Computer Concept & Programming

I semester, BScCSIT

Ambition Guru College

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Unit 9

(3 hrs.)

Introduction to Graphics

- Modes, Initialization, Graphics Function, drawing shapes, lines, working with Colors

Graphics

- **Graphics** in computer programming refers to the creation, manipulation, and display of visual images such as lines, shapes, and colors on a screen using code.
- Graphics transforms data into a visual format that is easy to understand and interact with.

Applications

1. Games development – To create interactive environments and characters
2. Graphical User Interface (GUI) – For designing user-friendly software interfaces
3. Animation and multimedia – Used in movies, cartoons, and presentations
4. Computer-Aided Design (CAD) – In engineering and architecture
5. Data visualization and image processing – Charts, graphs, dashboards, Editing images
6. Simulations – In training, flight simulators, virtual reality

Graphics: Header file in C

- The **graphics.h** header file provides predefined functions to perform graphic operations like drawing shapes (lines, circles, rectangles), setting colors, filling areas, and managing the graphical screen. It is mainly used in Turbo C/C++ for creating basic 2D graphics.

Examples of functions in graphics.h:

- initgraph()
- line()
- circle()
- setcolor()
- closegraph()

Graphics: Concept of Coordinate System

In C graphics, the screen follows a 2D Cartesian coordinate system, but with a slight change:

- Origin (0,0) is at the top-left corner of the screen.
- The X-axis increases to the right.
- The Y-axis increases downward.

For example:

- The point (100, 100) is 100 pixels to the right and 100 pixels down from the top-left corner.
- The bottom-right corner depends on the resolution, e.g., in 640×480 mode, it is (639, 479).

Graphics: Some definitions

- **Pixels:** A pixel is a short from of picture element and it represent a single point in a graphic image. More pixels = **higher resolution** = better image quality
- **Resolution:** The number of pixels used on the screen is called resolution.
- **Color:** In graphics, color defines the appearance of a pixel. The number of colors a pixel can display depends on the color depth (bits per pixel):

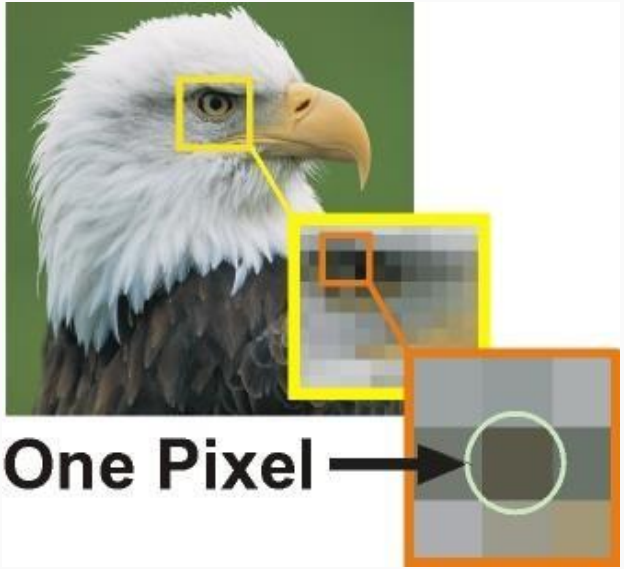
✓ 1-bit: 2 colors (black and white)

