Flood-fill Algorithm	Boundary-fill Algorithm
It can process the image containing more than one boundary colours.	It can only process the image containing single boundary colour.
Flood-fill algorithm is comparatively slower than the Boundary-fill algorithm.	Boundary-fill algorithm is faster than the Flood-fill algorithm.
In Flood-fill algorithm a random colour can be used to paint the interior portion then the old one is replaced with a new one.	In Boundary-fill algorithm Interior points are painted by continuously searching for the boundary colour.
It requires huge amount of memory.	Memory consumption is relatively low in Boundary-fill algorithm.
Flood-fill algorithms are simple and efficient.	The complexity of Boundary-fill algorithm is high.

Reflection:

It is a transformation which produces a mirror image of an object. The mirror image can be either about x-axis or y-axis. The object is rotated by180°.
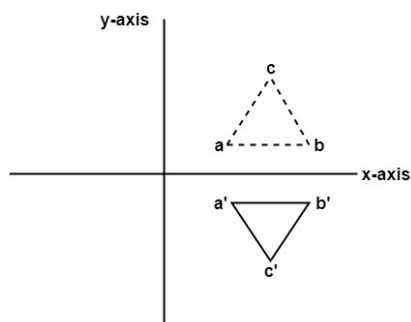
Types of Reflection:

1. Reflection about the x-axis
2. Reflection about the y-axis
3. Reflection about an axis perpendicular to xy plane and passing through the origin
4. Reflection about line y=x

1. Reflection about x-axis: The object can be reflected about x-axis with the help of the following matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

In this transformation value of x will remain same whereas the value of y will become negative. Following figures shows the reflection of the object axis. The object will lie another side of the x-axis.
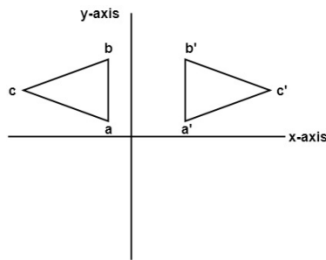
2. Reflection about y-axis: The object can be reflected about y-axis with the help of following transformation matrix

$$\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Here the values of x will be reversed, whereas the value of y will remain the same. The object will lie another side of the y-axis.

The following figure shows the reflection about the y-axis

3. Reflection about an axis perpendicular to xy plane and passing through origin: In the matrix of this transformation is given below

$$\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
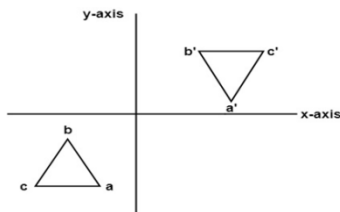
In this value of x and y both will be reversed. This is also called as half revolution about the origin.

4. Reflection about line y=x: The object may be reflected about line y = x with the help of following transformation matrix

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$
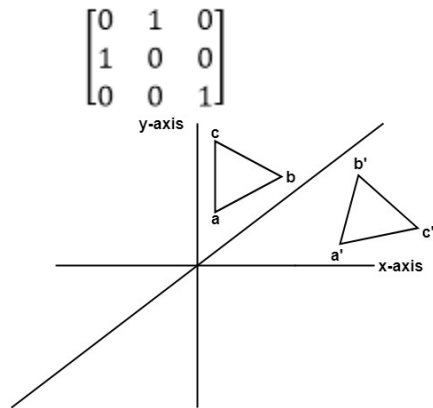
First of all, the object is rotated at 45°. The direction of rotation is clockwise. After it reflection is done concerning x-axis. The last step is the rotation of y=x back to its original position that is counterclockwise at 45°.

- C

```c
// C Implementation for Boundary Filling Algorithm

#include <graphics.h>


// Function for 4 connected Pixels

void boundaryFill4(int x, int y, int fill_color,int boundary_color)

{

   if(getpixel(x, y) != boundary_color &&

     getpixel(x, y) != fill_color)

   {

     putpixel(x, y, fill_color);

     boundaryFill4(x + 1, y, fill_color, boundary_color);

     boundaryFill4(x, y + 1, fill_color, boundary_color);

     boundaryFill4(x - 1, y, fill_color, boundary_color);

     boundaryFill4(x, y - 1, fill_color, boundary_color);
```

```c
        }
    }
}

//driver code
int main()
{
    // gm is Graphics mode which is
    // a computer display mode that
    // generates image using pixels.
    // DETECT is a macro defined in
    // "graphics.h" header file
    int gd = DETECT, gm;

    // initgraph initializes the
    // graphics system by loading a
    // graphics driver from disk
    initgraph(&gd, &gm, "");

    int x = 250, y = 200, radius = 50;

    // circle function
    circle(x, y, radius);

    // Function calling
    boundaryFill4(x, y, 6, 15);
```

```
    delay(10000);


    getch();


    // closegraph function closes the

    // graphics mode and deallocates

    // all memory allocated by

    // graphics system .

    closegraph();


    return 0;

}
```

