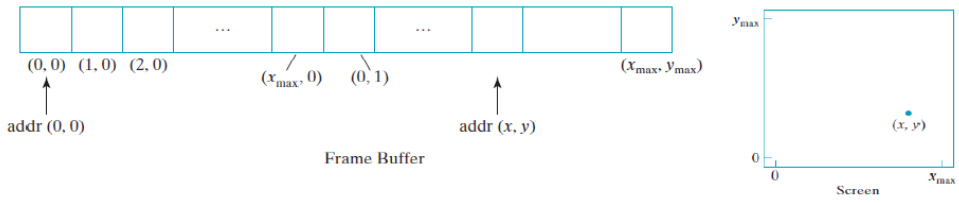
Computer Graphics Spring 2023

Exercise 2 Answers

I. **True/False.**

1. DDA line drawing algorithm is more efficient than Bresenham's line drawing algorithm. (False)
2. When an RGB color setting specifies an equal amount of red, green, and blue, the result is some shade of gray. (True)
3. When 8 bits are used to store a pixel in frame buffer, 512 different colors can be displayed. (False)
4. The minimum number of bits required for direct color storage scheme is 3 bits. (True)
5. Using indexed color storage scheme does not affect the number of simultaneous colors that can be displayed. (False)

II. Suppose the frame buffer array is addressed in row major order and that pixel positions are labeled from (0, 0) at the lower-left screen corner to (x_{max}, y_{max}) at the top-right corner as shown in the following figure. Suppose a bi-level system and the frame-buffer is of 4 rows and 4 columns, calculate the bit address of the pixel (1,2), (2,2) and (3,3).



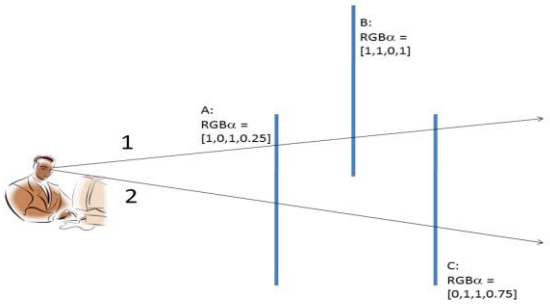
Use one of these equations:

$$\text{addr}(x, y) = \text{addr}(0, 0) + y(x_{\max} + 1) + x$$

$$\text{addr}(x + 1, y) = \text{addr}(x, y) + 1$$

$$\text{addr}(x + 1, y + 1) = \text{addr}(x, y) + x_{\max} + 2$$

III. In the following figure, a simple scene consisting of 3 differently colored objects A, B, and C is given. Calculate the final color seen by the person from rays 1 and 2.



At ray 1: Get the final color through two steps:

P1 = (1)(1,1,0) + (1-1)(0,1,1) = (1,1,0)

P2 (seen color) = (0.25)(1,0,1) + (1-0.25)(1,1,0) = **(1,0.75,0.25)**

At ray 2: As long as a third background color is not provided, alpha of the second object is not important. Use only alpha of the first object.

P (seen color) = (0.25)(1,0,1) + (1-0.25)(0,1,1) =**(0.25, 0.75, 1)**

Hint: you can use this law for 3 layers, check explanation in the book (Read only)

$$\mathbf{P} = t_0\mathbf{F} + t_1\mathbf{B_1} + (1 - t_0 - t_1)\mathbf{B_2}$$