

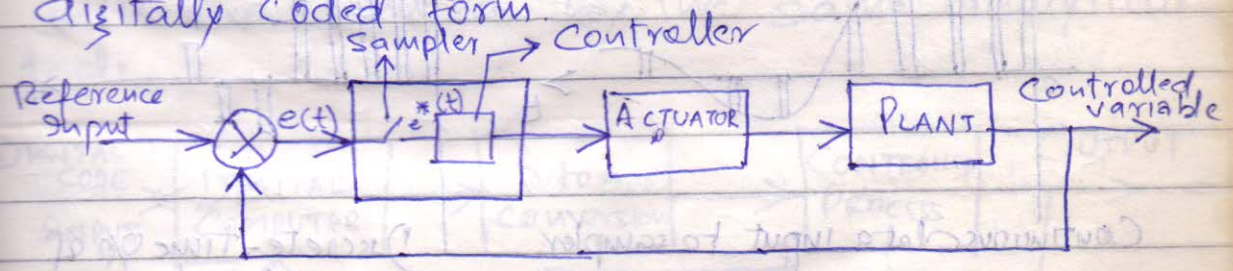
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CONTROL SYSTEM - II

CHAPTER 1: DISCRETE TIME CONTROL

What are discrete time systems?

Discrete-time & digital control systems differ from the conventional continuous time or analog systems in that the signals in one or more parts of these systems are in the form of either pulse trains or numerical codes. The terms sampled-data control systems, discrete time control systems & digital control systems have all been used loosely & interchangeably in the control systems literature. Strictly speaking, sampled data are pulse-amplitude modulated signals obtained by some means of sampling an analog signal. A pulse-amplitude modulated signal is often presented in the form of a pulse train with signal information carried by the amplitude of the pulses. Digital data usually are those signals generated by digital computers or digital transducers; they are often in some form of digitally coded form.



CLOSED-LOOP DISCRETE TIME CONTROL SYSTEM

CONTROL SYSTEM - II
CHAPTER 2 : DISCRETE TIME CONTROL

BASIC ELEMENTS OF A DISCRETE TIME CONTROL SYSTEM

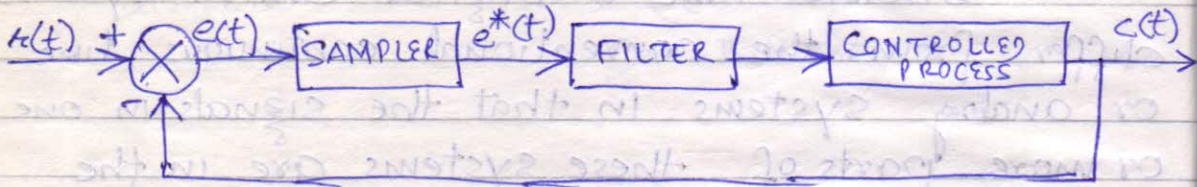
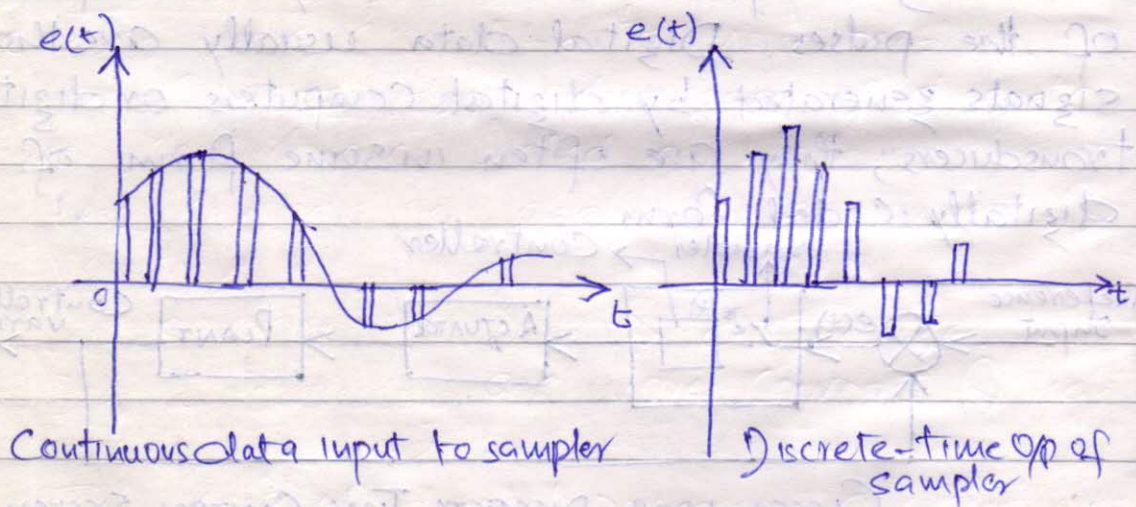


Figure shows the basic elements of a typical closed loop control system with sampled data. The sampler simply represents a device or operation that outputs a pulse train. No information is transmitted between two consecutive pulses. Figure below shows the typical input & output of a sampler. A continuous input signal $e(t)$ is sampled by the sampler and the output is a sequence of pulses.



Continuous data input to sampler

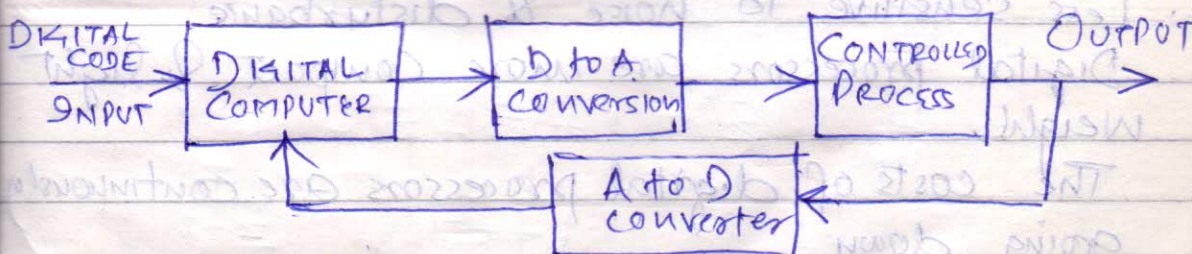
Discrete-time op of sampler

In the illustrated case, the sampler is assumed to have a uniform sampling rate. The magnitude of the pulses at the sampling instants represent the value of the input signal $e(t)$ at the corresponding instants.

The filter located between the sampler & the controlled process is used for the purpose of smoothing, since most controlled processes, such as the ones involving a conventional ac or dc motor, are naturally designed and constructed to receive analog signals.

The block diagram of a typical digital control system is shown in Fig below. The existence of digitally coded signals such as binary coded signals in certain parts of the system requires the use of analog to digital converters and digital to analog converters.

The digital computer block can be a special purpose digital computer, a microprocessor or a digital signal processor. Although there are basic differences b/w the hardware structures and components b/w discrete-time & digital control systems, from analytical standpoint, both are treated by the same analytical tools.



A typical digital control system