A mouse is a small hardware input device used by hand. It controls the movement of the cursor on the computer screen and allows users to move and select folders, text, files, and icons on a computer. It is an object, which needs to put on a hard-flat surface to use. When the users move the mouse, the cursor moves in the same direction on the display screen. The name mouse is derived from its size as it is a small, corded, and elliptical shape device that looks a bit like a mouse. A connecting wire of a mouse is imaginable to be the mouse's tail. Additionally, some of the mice have combined features like extra buttons, which may be assigned and programmed with many commands. The mouse invention is considered as one of the most important breakthroughs in the computer field as it helps to reduce the use of a keyboard.

Parts of a Computer Mouse

There are different parts of a computer mouse to work smoothly. All parts of the mouse are given below with their functions:

Buttons

Nowadays, almost every mouse has two buttons, **left** and **right**. These buttons are used for manipulating any objects and text as well. In older times, the computer mouse contained only one button. For instance, most of the starting Apple computer mouse included only one button. When a user clicks a button of the

mouse, it communicates with the computer to perform an activity on the screen. These two buttons (left and right) of the mouse allow users to input different-different messages to the computer, which is based on clicking the left and right-button by users. A computer system understands the left or right-click based on the configuration of your mouse driver.

Ball, laser, or LED

A mouse, if it is a mechanical mouse, uses a ball and rollers, and an optical mouse uses a laser or LED. These parts allow the mouse to track the movement on an x-axis and y-axis directions and move the mouse cursor on the screen.

Circuit board

A circuit board is located inside of mouse chasses, which is used to transmit all mouse signal information, clicks, and other information. This board includes all electronic components such as a diode, register, capacitor, and more. It accepts input in the form of electronic signals when a user gives any instruction by clicking the mouse buttons, scrolling, etc.

Mouse wheel

Nowadays, computer mouses also include a wheel that is used to scroll the document page up and down direction.

Cable/Wireless Receiver

The corded mouse has a cable with a plug that connects to the computer. If the mouse is wireless, it requires a USB receiver to get the wireless signal, such as (Bluetooth, Infrared, Radio signals), and input it into the computer.

Microprocessor

It is a processor that is embedded on the circuit board of the mouse. All components of the mouse are not able to work without a microprocessor, as it is the brain of the mouse.

Keyboard

Keyboard is the most common and very popular input device which helps to input data to the computer. The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing additional functions.

Keyboards are of two sizes 84 keys or 101/102 keys, but now keyboards with 104 keys or 108 keys are also available for Windows and Internet.

The keys on the keyboard are as follows −

S.No	Keys & Description
1	**Typing Keys** These keys include the letter keys (A-Z) and digit keys (09) which generally give the same layout as that of typewriters.
2	**Numeric Keypad** It is used to enter the numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machines and calculators.
3	**Function Keys** The twelve function keys are present on the keyboard which are arranged in a row at the top of the keyboard. Each function key has a unique meaning and is used for some specific purpose.
4	**Control keys** These keys provide cursor and screen control. It includes four directional arrow keys. Control keys also include Home, End, Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	**Special Purpose Keys** Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

1. Monitor

A computer's principal output device is a monitor, often known as a Visual Display Unit (VDU). It displays the processed data like text, images, videos, audios, etc. It makes images by arranging microscopic dots in a rectangular pattern, known as pixels. The sharpness of an image is determined by the number of pixels. There are two types of monitor viewing screens:

(1) Cathode-Ray Tube (CRT): This type of monitor is based on a cathode ray tube. In which the cathode ray tube generates a beam of electrons with the help of electron guns they strike on the inner surface of phosphorescent of the screen to generate images. The CRT monitor holds millions of phosphorus dotes in three different colors, i.e., red, blue, and green. These dots glow when the beam struck on them and create an image. The main parts of the CRT monitor are the electron gun, fluorescent screen, glass envelope, deflection plate assembly, and base.

Characteristics of Monitor:
- Resolution pixels: Pixels are the smallest element of any image
- Size: The size of the monitor – The diagonal measurement of a desktop screen is typically 14 to 25 inches.

- Refresh Rate: Total number of times per second that an image on a display is repainted or refreshed.

