CAD/CAM 23ME506

Topic: Unit III

NUMERICAL CONTROL

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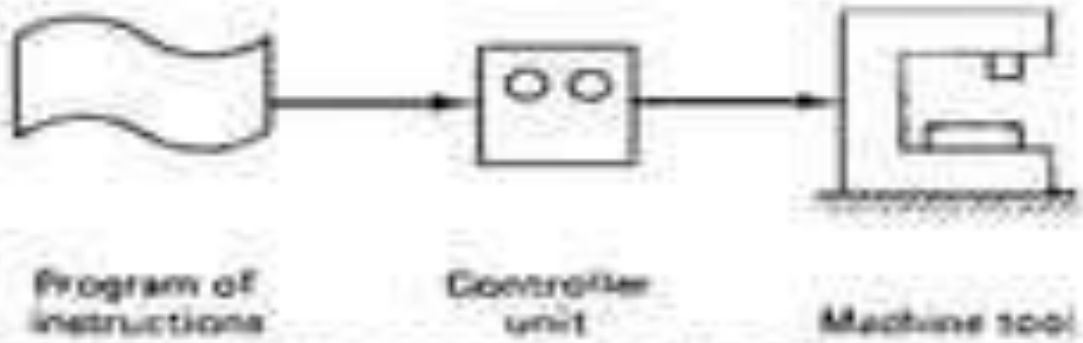
Unit- 3
NUMERICAL CONTROL

What is Numerical control?

- Numerical Control is a system in which actions are controlled by the direct insertion of numerical data at some point.
- In other words Programmable automation in which the mechanical actions of a 'machine tool' are controlled by a program.



7.1 Three basic components of a numerical control system.

Numerical Control

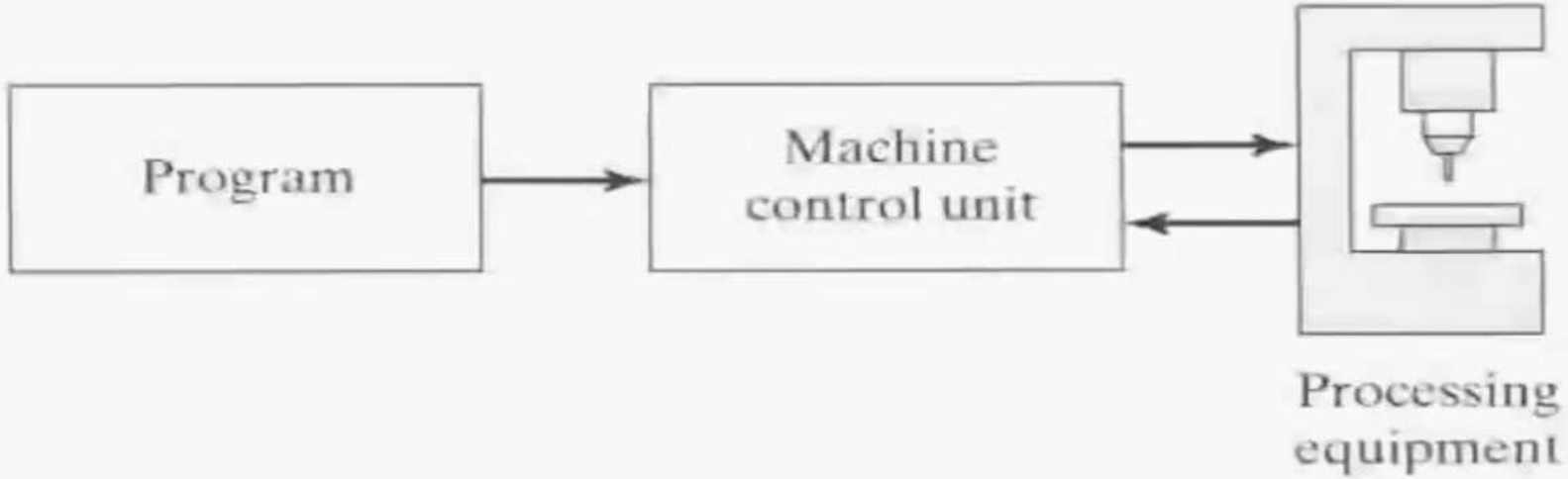


Figure 6.1 Basic components of an NC system.

A Definition of NC

- Numerical Control is a system in which actions are controlled by the direct insertion of numerical data at some point.
- In other words, Programmable automation in which the mechanical actions of a 'machine tool' are controlled by a program
- or
- It is defined Method of programmable automation in which various functions of machine tools are controlled by numbers , letters and symbols.

NUMERICAL CONTROL ELEMENTS

1.Program of instructions.
2.Machine control unit (MCU).
3.NC machine tool.
4.NC Cutting tools.

1.Program of Instructions:

1. The program of instructions is the detailed step - by - step of operations which are implemented by MCU .
2. The program is coded in alphanumerical form on an input medium to the MCU
3. The input medium is a punched tape or a magnetic tape .
4. Two method are used to program for NC
   I. Manual part programming
   II. Computer – aided part programming

Definition of Numerical Control (NC):

- A versatile form of programmable automation in which machine movements and various other functions are controlled by instructions expressed as a series of letters, numbers and symbols initiated via an electronic control system.

Machine Control Unit (MCU)

- NC machine tool has a main unit, which is known as Machine Control Unit.

- It consists of some electronic hardware that reads the NC programme, interprets it and conversely translates it for mechanical actions of the machine tool.

A typical Machine Control Unit may consist of the following units :

- *Input or Reader Unit*
- *Memory*
- *Processor*
- *Output Channels*
- *Control Panel*
- *Feedback Channels*

BASIC REQUIREMENT OF NC MACHINE CONTROL

a. Preparatory functions: which unit, which interpolator, absolute or incremental programming, which circular interpolation plane, cutter compensation, etc.

b. Coordinates: three translational, and three rotational axes.

c. Machining parameters: feed, and speed.

d. Tool control: tool diameter, next tool number, tool change.

e. Cycle functions: drill cycle, ream cycle, bore cycle, mill cycle, clearance plane.

f. Coolant control: coolant on/off, flood, mist.

g. Miscellaneous control: spindle on/off, tape rewind, spindle rotation direction, pallet change, clamps control, etc.

h. Interpolators: linear, circular interpolation

Advantages of CNC Machine tool

- Storage of more than one part program
- Various form of program input
- Program editing at the machine tool
- Positioning features for setup
- Tool length compensation
- Acceleration and deceleration calculations
- Communication interface
- Diagnostics

CLASSIFICATION OF CNC SYSTEMS

- **According to the type of machine:**
  - Point-to-point
  - Straight-cut
  - Continuous path
- **According to the programming method:**
  - Absolute
  - Incremental
- **According to the type of control system:**
  - Open-loop
  - Closed-loop