Observer, Controller Design for DT Systems—Summary

- For CT system

$$\dot{x}(t) = Ax(t) + Bu(t), \quad y(t) = Cx(t) + Du(t)$$

– To design a stabilizing controller, find K such that

$$eig(A_{cl}) = eig(A - BK) < 0$$

or at a prescribed location

– To design a converging estimator (observer), find L such that

$$eig(A_{cl}) = eig(A - LC) < 0$$

or at a prescribed location

- What if the system is DT?

$$x(k+1) = Ax(k) + Bu(k), \quad y(k) = Cx(k) + Du(k)$$

– To design a stabilizing controller, find K such that

$$-1 < eig(A_{cl}) = eig(A - BK) < 1 \text{ or at a prescribed location}$$

– To design a converging estimator (observer), find L such that

$$-1 < eig(A_{cl}) = eig(A - LC) < 1 \text{ or at a prescribed location}$$