(2) Display on a Flat Panel Monitor with a Cathode-Ray Tube (CRT): A flat-panel display is a type of video display with less volume, weight, and power consumption than a CRT. They can be put on the wrist or hang on the wall. Calculators, video games, monitors, laptop computers, and graphical displays all use flat-panel displays.

(3) Plasma Monitor: It is also a flat panel display but it is based on plasma display technology. In a plasma monitor, a small cell is present in between two glass surfaces and these cells contain a solution of noble gases and mercury. So when the electricity supply on the gas present in the cell converts into plasma and produces UV light that creates an image. It is much better than an LCD monitor. The resolution of this monitor is also high up to 1920 x 1920. It has a good contrast ratio, high refresh rate, etc.

2. Printer

Printers are information output devices that allow you to print data on paper. Or in other words, it is an output device that creates a hard copy of the processed data or information. Printers are divided into two categories:

(1) Impact Printer: In impact printers, characters are printed on the ribbon, which is then smashed on the paper. Or we can say that such type of printer uses a print head or hammer to print the data on the paper. Here to print the paper the hammer or print head strikes an ink ribbon against the paper and the character starts printing. Some of the types of impact printers are:
- Dot matrix printer
- Daisy wheel printer
- Line printer
- Chain printer

Impact printers have the following characteristics:
- Extremely low consumable costs.
- Fairly noisy
- It's perfect for large-scale printing because of its inexpensive cost.
- Physical contact with the paper is required to form an image.

(2) Non-Impact Printers: Non-impact printers print characters without the use of a ribbon. These printers are often known as Page Printers because they print a full page at a time. Some of the types of non-impact printers are:
- Laser printer
- Inkjet printer

Non-impact printers have the following characteristics:
- Quicker
- They don't produce much noise.
- Superior quality
- Supports a wide range of fonts and character sizes

3. Plotter

A plotter is a device that prints high-quality graphics in a variety of color formats. It works in a similar way to a printer, although it has more advanced features. It is used to print large maps, architectural drawings, large-format printing, and create pictures, 3D postcards, advertising signs, charts, and various designs of the internal structure of building machines, as well as create pictures, 3D postcards, advertising signs, charts, and various designs of the internal structure of building machines.

Characteristics of Plotter:

- Large size prints can be taken via plotters
- It is slow & expensive.

Projection are defined as mapping of three-dimensional points to a two-dimensional plane. There are two type of projection parallel and perspective.

1. Parallel Projection :
Parallel projections are used by architects and engineers for creating working drawing of the object, for complete representations require two or more views of an object using different planes.
Parallel Projection use to display picture in its true shape and size. When projectors are perpendicular to view plane then is called orthographic projection. The parallel projection is formed by extending parallel lines from each vertex on the object until they intersect the plane of the screen. The point of intersection is the projection of vertex.
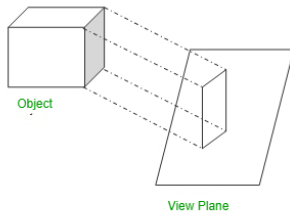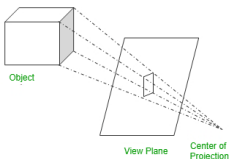

2. Perspective Projection :
Perspective projections are used by artist for drawing three-dimensional scenes.
In Perspective projection lines of projection do not remain parallel. The lines converge at a single point called a center of projection. The projected image on the screen is obtained by points of intersection of converging lines with the plane of the screen. The image on the screen is seen as of viewer's eye were located at the centre of projection, lines of projection would correspond to path travel by light beam originating from object.

Two main characteristics of perspective are vanishing points and perspective foreshortening. Due to foreshortening object and lengths appear smaller from the center of projection. More we increase the distance from the center of projection, smaller will be the object appear.

SR.NO	Parallel Projection	Perspective Projection
1	Parallel projection represents the object in a different way like telescope.	Perspective projection represents the object in three dimensional way.
2	In parallel projection, these effects are not created.	In perspective projection, objects that are far away appear smaller, and objects that are near appear bigger.
3	The distance of the	The distance of the object

SR.NO	Parallel Projection	Perspective Projection
	object from the center of projection is infinite.	from the center of projection is finite.
4	Parallel projection can give the accurate view of object.	Perspective projection cannot give the accurate view of object.
5	The lines of parallel projection are parallel.	The lines of perspective projection are not parallel.
6	Projector in parallel projection is parallel.	Projector in perspective projection is not parallel.
7	Two types of parallel projection : 1.Orthographic, 2.Oblique	Three types of perspective projection: 1.one point perspective, 2.Two point perspective, 3. Three point perspective,
8	It does not form realistic view of object.	It forms a realistic view of object.