Algorithm for Bresenham Line Drawing and Scaling it

Step 1:

Input the starting and ending points of the line:

- Starting point (x_0, y_0)

- Ending point (x_1, y_1)

Step 2:

Calculate the absolute differences between the coordinates:

- $\Delta x = |x_1 - x_0|$

- $\Delta y = |y_1 - y_0|$

Step 3:

Determine the step directions for x and y:

- sx = 1 if $x_1 > x_0$, otherwise -1

- sy = 1 if $y_1 > y_0$, otherwise -1

Step 4:

Initialize lists to store the points:

- xes = [x_0]

- yes = [y_0]

Step 5:

Determine whether the line is more horizontal ($\Delta x > \Delta y$) or vertical ($\Delta y >= \Delta x$):

- For horizontal lines ($\Delta x > \Delta y$):

  - Initialize decision parameter $P = 2\Delta y - \Delta x$

  - Update points and decision parameter iteratively until x_0 equals x_1:

    - If P >= 0:

      - Update y_0: $y_0 = y_0 + sy$

      - Update P: $P = P + 2(\Delta y - \Delta x)$

    - Otherwise:

- Update P: $P = P + 2\Delta y$

- For vertical lines ($\Delta y >= \Delta x$):

  - Initialize decision parameter $P = 2\Delta x - \Delta y$

  - Update points and decision parameter iteratively until y_0 equals y_1:

    - If $P >= 0$:

      - Update x_0: $x_0 = x_0 + sx$

      - Update P: $P = P + 2(\Delta x - \Delta y)$

    - Otherwise:

      - Update P: $P = P + 2\Delta x$

Step 6:

Apply 2D transformations to the line points using a transformation matrix:

- Define the scaling matrix:

  - Scale x by 2 and y by 0.5

- Define the translation matrix:

  - Translate by 3 units right and 2 units up

- Calculate the composite transformation matrix (scaling * translation)

- Transform the original line points using the composite matrix

Step 7:

Plot the original line and the transformed line:

- Use different colors and markers to distinguish between them

- Add gridlines, titles, and labels for clarity