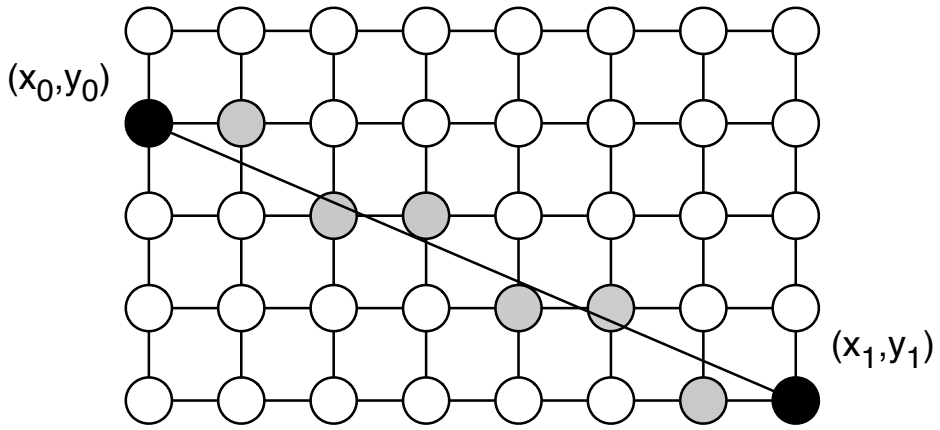
Line Rasterization



- Line begins and ends at pixel coordinates (x_0, y_0) and (x_1, y_1).
- Assume slope $|m| \leq 1$ and $x_0 \leq x_1$
- Which pixels do we choose?

Digital Differential Analyzer (DDA)

- Slope (store as fixed or floating point)

$$m = \frac{y_1 - y_0}{x_1 - x_0}$$

- Increment x by 1 on each step ($|m| < 1, x_0 \leq x_1$)

$$x_{i+1} = x_i + 1$$

- Update y via line equation

$$\begin{aligned} y_{i+1} &= m x_{i+1} + b \\ &= m(x_i + 1) + b \\ &= y_i + m \end{aligned}$$

DDA for line

$|m| \leq 1,\ x_0 \leq x_1$

```
m = (y1 - y0)/(x1 - x0);        /* m : fixed or float */
y = y0;                         /* y : fixed or float */
for (x = x0; x <= x1; x++) {    /* x : integer */
  setPixel(x, round(y));
  y += m;
}
```

- `setPixel(x,y)` "sets" the pixel at the logical address `(x,y)` in the *framebuffer*.
- `y` is rounded to the nearest scan line.

DDA for line

$|m| > 1,\ y_0 \leq y_1$

```
m = (x1 - x0)/(y1 - y0);        /* m : inverse slope */
x = x0;
for (y = y0; y <= y1; y++) {
  setPixel(round(x), y);
  x += m;
}
```

- Roles of x and y reversed.