EL 333
Multivariable Control
19.09.2018

Stability

- often, unstable (not stable) situations catch attention.

  example: falling bicycle,
  power grid blackout

- As a performance specification for system design, stability is often desired
  ↳ come to a consensus on how to decide if system is stable or not
  ↳ how to make unstable systems stable (or vice versa).

What do we mean by stability?

one notion: System is at a point
↳ Apply a disturbance
↳ if it returns to that point as time goes on, then system is stable.

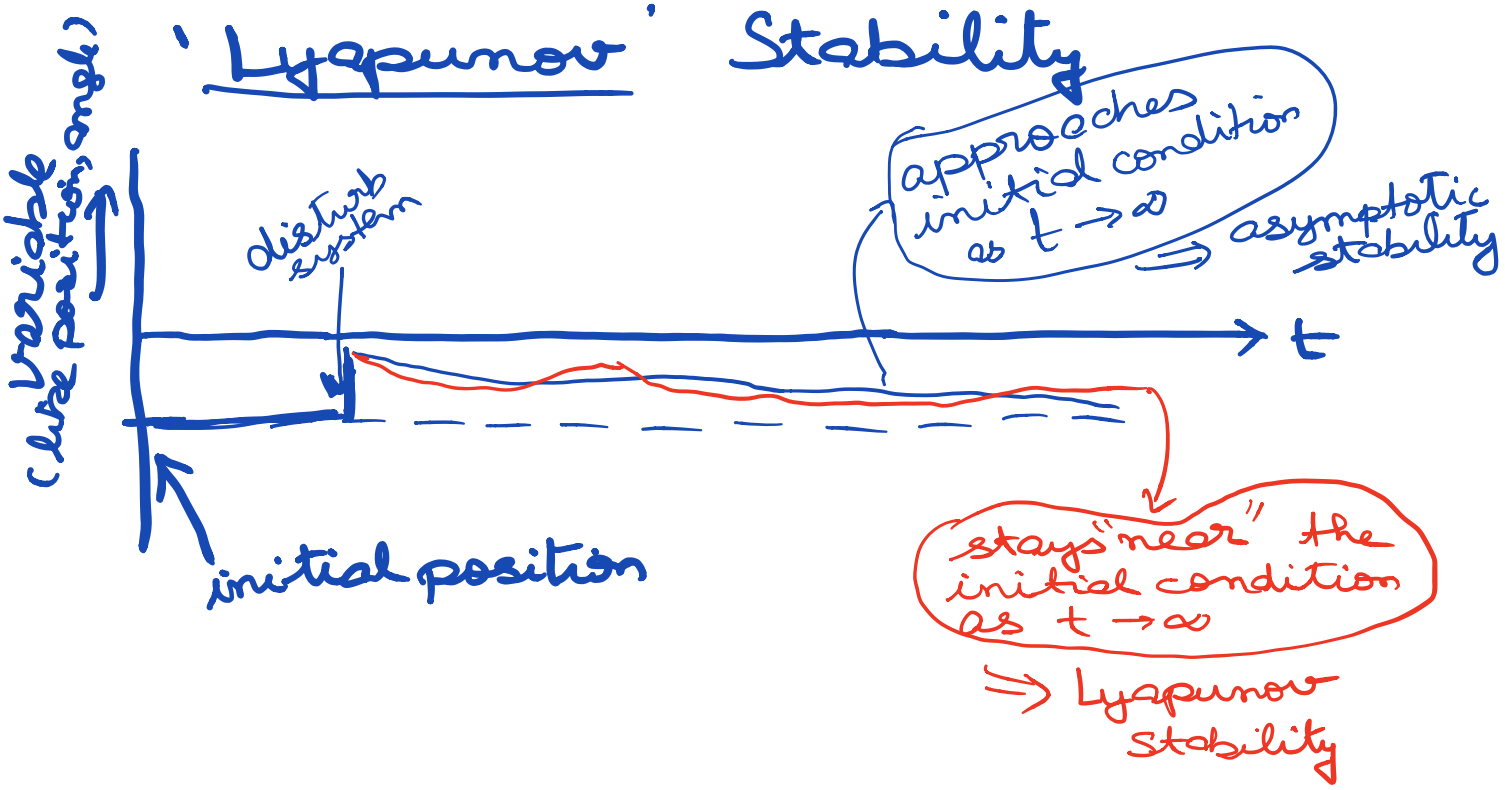
example: pendulum with friction.

$\ddot{x} + r\dot{x} + \sin x = 0$
↳ friction

(without friction, it continues to oscillate)

We want to talk about

'Lyapunov' Stability



What is not stable is unstable.

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↳ How this works for linear systems?

↳ How to apply to nonlinear systems?

↳ Lyapunov Theorem

Lyapunov function

(generalized energy)

*This also works for linear systems.

↳ Lyapunov-based methods used in many areas of control.