INTERACTIVE INPUT TECHNIQUES
(Section 8-9 in *Computer Graphics*)

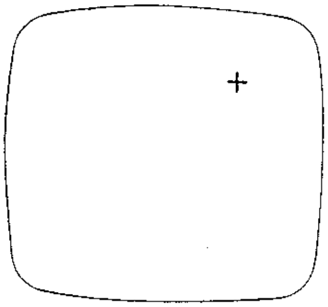
- Interactive Input Techniques
  - basic positioning methods
  - constraints
  - grids
  - gravity fields
  - rubber-band methods
  - sketching
  - dragging

INPUT FUNCTIONS
(Section 8-10 in *Computer Graphics*)

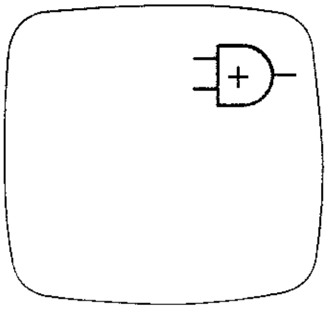
- Input Functions
  - input modes
    - request mode
    - sample mode
    - event mode
  - concurrent use of input modes

Basic Positioning Techniques

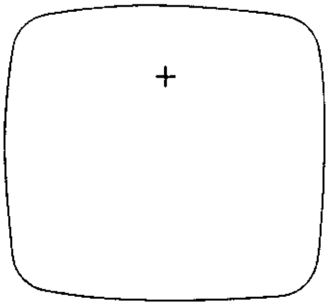
- used to specify a location for an object or a character string
  - the cursor is moved to the desired location
  - a button is pressed to fix the object at this location



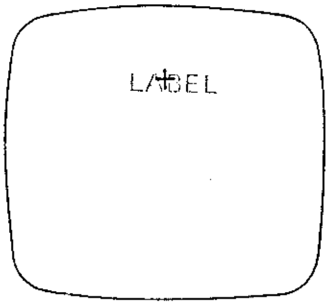
Position Cursor
and Press Button



Object Displayed
at Cursor Position



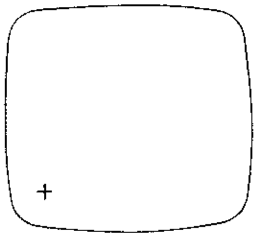
Press Button to
Select Text Position



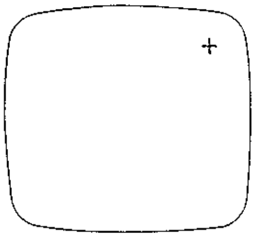
Text Displayed,
Centered on
Selected Position

Basic Positioning Techniques, continued

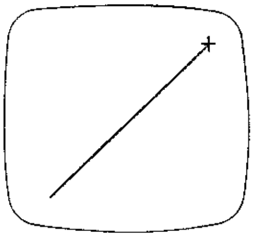
- used to draw lines



Press Button For First Line Endpoint

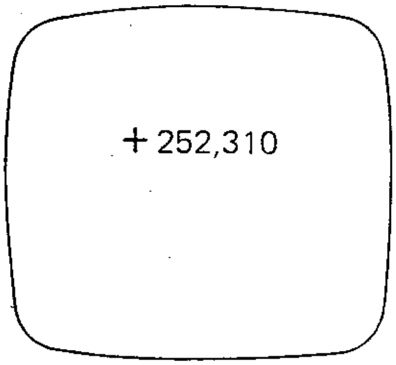


Press Button at Second Line Endpoint



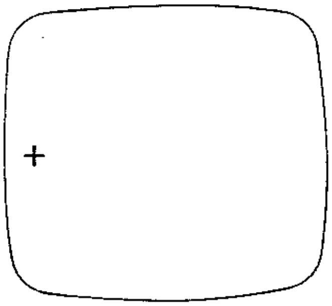
Line Displayed Between the Two Chosen Endpoints

- used to place the cursor at a predetermined position

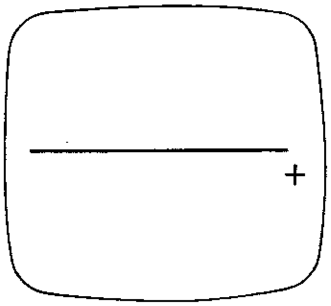


Constraints

- used to achieve predetermined orientations and alignments
- common constraints
  - horizontal alignment

