2. Introduction to CAD

- History of CAD
- CAD Graphics Generator:
- Objective of CAD Software:
- Drawing Features in CAD Software: editing and dimensioning
- Typical CAD Command: command branch & macro
- Computer Hardware:
- Video Display Unit: raster scan display & vector scan display
CAD Technologies
History of Computer Graphics

1950s: SAGE System (Analyze Radar Image with Light-pen)

1962: SketchPad at MIT (Interactive Graphics with SketchPad)


1970s: Recognized as Indispensable Tools to Improve Productivities especially in ME, EE, and CE

1980s - 1990s: Widely Spread Due To Lower Price and availability of PC

1990s - : Network Based such as Internet, LAN, and WAN
Design Considerations

**Functionality**
- Part must function correctly and last a reasonable duration of time
- Functional considerations involve weight, strength, thermal properties, kinematics, and dynamics, etc.
- Performance evaluation against design specifications

This is determined by a part’s
- geometry
- material properties
- environment

**Economics**
Part must be designed as closely as possible to the design specifications

The economic factors include
- materials
- processing costs
- marketing details
Some Design Practices:
Do’s and Don’ts for Design

Preferred

Preferred if possible

Preferred

Preferred if possible
Preferred

neck
Some Design Practices:
Do’s and Don’ts for Casting

- Preferred diagrams showing do's and don'ts for casting processes.

- Hole machined from solid casting vs. hole cored; then machined.
CAD Graphics Generator
scaling, rotation, translation, and geometric representation
**Principles of Projection: 3D Visualization**

- **Parallel projection** projects an object with parallel projection lines.

- **Orthographic projection** projects an object perpendicular to the plane of projection.
  - **Multiview projection**
  - **Axonometric projection**
    a. Trimetric projection: three mutually perpendicular lines are projected onto plane of projection to make all different angles.
    b. Dimetric projection: three mutually perpendicular lines are projected to make two different angles.
    c. Isometric projection: three mutually perpendicular lines are projected to make all same angles.

- **Oblique projection** projects an object obliquely (i.e., non-perpendicular) to the plane of projection and used to emphasize a particular face of the object.

- **Perspective projection**: all parallel lines converge at vanishing points at infinity as they recede from the observer.
Orthographic Projection

Only the first and third quadrants are used in the left *hemisphere*
- first angle projection
- third angle projection
Can you draw the three principal views of the part?
1. Draw two reference lines (i.e., edge views of datum planes). To do this, draw one first at any position (H-H) and then draw projection lines from a point (A) on two views to find the intersection (X), and then draw a 45 degree line to find the intersection (Y) with the first reference line. Here, place the second reference line perpendicularly.

2. Identify a point on two views and draw projection lines to the missing view and find the intersection. That's the point (A) on the missing view.

3. Repeat this point by point for all points and connect the points appropriately.
Sample Drawing

![Diagram with dimensions and scale]
Objective of CAD Software

- More time on design
- Minimum steps of commands
- Data protection
- Easy menu arrangement
- Access of nested commands
- Neat appearance of layout
- Data interchangeability
Typical CAD Commands

Figure 2.5-1

Typical CAD menus in (a) AutoCad, (b) Pro/E, and (c) SolidWorks
Computer Hardware

- Input Device
- Central Processing Unit (CPU)
- Memory
- Storage Device
- Communication Device
- Output Device
Video Display

- Raster display
- Vector display