Pole-Zero Cancellations and Stability

- In case of a pole-zero cancellation, the t.f. contains *much less* information than the state-space model because some dynamics are "hidden."

- These dynamics can be either good (stable) or bad (unstable), but we cannot tell from the t.f.

- Our original definition of stability (no RHP poles) is flawed because there can be RHP eigenvalues of the system matrix A that are canceled by zeros, yet they still have dynamics associated with them.

Definition of Internal Stability (State-Space Version): a state-space model with matrices (A, B, C, D) is *internally stable* if all eigenvalues of the A matrix are in LHP.

This is equivalent to having no RHP open-loop poles and no pole-zero cancellations in RHP.