Unit 7
Graphical Languages

Graphics Software

There are two general categories of graphics software

- **General programming packages:**
  - Provides extensive set of graphics functions for high level languages (FORTRAN, C etc).
  - Basic functions include those for generating picture components (straight lines, polygons, circles, and other figures), setting color and intensity values, selecting views, and applying transformations.
  - Example: *GL(Graphics Library).*
- **Special-purpose application packages:**
  - Designed for nonprogrammers, so that users can generate displays without worrying about how graphics operations work.
  - The interface to the graphics routines in such packages allows users to communicate with the programs in their own terms.
  - Example: artist's painting programs and various business, medical, and CAD systems.

Software standards

Primary goal of standardized graphics software is portability. When packages are designed with standard graphics functions, software can be moved easily from one hardware system to another and used in different implementations and applications. International and national standards planning organizations in many countries have cooperated in an effort to develop a generally-accepted standard for computer graphics. After considerable effort, this work led to following standards:

- **GKS (Graphical Kernel System):** This system was adopted as the first graphics software standard by the International Standards Organization (ISO) and American National Standards Institute (ANSI). Although GKS was originally designed as a two-dimensional graphics package, a three-dimensional GKS extension was subsequently developed.
- **PHIGS (Programmer's Hierarchical Interactive Graphics Standard):** Extension to GKS, Increased Capabilities for object modeling, color specifications, surface rendering and picture manipulations are provided. Subsequently, an extension of PHIGS, called **PHIGS+**, was developed to provide three-dimensional surface-shading capabilities which are not available in PHIGS.

Although PHIGS presents a specification for basic graphics functions, it does not provide a standard methodology for a graphics interface to output devices (i.e. still **machine dependent**). Nor does it specify methods for storing and transmitting pictures. Separate standards have been developed for these areas:

- **CGI (Computer Graphics interface):** Standardization for device interface
- **CGM (Computer Graphics Metafile):** Standards for archiving and transporting pictures

The **CGI** defines idealized abstract classes of graphical devices capable of accepting input and generating, storing and manipulating pictures. The **CGM** provides a file format suitable for the storage and retrieval of device-independent picture descriptions.