First semester lecture notes

(Attachment)

Lecture #2 Part One

Computer Graphics Software:

- The graphic software is a collection of programs written to make it convenient for user to operate the computer graphics system.

The graphics software is divided into three modules:

- Graphics package
- Application program
- Application data base

The software configuration is illustrated in Figure below:
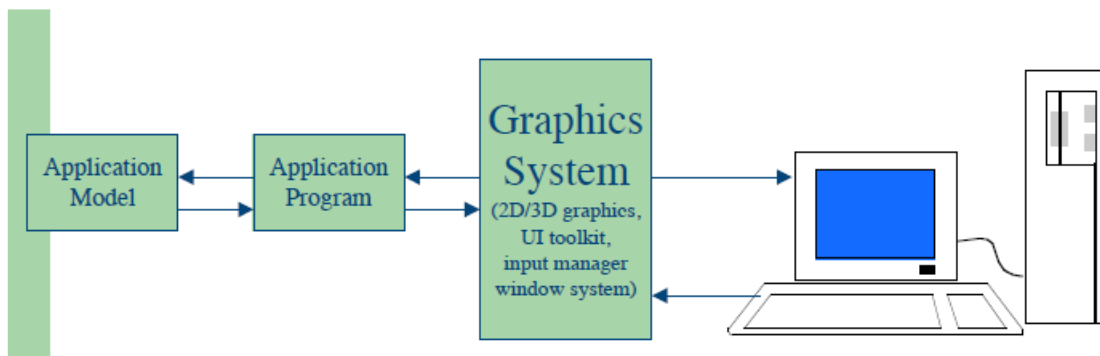
Function of a graphics package:

1- Generation of graphic elements
2- Transformation
3- Display control
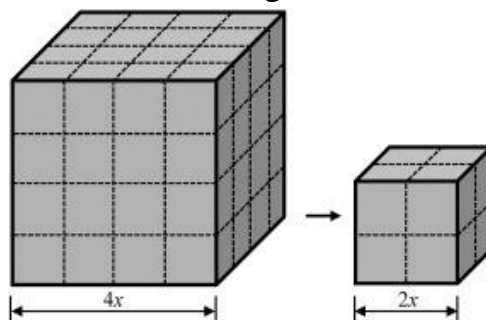4- Segmenting function
5- User input functions

1- Generation of graphic Elements:

- A graphic element is a set of basic image component such as dot(point), line segment, area, volume

- The graphical mode can be constructed application model out of a collection of elements on the system.

2- Transformation:

- The transformation of the elements include enlargement and/or reduction of the image in a process called Scaling.

3- Display control:

- It is the ability to view the geometry from the desired angle.

4- Segment function:

- It is related to the capability of relace, delete or modifying the portions of the geometry.

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5- User input function:

- The user can create his own code to modify the geometry or the mode in a specific way.

Main CAD terms and Definitions

application

A computer programs. A CAD application, also called and add-on or plug-in, can carryout comlex tasks specific to a particular drawing problem. CAD applications run in tandem with the CAD software to perform specialized or automated tasks. Some examples of CAD applications specific to theatre include programs to automate the drawing of construction drawings and light plots.

arrowhead

The part of a dimension or leader which points to an object or extension line. Arrowheads usually can be drawn automatically in several styles or shapes.

Bezier curve

A curve defined by endpoints, tangent lines, and control points at the ends of the tangent lines. Altering the length and angle of tangent lines alters the shape of the curve.

Bitmap

A pixel based graphic or image inserted in a drawing. Bitmaps can be sized but not edited with most CAD programs.

block

CAD

Computer-aided design. Common CAD programs include: AutoCAD, Vectorworks, Microstation. Programs differ greatly in features, complexity, cost, and hardware requirements.
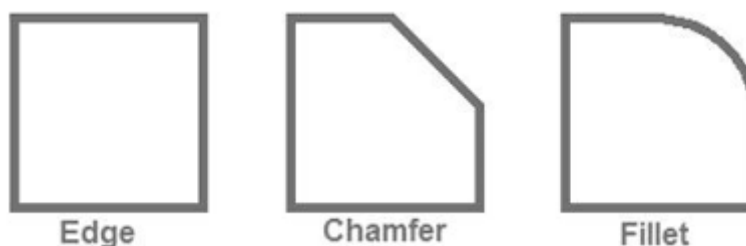
Cartesian coordinates

centre point

The defining point at the exact center of a circle, arc, regular polygon or ellipse.

chamfer

A diagonal line which connects points on two intersecting objects such as an angled corner. The chamfer tool is an editing tool.