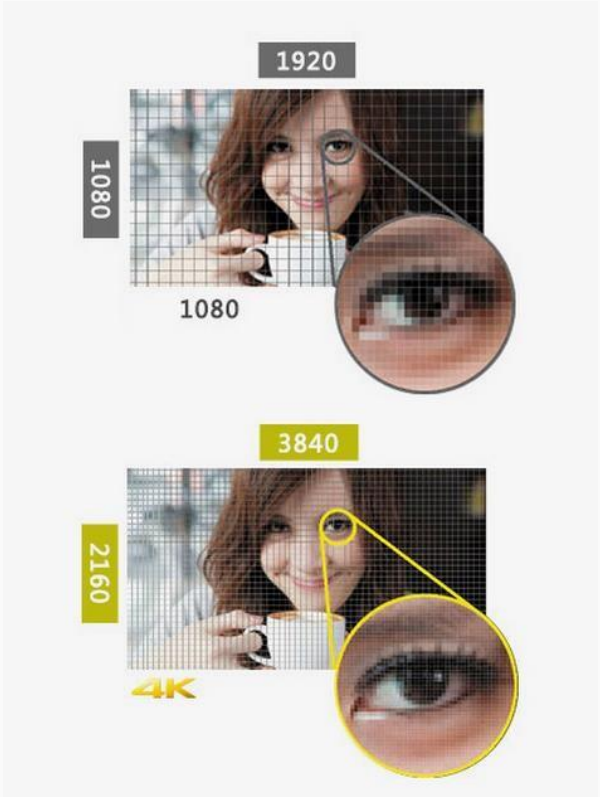
✓ 4-bit: 16 colors

✓ 8-bit: 256 colors

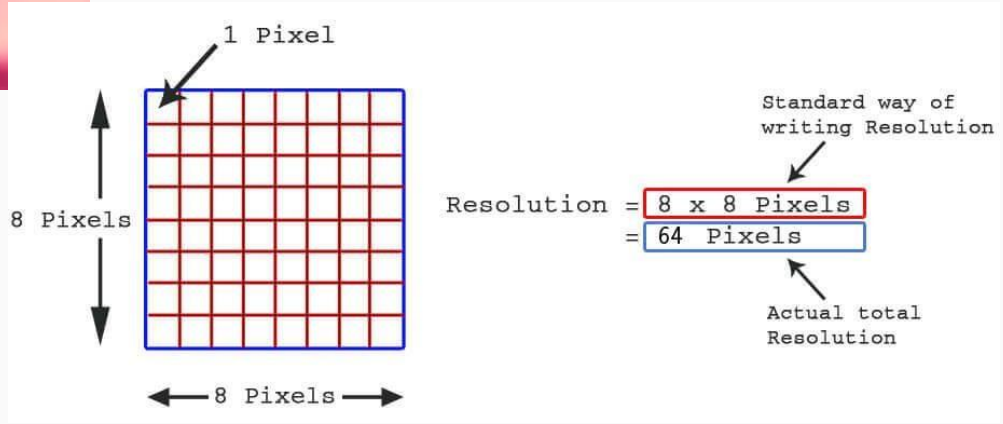
✓ 16-bit or 24-bit: Thousands to millions of colors

Graphics: Pixel





Graphics: Resolution



Graphics mode and Initialization

Graphics mode and Initialization

A **graphics mode** is a display setting where the screen can show images, shapes, and colors (unlike text mode, which only shows characters).

Graphics mode defines:

- The screen resolution (e.g., 640×480, 800×600)
- The number of colors
- The type of graphics driver (like VGA, EGA, etc.

Initializing Graphics in C

To use graphics in C, you must initialize the graphics system using initgraph() function, which sets up the graphics mode and driver.

Graphics mode and Initialization

Initializing Graphics in C

Syntax of initgraph(): `initgraph(&graphicsDriver, &graphicsMode, "BGI path");`

graphicsDriver: Integer variable, usually set to DETECT (lets compiler auto-detect driver)

graphicsMode: Integer variable that stores the mode selected

"BGI path": Path to the BGI (Borland Graphics Interface) folder (e.g., "C:\\Turboc3\\BGI")

Graphics mode and Initialization

Initializing Graphics in C

```
#include<graphics.h>
#include<stdio.h>
#include<conio.h>

int main() {
    int gd = DETECT, gm;

    initgraph(&gd, &gm, "");  // No need for BGI path in WinBGIm
    outtext("Graphics Mode Initialized!");
    circle(200, 200, 50);     // Draw a circle
    getch();                  // Wait for key press
    closegraph();             // Close graphics mode
    return 0;
}
```

Basic Graphics functions in C

Basic Graphics functions in C

Function	Description
initgraph()	Initializes graphics mode
line(x1, y1, x2, y2)	Draws a line from (x1, y1) to (x2, y2)
rectangle(x1, y1, x2, y2)	Draws a rectangle using two corner points
circle(x, y, radius)	Draws a circle with center (x, y) and radius
ellipse(x, y, stangle, endangle, xradius, yradius)	Draws an ellipse
arc(x, y, start_angle, end_angle, radius)	Draws an arc
setcolor(color)	Sets the outline color for shapes
setbkcolor(color)	Sets the background color
setfillstyle(style, color)	Sets pattern and fill color
floodfill(x, y, border_color)	Fills an area with color
closegraph()	Closes the graphics mode

Basic Graphics functions in C

```c
#include <graphics.h>
#include <conio.h>

int main() {
    int gd = DETECT, gm;
    initgraph(&gd, &gm, "");  // For Dev-C++ with WinBGIm

    // Set background color
    setbkcolor(WHITE);
    cleardevice();  // Apply background

    // Draw a line
    setcolor(BLUE);
    line(100, 100, 300, 100);

    // Draw rectangle
    setcolor(RED);
    rectangle(100, 150, 300, 250);

    // Draw filled circle
    setfillstyle(SOLID_FILL, GREEN);
    circle(200, 350, 50);
    floodfill(200, 350, GREEN);  // Fill the circle

    // Draw ellipse
    setcolor(MAGENTA);
    ellipse(200, 450, 0, 360, 100, 30);

    // Draw arc
    setcolor(BROWN);
    arc(200, 550, 0, 180, 50);

    getch();        // Wait for user input
    closegraph();   // Close graphics mode
    return 0;
}
```

Basic Graphics functions in C : Draw a circle

```
#include <graphics.h>
#include <conio.h>

int main() {
    int gd = DETECT, gm;

    initgraph(&gd, &gm, "");

    // Set color and draw a circle
    setcolor(BLUE);
    circle(200, 200, 100);  // center (200, 200), radius 100

    getch();
    closegraph();   // Close the graphics mode
    return 0;
}
```

Basic Graphics functions in C : Draw a circle

```
#include <graphics.h>
#include <conio.h>

int main() {
    int gd = DETECT, gm;

    initgraph(&gd, &gm, "");

    // Set color and draw a circle
    setcolor(BLUE);
    circle(200, 200, 100);  // center (200, 200), radius 100

    getch();
    closegraph();   // Close the graphics mode
    return 0;
}
```

Questions:

1. What is the purpose of the initgraph() function in C/C++ graphics programming?
2. Write the syntax and purpose of the line() and rectangle() functions.
3. What is the difference between setcolor() and setbkcolor() in graphics?
4. List any four functions used to draw shapes in graphics programming.
5. Name two header files necessary for using graphics in C/C++.
6. Explain the different graphics modes and how graphics are initialized in C/C++ programming. Also, write a program to initialize the graphics mode.
7. Describe various graphics functions available in the graphics.h library. Give suitable examples of any three functions.

Compiled by ab.

THANK YOU

Any Queries ?