Assignment - 01

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Course Title : Computer Graphics

Course Code : CSE423

Section : 14

Semester : Summer 2025

Date of submission : 13.07.2025

Ans. to the Q. NO- 01 (a)

Given Points,

$$\left.\begin{matrix} A\ (16, 17) \\ B\ (-10, -7) \end{matrix}\right\} \text{ line segment}$$

for slope,

$$dx = -10 - 16 = -26$$
$$dy = -7 - 17 = -24$$

$$\therefore \text{slope, } m = \frac{dy}{dx} = \frac{-24}{-26}$$
$$\approx 0.923 \quad \therefore [m < 1]$$

from A and B,

$$\left.\begin{matrix} x_0 = -10 \\ y_0 = -7 \\ x_1 = 16 \\ y_1 = 17 \end{matrix}\right\} \begin{matrix} \because dx \text{ and } dy \text{ negative (-ve).} \\ \text{let,} \\ [\text{left to right moving}] \end{matrix}$$

$$\therefore dx = x_1 - x_0 = 16 - (-10) = 26$$
$$dy = y_1 - y_0 = 17 - (-7) = 24$$

$\because$ We Know,

$$d_{int} = 2dy - dx = 2 \cdot (24) - 26$$
$$= 22$$

[P.T.O.]

Now,

	x	y	d	NE/E	d updating	pixel
1	-10	-7	22	NE	$d = d + 2dy - 2dx$ $= 18$	(-10, -7)
2	-9	-6	18	NE	$d = d + 2dy - 2dx$ $= 18 + (-4) = 14$	(-9, -6)
3	-8	-5	14	NE	$d = d + 2dy - 2dx$ $= 14 + (-4) = 10$	(-8, -5)
4	-7	-4	10	NE	$d = d + 2dy - 2dx$ $= 10 + (-4) = 6$	(-7, -4)
5	-6	-3	6	NE	$d = d + 2dy - 2dx$ $= 6 + (-4) = 2$	(-6, -3)
6	-5	-2	2	NE	$d = d + 2dy - 2dx$ $= 2 + (-4) = -2$	(-5, -2)
7	-4	-1	-2	E	$d = d + 2dy$ $= -2 + 48 = 46$	(-4, -1)
8	-3	-1	46	NE	$d = d + 2dy - 2dx$ $= 46 + (-4) = 42$	(-3, -1)
9	-2	0	42	NE	$d = d + 2dy - 2dx$ $= 42 + (-4) = 38$	(-2, 0)
10	-1	1	38	NE	$d = d + 2dy - 2dx$ $= 38 + (-4) = 34$	(-1, 1)

∴ The first 10 pixels I got from the given line segment A (16, 17) to B (-10, -7) using the Midpoint line drawing algorithm are:

(-10, -7),
(-9, -6),
(-8, -5),
(-7, -4),
(-6, -3),
(-5, -2),
(-4, -1),
(-3, -1),
(-2, 0) &
(-1, 1).

(Ans:)

[P.T.O.]

Ans. to the Q. NO- 01(b)

Given two endpoints,

$A(2,4) \rightarrow (x_1, y_1)$

$B(10,5) \rightarrow (x_2, y_2)$

Now,

$dx = x_2 - x_1$

$= 10 - 2 = 8$

$dy = y_2 - y_1$

$= 5 - 4 = 1$

We know,
In DDA,
if $-1 < m < 1$,

$x_{K+1} = x_K + 1$

$y_{K+1} = y_K + m$

$\therefore m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{dy}{dx}$

$= \frac{1}{8}$

$= 0.125$

$\therefore -1 < m < 1$

$\therefore$ using DDA Algorithm:

Steps determination = testmax $(|dx|, |dy|)$

= testmax $(|8|, |1|)$

= 8

Increment Calculation $\Rightarrow x_{inc} = \frac{dx}{steps} = \frac{8}{8} = 1$

$y_{inc} = \frac{dy}{steps} = \frac{1}{8} = 0.125$

DDA Algorithm Table :

	$x_{current}$	$y_{current}$	y (round off)	Pixel
0 (given)	2·000	4·000	4	(2,4)
1	2+1 = 3·000	4·000+0·125=4·125	4	(3,4)
2	3·000+1=4·000	4·125+0·125=4·250	4	(4,4)
3	4·000+1=5·000	4·250+0·125 = 4·375	4	(5,4)
4	5·000+1=6·000	4·375+0·125 = 4·500	5	(6,5)
5	6·000+1=7·000	4·500+0·125 = 4·625	5	(7,5)
6	7·000+1=8·000	4·625+0·125 = 4·750	5	(8,5)
7	8·000+1=9·000	4·750+0·125 = 4·875	5	(9,5)
8	9·000+1=10·000	4·875+0·125 = 5·000	5	(10,5)

∴ All the pixels points for given two endpoints A (2,4) and B (10,5) using DDA Algorithm are :

(2,4),
(3,4),
(4,4),
(5,4),
(6,5),
(7,5),
(8,5),
(9,5), &
(10,5)

(Ans:)

Ans. to the Q. NO - 02(a)

We Know,

Total pixels

= Horizontal Resolution × Vertical Resolution

=(2340 x 1080) pixels

= 2527200 pixels.

Given,

Resolution = 2340 x 1080 pixels

Frame rate = 67 fps

GPU Speed = 82000 pixel/ms

(Ans:)

Ans. to the Q. NO - 02(b)

We Know,

$$\text{Time per frame} = \frac{1}{\text{Frame Rate}}$$

$$= \frac{1}{67 \text{ fps}}$$

$$= 0.014925 \text{ seconds}$$

$$= 0.014925 \times 1000 \text{ milliseconds}$$

$$= 14.925 \text{ milliseconds}$$

(Ans:).

Ans. to the Q. NO- 02(C)

We Know,

Time needed by GPU to render one frame,

$$= \frac{\text{Total Pixels}}{\text{Pixels Per Milliseconds}}$$

$$= \frac{2527200}{82000}$$

$$= 30.8195122 \text{ ms}$$

$$\approx 30.82 \text{ ms}$$

from (b),

We get,

available time = 14.925 ms

but here,

the GPU needs = 30.82 ms

$\because$ 30.82 ms > 14.925 ms

$\therefore$ No, the GPU cannot render one entire frame within the required time to maintain 67 fps.

(Ans:)