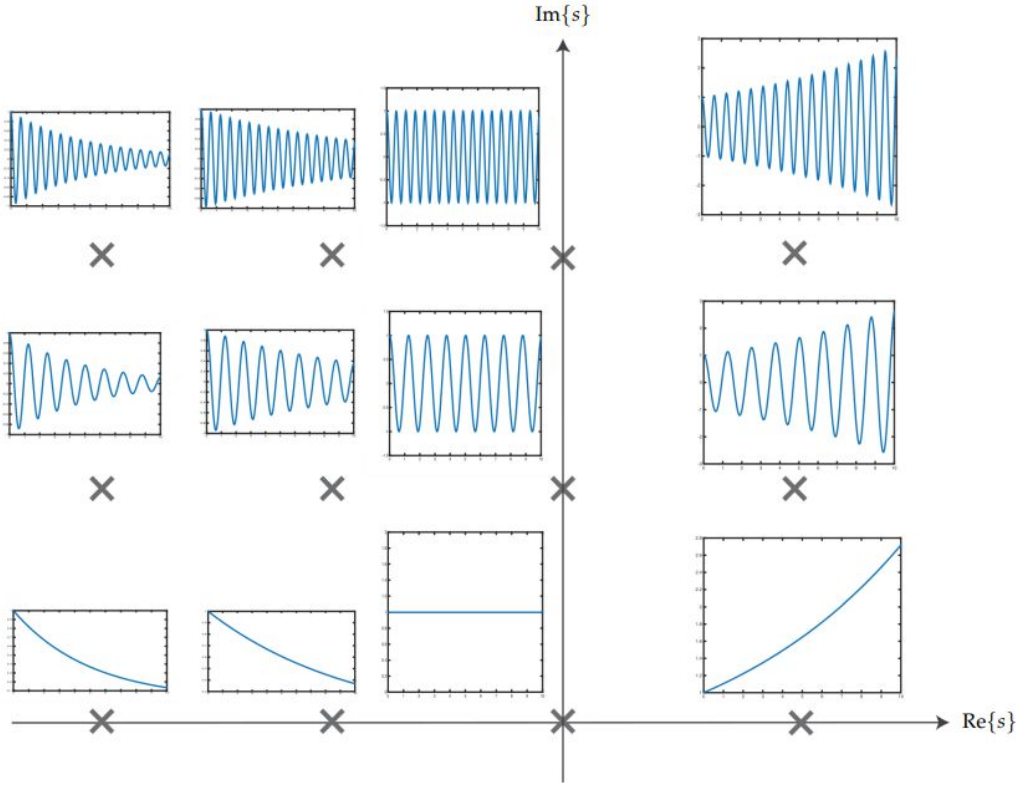
Stability - Eigenvalues for CT System



note: only the real part of the response is shown

Feedback Stabilization

“fly-by-wire”
(electronic feedback control)

Controllability