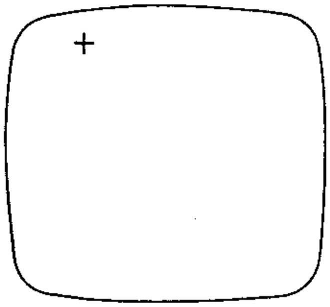


Press Button
to Select First
Endpoint

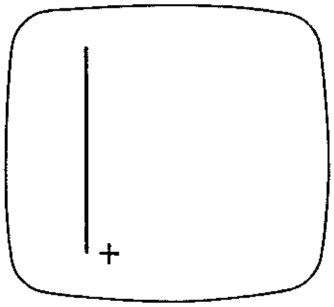


Press Button
to Select
Second Endpoint

  - vertical alignment



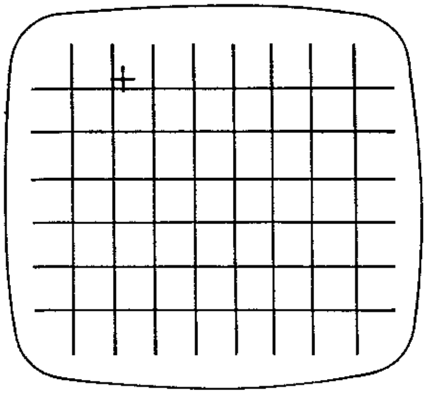
Press Button
to Select
First Endpoint



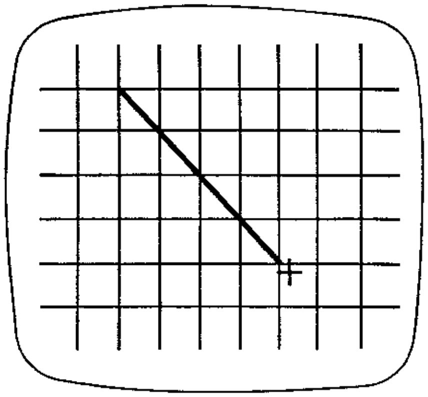
Press Button
to Select
Second Endpoint

Grids

- **used to round coordinate positions to the nearest grid intersection**



Press Button to
Select First Endpoint

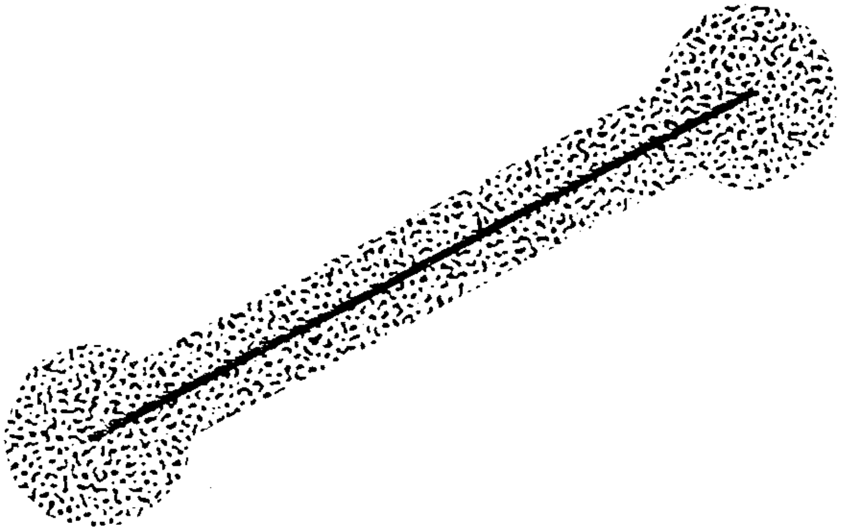


Press Button
to Select
Second Endpoint

- **useful for positioning and aligning objects and text**
- **grids can be displayed or invisible**

Gravity Fields

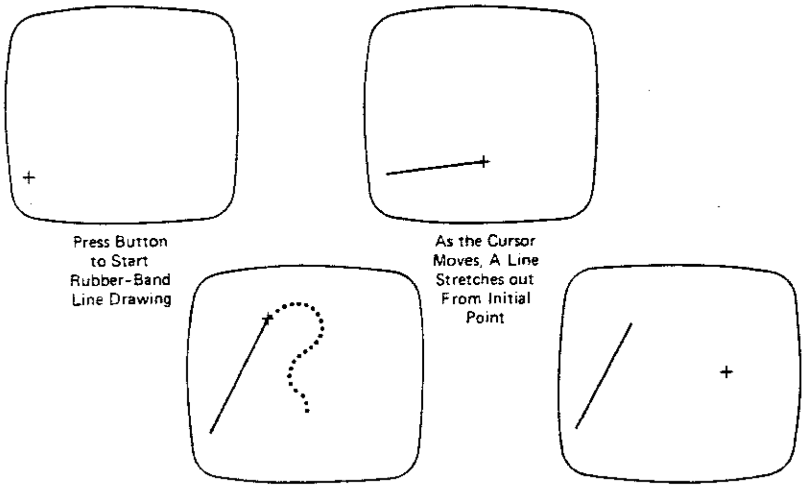
- used to connect a new line to a previously drawn line



