



GALGOTIAS
UNIVERSITY

**School of Computing
Science and Engineering**

Program: B.C.A.

Course Code: BCAS3003

Course Name: Computer Graphics

Course Prerequisites

- Knowledge of Mathematics**
- Fundamental knowledge of Computer**

Syllabus

Unit 2 – Output Primitives

(8 hours)

- Line Drawing Algorithms**
- Circle Generation Algorithms**
- Ellipse Generating Algorithm**
- Pixel Addressing**
- Filled-Area Primitives**
- Fill Area Function,**
- Cell Array, Character Generation**

Recommended Books

Text books

- ❑ D. Hearn, P. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 1997

Reference Book

- ❑ Heam Donald, Pauline Baker M: "Computer Graphics", PHI 2nd Edn. 1995.
- ❑ Harrington S: "Computer Graphics - A Programming Approach", 2nd Edn. Mc GrawHill.
- ❑ Shalini Govil-Pai, Principles of Computer Graphics, Springer, 2004

Additional online materials

- ❑ Coursera - <https://www.coursera.org/learn/fundamentals-of-graphic-design>
- ❑ <https://www.youtube.com/watch?v=fwzYuhduME4&list=PLE4D97E3B8DB8A590>
- ❑ NPTEL - <https://nptel.ac.in/courses/106/106/106106090/>
- ❑ <https://www.coursera.org/learn/research-methods>
- ❑ <https://www.coursera.org/browse/physical-science-and-engineering/research-methods>

Characters Generation

- In computer graphics character can be generated using software.
- In hardware implementation of character generation, limited faces of character can be generated.
- A wide variety of faces of character can be generated with software implementation.
- There are three methods for generating characters using software implementation such as Stroke method, Vector method or bitmap method, Star bust method.

Characters Generation

Stroke Method

- ❑ In this method we use a sequence of line drawing function and arc functions to generate characters.
- ❑ We can generate a sequence of character by assigning starting and end point of line or arc.
- ❑ By using this method various faces of character can be generated by changing the values (parameters) in line and arc function.



Characters Generation

Stroke Method

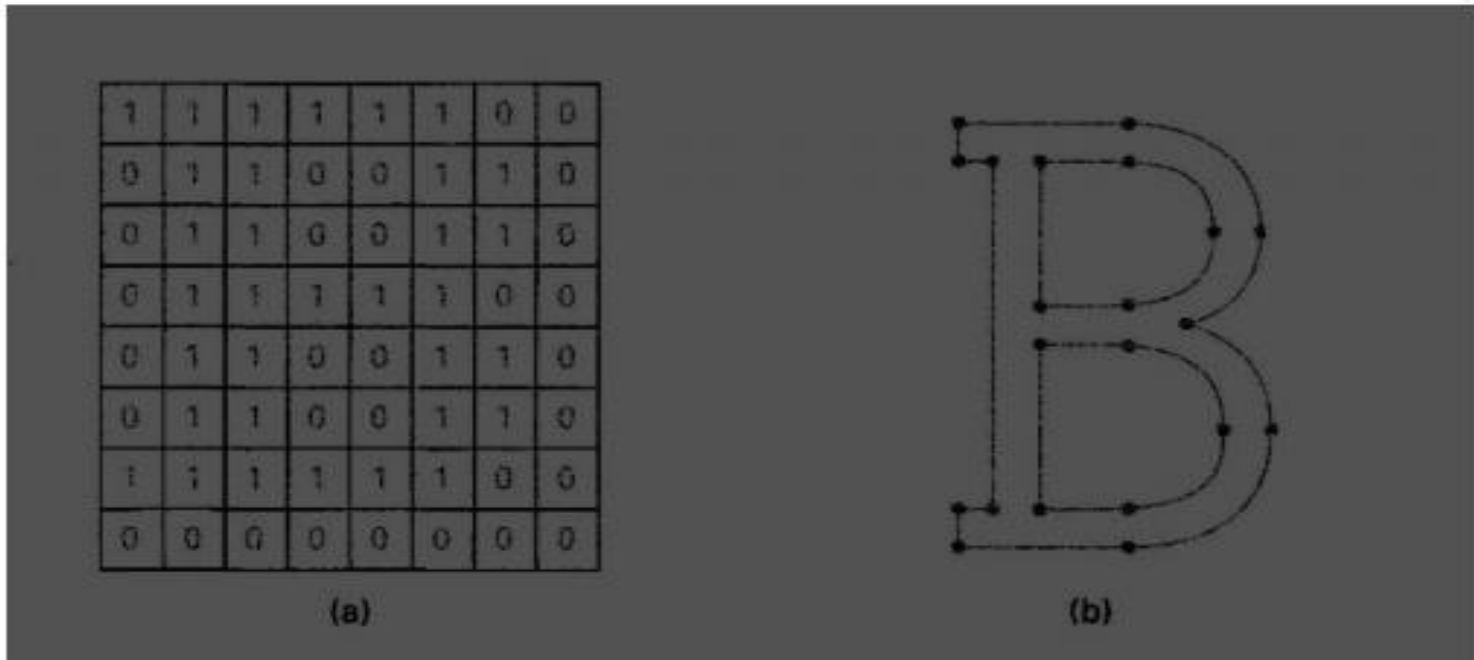
- ❑ We can build our own stroke method character generator by calls to the line drawing algorithm. Here it is necessary to decide which line segments are needed for each character and then drawing these segments using line drawing algorithm.
- ❑ The main disadvantage of this method is when we draw a diagonal line it produce aliased character.