Edge   Chamfer   Fillet

color

A property of any drawing object which defines the color in which it appears on the screen and (possibly) the color in which it is printed. Color is often associated with an object's layer or class assignment and can be used to

determines how that object will appear on a printout with regard to line thickness and line type.

component

constraint

A drawing tool which limits drawing to a particular point, line or angle. Some common constraints are snap to grid and ortho.

control points

Points determining the path and shape of a Bezier curve.

coordinates

A sytem of numbers used to locate a point or object in a drawing.
In the Cartesian coordinate system 2 numbers x and y are used to describe the location of a point in the horizontal and vertical dimensions respectively.
3D CAD programs add the z coordinate which describes distance in the third dimension.
In the Polar coordinate system a point is described by a distance and an angle where 0° exends horizontally to the right.

cursor

The screen symbol or icon which represents the current mouse location relative to the drawing window or viewport. The cursor may appear as crosshairs or another symbol based on which command is active.

curve

A complex entity created by the definition of endpoints of spline curve sections. Note, the type of curve you use determines the types of editing tools or functions that may be performed on it. See also Bezier curve

datum

A temporary coordinate point set by the user which can be used as a snap point or reference point when drawing.

dimension line

A line, usually with an arrow indicating the direction and distance of a drawing dimension. See also extension line.

drawing database

The central part of a CAD drawing. A list of all objects which exist within a drawing along with all parameters and definition points.

drawing units

drawing window

DXF

Drawing exchange format created by Autodesk. An ascii text file format describing drawing data and settings to translate drawings between programs

and formats. Note: DXF is not a standardized format and different programs convert or ignore different entities found in a DXF file.

edit

The process of modifying a drawing object or entity.

editing tools

A class of drawing commands used to modify drawing entities or objects. Common edits include: trim, rotate, move and stretch.

ellipse

A CAD drawing object defined by a major axis, minor axis and centerpoint. An ellipse may also be constructed out of arcs and line segments. An ellipse created in this way is not mathematically a true ellipse but is an easier object to edit.

environment

The over-all setup of a CAD program including all drawing settings, colors, units, tool palettes, etc. comprise the drawing environment.

Explode

A common command which break objects apart into their component pieces. Explode most often works on symbols, breaking them back into their component pieces. In some CAD programs other entities are explodable such as text lines, polylines, or other complex objects.

extension line

The line which extends from a measured line or object to the dimension line, showing the extent of the measured distance.

fillet

(Rhymes with skillet). An arc connecting endpoints of two intersecting lines or objects, often a rounded corner.

fill

A complex object defined by a series of points or a bordering object such as a circle or polyline which fills the defined area with solid color. The display of a fill is highly dependant upon the display or printer/plotter being used.

font

The typographic style property of text. Fonts may be drafting style (one line thickness) or typographic such as that being used in this document. Fonts are commonly managed by the operating system, not the CAD program and can be difficult to translate from one computer to another or one CAD program to another.

grid

A drawing tool which is usually a pattern of regularly spaced dots or lines which make the alignment and drawing of objects easier. A snap to grid tool constrains or locks all drawing to grid points only.

group

A collection of objects which can be manipulated as one object.

handles

hatch

A complex object defined by a series of points or a bordering object such as a circle or polyline which fills the defined area with a repeating pattern of lines. Hatches have a scale property which determines the size and density of the repeating pattern. See also fill.

layer

A property of any drawing object. Usually objects are organized onto different layers for organazational purposes and ease of drawing, viewing and editing. Layers often can be named and can have default colors or other properties associated with them. Vectorworks Layers have the added ability to have associated properties of scale, view, and projection. These added properties of Vectorworks layers are similar in function to AutoCAD paperspace.

leader

A line with an arrowhead and attatched text pointing at another object.

leader line

The line portion of a leader connecting the shoulder to an arrowhead.

line

A CAD object defined by two endpoints.

line type

A property of any line, circle, curve, or arc. Line type describes a repeating pattern of lines and spaces. Lines may be solid, dashed, alternate, etc. The additional property of line type scale determines how often in a given distance a pattern of lines and spaces repeats. Scale may or may not be affected by the scale of the drawing view.

line width

A property of any line, circle, curve, or arc. Line width describes how thick a line or other object appears on the the screen or on a printout. Different CAD programs use different schemes for acheiving line width.

locus

A drawing object with a single reference point and no physical dimension.

macro

A sequence of commands recorded and saved for easy playback. Well designed macros can save a great deal of drawing time. See also script and application.

major axis

The longer axis of an ellipse.

manual entry

The process of entering points manually by typing coordinates as opposed to clicking within the viewport or workspace.

markers

A line marker is used to mark the end points of lines.

minor axis

The shorter axis of an ellipse.

move

A drawing editing tool which moves objects or selection sets to a new drawing location by changing all definition points by a given distance.

nested

Objects inside of other objects. Symbols may be nested within other symbols. Drawing commands can be nested or executed while other drawing commands are active. Macro programming objects can be nested in terms of their control structure.

object handles

In a windows CAD program the handles which appear when an object is selected. Handles often allow objects to be stretched, rotated, or moved. Note: in AutoCAD handles refer to arbitrary names assigned to each drawing entity in the drawing database so that macros and applications may refer to specific entities directly.

offset

The distance between two objects. Offsets are often used to draw parallel lines or determine the location of a dimension. In AutoCAD a command which creates a duplicate of an object at a specified distance.

origin

The point in a drawing with the x,y coordinates of 0,0.

ortho

Short for orthagonal. Usually refers to objects placed horizontally or vertically within a drawing. Ortho mode is a constraint which limits all drawing to regular 90° angles. In some CAD programs other ortho angles and modes may be set.

