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Assignment - 4. - A4

Problem - Write C++ program to draw the polygons by using the mouse. Choose colours by clicking on the desired color panel. Use window port to draw. Use DDA algorithm for line drawing

Objective - To draw a desired colour polygon using mouse and DDA line algorithm.

Outcome - ① Able to draw polygon with desired colour using DDA line algorithm.
② Able to draw polygon using mouse interfacing -

S/W and H/W requirements - Qt creator, Fedora OS.

~~Algorithms~~
~~Theory~~: Algorithms:

DDA - Digital Differential Analyser.

① Take input (x_1, y_1) & (x_2, y_2)
② $dx = (x_2 - x_1)$, $dy = (y_2 - y_1)$
③ if $(abs(dx) \geq abs(dy))$
    len = abs(dx)
  else
    len = abs(dy)

④ ~~line~~ $x_{inc} = dx / len$

(5) yinc = dy/len.

(6)
```
x = x1, y = y1
i = 0
while (i < len)
{
    setpixel (x, y, color)
    x = x + xinc
    y = y + yinc
    i++
}
```

2 Mouse interfacing algorithm.

```
if (start)
{
    int p = ev -> pos().x();
    int q = ev -> pos().y();
    a[ver] = p;
    b[ver] = q;
    if (ev -> button() == Qt::RightButton)
    {
        dda (a[ver], b[ver], a[0], b[0]);
        start = false;
    }
    else
        if (ver > 0) {
        dda (a[ver], b[ver], a[ver-1], b[ver-1]);
    }
}
ver++;
}
```

Advantage of DDA

(1) The DDA algorithm is a faster method for calculation pixel positions than the direct use of line equation $y = mx + b$.

(2) Easy to understand.

(3) It requires no special skills for implementation.

* Dicadvantages of DDA

(1) Because of round off, errors are introduced and the calculated pixel position to drift away from the true line path.

(2) Because of floating point operations the algorithm is complex.

* Advantages of mouse interfacing

(1) Polygon with any number of vertices can be drawn

(2) Polygon with any size and alignment of vertices can be drawn.

* Dicadvantages of mouse interfacing.

There may be gap between polygon closing when the right click is made.

* Test Cases

(1) DDA line algorithm

$(x_1, y_1) = (1, 3)$ $(x_2, y_2) = (4, 5)$

$dx = 4 - 1 = 3$

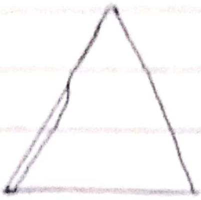
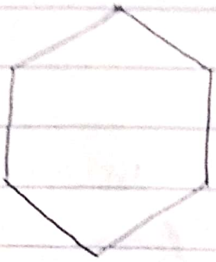
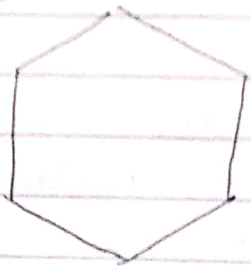
$dy = 5 - 3 = 2$

$abs(dx) = 3$ $abs(dy) = 2$

$len = abs(dx) = 3$ $x_{inc} = 1$ $y_{inc} = 0.67$.

{2} Mouse interfacing algorithm
start = true, until Right button clicked
let (p,q) = (3,7) (a[0], b[0]) = (7,2)
∴ dda (3,7,7,2)

If right button is clicked then start false
program gets terminated.

Test Case	Expected O/p	Actual O/p	Result
1) colour = Red input given by mouse			Pass
(2) colour = green input given by mouse			Pass

Conclusion: Polygon drawing with mouse interfacing is done by using DDA line algorithm. It is implemented successfully with clear understanding of concept of polygon.