



Painting a polygon --- AT A PIXEL

- 1) scan conversion -- is this pixel
inside the polygon?
- 2) visibility -- is this pixel
visible or hidden?
- 3) color painting -- what is the color
of this pixel?

Algorithm for Scan Conversion

form of polygon input data

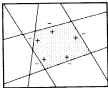
A_i, B_i, C_i for each edge i

for each edge i , define

$$f_i(x,y) = A_i x + B_i y + C_i$$

pixel (x,y) is in polygon iff

$$f_i(x,y) \geq 0 \text{ for all } i$$



Z - Buffer Algorithm

for new polygon, define

$$Z(x,y) = A_2x + B_2y + C_2$$

pixel (x,y) is visible iff

$$Z(x,y) < Z_{buf}(x,y)$$

for each visible pixel in new polygon,

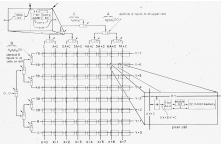
replace $Z_{buf}(x,y)$ by $Z(x,y)$

Algorithm for Smooth Shading

$$\text{RED}(x,y) = A_{\text{red}}x + B_{\text{red}}y + C_{\text{red}}$$

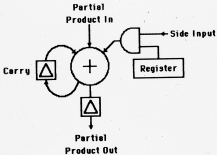
$$\text{GREEN}(x,y) = A_{\text{green}}x + B_{\text{green}}y + C_{\text{green}}$$

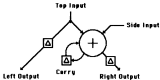
$$\text{BLUE}(x,y) = A_{\text{blue}}x + B_{\text{blue}}y + C_{\text{blue}}$$



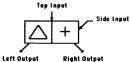
Conceptual design of an 8 x 8 pixel PIXEL-PLANES image-buffer memory chip.

Scan conversion, hidden-surface elimination and color-rendering commands are translated outside the memory system into A,B,C coefficients and associated PIXEL-PLANES commands.





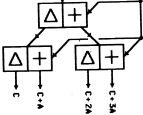
Multiplier Tree Node

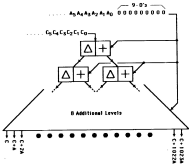


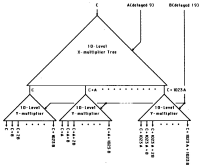
Multiplier Tree Node Symbol

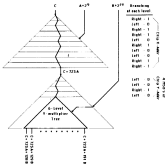
..... $A_5 A_4 A_3 A_2 A_1 A_0 0 0$

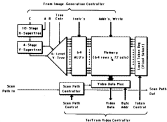
..... $C_5 C_4 C_3 C_2 C_1 C_0$

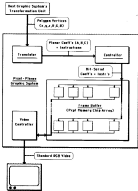


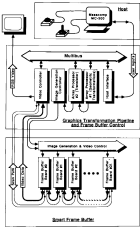


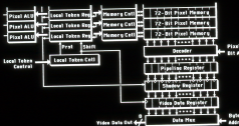


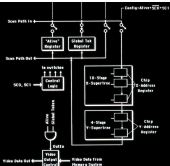


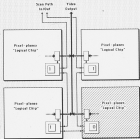




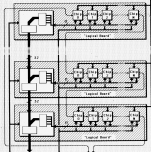






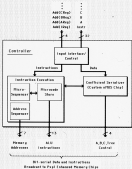


Base, Inside 1, 2, 3, 4
 C/Ds from Control Unit

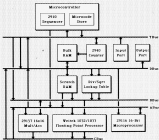


Pulse C/Ds, Flow Call Pulse Base Base, Inside Control, Side Addr., 1/2 C/Ds To From Same Field

To From Water Control Unit



BI - serial data and transfer function
 connected to P, I, D, A, B, C, D



Front-panel Transistor Block Diagram