- normally the gravity field is not displayed

Rubber-band Methods

- used to construct and position straight lines



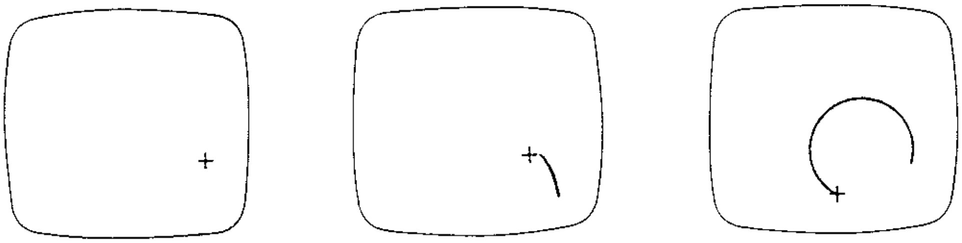
Press Button to Start Rubber-Band Line Drawing

As the Cursor Moves, A Line Stretches out From Initial Point

Line is Positioned and a Button Pressed to End Process

After Stop Button is Pressed, Cursor Can be Moved Without Rubber-Band Effects

- used to construct circular arcs



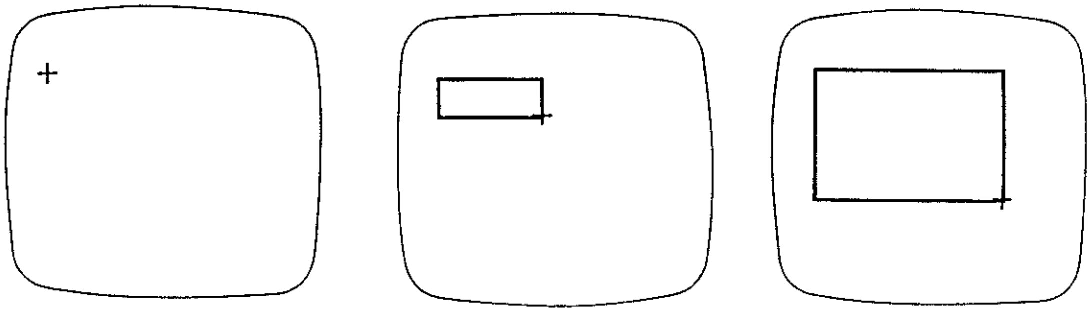
Press Button to Start

Arc Stretches Out From Start Position as Cursor Moves

Pressing Stop Button Ends Process

Rubber-band Methods, continued

- used to scale objects

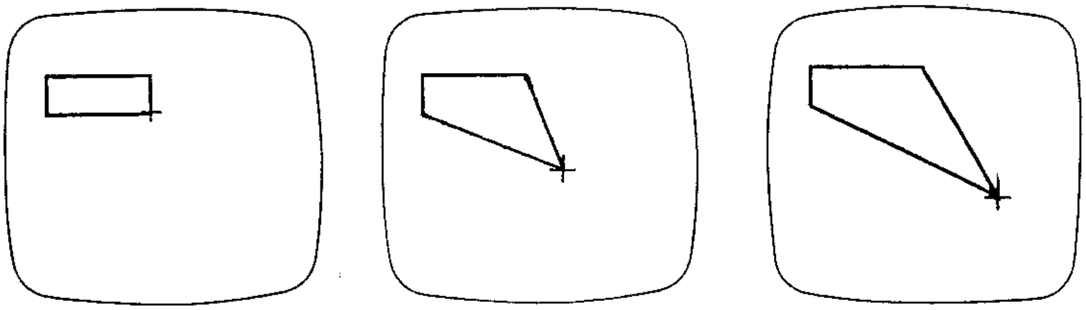


Press Button
To Start

Rectangle
Stretches Out
As Cursor Moves

Press Button
To Stop

- used to distort objects by allowing only the line segments attached to a single vertex to change



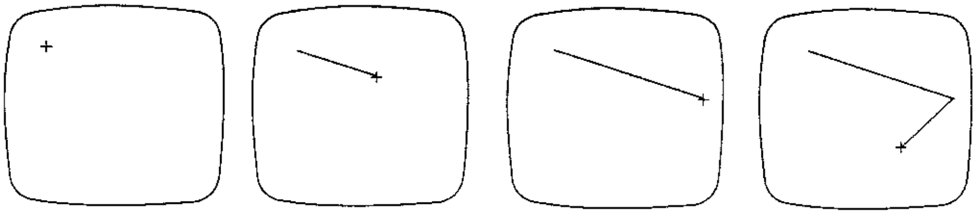
Press Button
To Start

Polygon
Stretches Out
As Cursor Moves

Press Button
To Stop

Sketching

- uses rubber-band methods to create objects consisting of connected line segments



