

EXPERIMENT NO. 01

AIM: To implement DDA Algorithm for drawing a line segment between two given end points A (x1, y1) and B(x2, y2).

SOFTWARE USED: TurboC

THEORY:

DDA algorithm is an incremental scan conversion method. The characteristic of the DDA algorithm is to take unit steps along one coordinate and compute the corresponding values along the other coordinate. Its faster method for calculating position than direct use of equation

$$y = mx + c.$$

$$\Delta y = m \Delta x$$

If slope is less than or equal to 1, we sample at unit Δx intervals ($\Delta x = 1$) and compute each successive 'y' values as

$$Y_{k+1} = Y_k + m$$

'k' subscript takes integer values starting from 1 for the 1st point increases by 1 unit final endpoint is reached. Since 'm' can be any real number from 0 to 1, calculated 'y' values must be rounded to nearest integers. For lines with a positive slope greater than 1 we required reverse the roles of 'x' and 'y'. That is we sample at unit intervals ($\Delta y = 1$). Calculate each succeeding 'x' value as

$$X_{k+1} = X_k + 1/m$$

This is based on the assumption that lines are to be processed from left end point to right end point to reverse processing direction, either we have

$$\Delta x = -1, \quad Y_{k+1} = Y_k - m$$

OR

$$\Delta y = -1, \quad X_{k+1} = X_k - 1/m$$

If absolute value of slope is less than 1 start end point is at left, we get $\Delta x = 1$ calculate 'y' value such equation

$$Y_{k+1} = Y_k + m.$$

If start end point is at right we set $\Delta x = -1$ equation 'y' passing from equation

$$Y_{k+1} = Y_k - m$$

ALGORITHM:

- 1) Read the line end points (x_1, y_1) and (x_2, y_2)
- 2) Calculate $dx = x_2 - x_1$ and $dy = y_2 - y_1$
- 3) If $dx \geq dy$ then Length = dx
 Else Length = dy
- 4) $dx = x_2 - x_1 / \text{length}$ $dy = y_2 - y_1 / \text{length}$
- 5) $x = x_1 + 0.5 \text{ sign}(dx)$ $y = y_1 + 0.5 \text{ sign}(dy)$
- 7) $I = 1$
 While ($I \leq \text{length}$)
 {Plot integer(x), integer(y)
 $X = x + dx$; $Y = y + dy$; $I = ++$ }
- 8) Stop

ADVANTAGES OF DDA ALGORITHM

1. It is the simplest algorithm and it does not require special skills for implementation.
2. It is a faster method for calculating pixel positions than the direct use of equation $y = mx + b$.
3. It eliminates the multiplication in the equation by making use of raster characteristics

DISADVANTAGES OF DDAALGORITHM

1. Floating point arithmetic in DDA algorithm is still time-consuming.
2. The algorithm is orientation dependent. Hence end point accuracy is poor.

CONCLUSION: Thus successfully Implemented simplest implementation for [lines](#), the DDA algorithm interpolates values in interval by computing for each x_i the equations $x_i = x_{i-1} + 1$, $y_i = y_{i-1} + m$, where $\Delta x = x_{\text{end}} - x_{\text{start}}$ and $\Delta y = y_{\text{end}} - y_{\text{start}}$ and $m = \Delta y / \Delta x$

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