pan

The process of altering the drawing view by moving the viewpoint laterally relative to the drawing.

polar coordinates

See coordinates.

polygon

A complex object composed of three or more straight lines in a closed figure. Polygons are treated differently by diffent CAD programs. Often a polygon is simply a closed polyline entity.

polyline

A complex object composed of two or more lines, curves, or arcs which have contiguous endpoints. A closed polyline or polygon has its endpoints joined into a closed form. Polylines are more difficult to edit than a form drawn with individual line segments, but offers some advantages when editing or building surfaces and 3 dimensional objects.

primitive

The simplest drawing objects from which all objects are built. Common 2D primitives include: point, line, circle, arc, and ellipse.

prompt

A program message often located on the programs status line.

radial copy

Also Duplicate Array (Vectorworks). An editing command which creates multiple copies of objects by copying them around a centerpoint for a given angle.

real scale

Objects in a CAD program a drawn at full scale or 1:1. See scale.

redraw

The process by which the video display is updated cleaning up any unwanted marks or construction points. See also regenerate.

reference points

Points associated with drawing objects which allow an object to be selected, grouped, and manipulated. Reference points are often not visible. One example is the reference point of a text line which is often found at the lower left hand corner of the text line. To select a text entity it is often neccessary to click near this invisible point or include it within a selection window.

regenerate

The process by which the view updated from the drawing database cleaning up any unwanted marks or construction points. Similar but more comprehensive and time consuming that a redraw. Note: on some CAD packages these processes are synonymous.

relative coordinates

Drawing coordinates which when manually entered are interpreted as relative to the last point entered. In AutoCAD relative coordinates are entered by preceeding the coordinate pair with the @ sign such as @2,3.

resolution

The clarity or degree to which individual elements can be discerned on a monitor or print/plot. Common monitor resolutions include 600x800 and 1280x1024 measured in pixels. Common laser printer and plotter resolutions range from 300x300 to 600x600 dots per inch. Resolution of these devices determines how accurate a printout will be or how accurate an object will appear on the screen. The actual resolution of objects saved in the drawing database is usually much higher to insure a high degree of accuracy. When drawing objects are viewed on screen or plotted their size and position is rounded to the nearest dot at the resolution of a given device.

rotate

A drawing editing tool which rotates objects or groups of objects based on a center of rotation and an angle.

Rubber banding

A feature of many CAD programs which shows how a line or other object will look before it is actually placed. An example is with the line command. A starting point is selected after which a line appears rubberbanded between the first point and the cursor. As soon as another point is selected the actual line is drawn and the rubberband moves to the next point.

scale

1) An editing tool which changes the size of an object relative to percentage. Some objects can be rescaled to different percentages in the x and y directions.

2) The relative size at which a drawing is viewed on the screen or printed/plotted. Scale is often represented as a ratio where 1:1 is full scale, 1:12 = 1" =1'-0", 1:24=1/2"=1'-0" etc.

script

A list of drawing commands which can be typed in a text editor and then loaded and executed with one command. Different scripting methods are supported by different CAD programs. Scripts are useful for performing repetitive tasks such as drawing setups.

selection set

One or more objects selected for action with a single command. Often items are selected this way by drawing a window around them or holding down the shift key while selecting them individually.

shoulder

The horizontal part of a leader line.

snap

A drawing tool which locates points exactly by finding an existing point within the drawing database which is closest to a point selected with the on the screen. Some common snaps are: snap to nearest point, snap to midpoint, snap to intersection of two lines, etc.

snap to grid

A drawing constraint which forces all points picked to fall on the currentl grid.

stretch

An editing tool which moves some of the points which define an object and leaves others.

trim

A drawing editing command which causes one object to end exactly at another. Trim points are calculated mathmatically so they are exact. Some complex objects such as curves cannot be trimmed to.

symbol

A collection of drawing objects defined as a single complex entity. Defining and using symbols speeds drawing and makes drawing files more compact. Symbols are also called blocks (AutoCAD).

tangent

A line which intersects a circle, ellipse or arc at only one point. Tangent lines to Bezier curves define the shape of the curve.

toggle

A drawing control or setting which is either on or off. Subsequent execution of the command reverses the state of the parameter. One toggle is the dispaly grid command.

units

Units of measure represented by numbers in a CAD program. Usually units are inches or feet, but can be anything from millimeters to light years.

vertex

A point defining the junction of a segment within a polyline or polygon.

view

The graphical representation of the geometry stored in the drawing database which appears in the drawing window or viewport. A view has a center point and a scale or zoom. Multiple views of one drawing may be open in seperate windows or viewports simultaneously.

viewport

The window or frame within which a view of the drawing is visible. In some complex CAD programs viewports are considered complex objects and can be placed in drawings. Many programs also support the use of multiple viewports which can simultaneously show different parts of the same drawing. This is especially important when working in 3D.

zoom

The way the view is changed by magnifying or reducing the image on the screen. Zoom scales the view only and does not affect the actual size of drawing objects.