Characters Generation

Bitmap Method

- It is also called dot matrix because in this method characters are represented by an array of dots in the matrix form.



Characters Generation

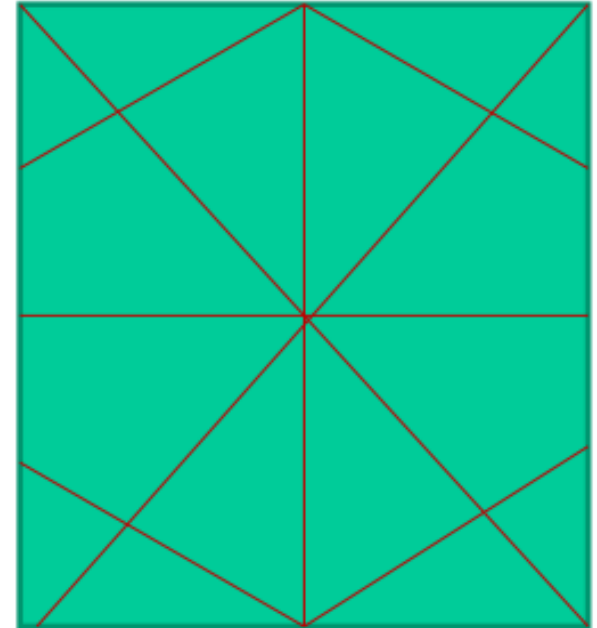
Bitmap Method

- ❑ It is a two dimensional array having columns and rows. An 5x7 array is commonly used to represent characters. However 7x9 and 9x13 arrays are also used.
- ❑ Higher resolution devices such as inkjet printer or laser printer may use character arrays that are over 100x100.
- ❑ Each dot in the matrix is a pixel. The character is placed on the screen by copying pixel values from the character array into some portion of the screen's frame buffer. The value of the pixel controls the intensity of the pixel.
- ❑ This method is suitable for producing various character.
- ❑ Font size of character can be increased by increasing the size of array.

Characters Generation

Starburst Method

- ❑ In this method a fixed pattern of line is used to generate the character.
- ❑ In this method we use a combination of 24 bit line segment.
- ❑ In 24 bit line segment code each bit represent a single line.
- ❑ To highlight a line we put corresponding bit 1 in 24 bit line segment code and 0 otherwise.



Characters Generation

Starbust Method

- ❑ For example, 24-bit code for Character A is 0011 0000 0011 1100 1110 0001 and for character M is 0000 0011 0000 1100 1111 0011.
- ❑ Disadvantages are given as follows:
- ❑ The 24-bits are required to represent a character. Hence more memory is required
- ❑ Requires code conversion software to display character from its 24-bit code
- ❑ Character quality is poor. It is worst for curve shaped characters.

Questions

- Explain Filled Area Primitives.
- Explain Flood fill algorithm with examples.
- Explain Boundary fill algorithm with examples.



Thank You