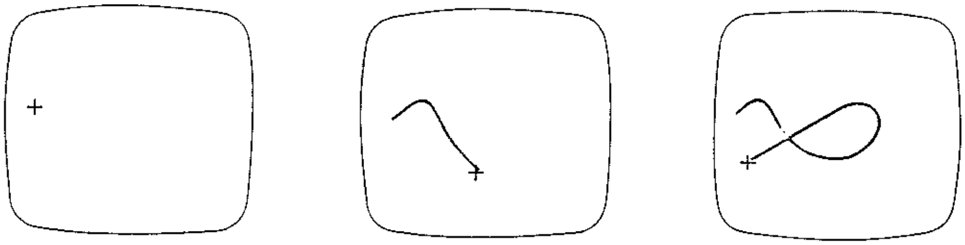
Press Button To Start

A Rubber-Band Line Stretches Out As Cursor Moves

Press Second Button To Indicate Line Endpoint

A Second Line is Now Displayed As Cursor Moves Again

- uses stroke techniques to create curved figures



Press Button to Start

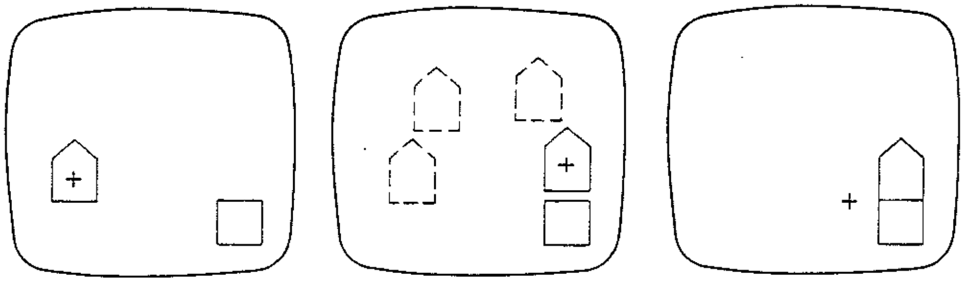
Line is Drawn, Following the Cursor Movement

Press Stop Button to End

- a variety of brushes can be provided
  - different thicknesses
  - different textures
  - different colors (including background)
  - even patterns

Dragging

- used to reposition objects
  - select an object from the menu
  - position the object
  - release the object



Press Button to Begin Displaying Selected Object at Cursor Position

Object Displayed at New Positions, Following Cursor Movement

Press Stop Button to End Dragging Operation when Object Correctly Positioned

Input Modes

- the mode specifies how the program and the input devices interact
  - request mode
    - input initiated by the program
  - sample mode
    - program and devices operate simultaneously
  - event mode
    - input initiated by the device
- set_device_mode (ws, device_code, input_mode)

request mode

- the program requests input and suspends processing until input is received
- examples
  request_locator (ws, device_code, x, y)
  request_stroke (ws, device_code, n, xa, ya)
  request_string (ws, device_code, nc, text)
  request_pick (ws, device_code, segment_id)

sample mode

- the program and input devices operate simultaneously. The program samples the devices as it requires data
- example
  sample_locator (ws, device_code, x, y)

event mode

- the input devices initiate input to the program
- input data is accumulated in an event queue
- data in the queue are identified according to
  - logical class
  - workstation number
  - physical device code
- the program can be directed to check the event queue
  - await_event (time, device_class, ws, device_code)
    - time sets maximum waiting time

event mode, continued

- example

```
set_stroke_mode (1, 2, event)
(* set tablet to stroke device, event mode *)
repeat
    await_event (3600, device_class, ws, device_code)
until device_class = stroke;
get stroke (n, x, y);
polyline (n, x, y);
```

- also useful
  - clear entire event queue
  - clear event queue for a specified workstation
  - clear event queue for a specified device

Concurrent Use of Input Modes - example

- drag an object around the screen with the light pen
- press a button to deposit the object

```
{drag object in response to light pen input}
{button is used to terminate processing}

begin
    set_locator_mode (1, 3, sample);     {set pen to locator device, sample mode}
    set_choice_mode (1, 7, event);       {set button to choice device, event mode}

repeat
    sample_locator (1, 3, x, y);         {read from pen}

      {translate object to x, y and draw}

    await_event (0, class, ws, code)     {check event queue for input}
  until class = choice                   {stop if button has been used}
end;
```

INTERACTIVE INPUT TECHNIQUES

- Basic Positioning Methods
- Constraints
- Grids
- Gravity Fields
- Rubber-band Methods
- Sketching
- Dragging

INPUT FUNCTIONS

- Input Modes
  - request mode
  - sample mode
  - event mode
- Concurrent Use of Input Modes