

INPUT AND INTERACTION

3.1 Interaction

Project Sketchpad :

Ivan Sutherland (MIT 1963) established the basic interactive paradigm that characterizes interactive computer graphics:

- User sees an *object* on the display
- User points to (*picks*) the object with an input device (light pen, mouse, trackball)
- Object changes (moves, rotates, morphs)
- Repeat

3.2 Input devices

- Devices can be described either by
 - Physical properties
 - Mouse
 - Keyboard
 - Trackball
 - Logical Properties
 - What is returned to program via API
 - **A position**
 - **An object identifier**
- Modes
 - How and when input is obtained
 - Request or event

Incremental (Relative) Devices

- Devices such as the data tablet return a position directly to the operating system
- Devices such as the mouse, trackball, and joy stick return incremental inputs (or velocities) to the operating system
 - Must integrate these inputs to obtain an absolute position
 - Rotation of cylinders in mouse
 - Roll of trackball

- Difficult to obtain absolute position
- Can get variable sensitivity

Logical Devices

- Consider the C and C++ code
 - C++: `cin >> x;`
 - C: `scanf ("%d", &x);`
- What is the input device?
 - Can't tell from the code
 - Could be keyboard, file, output from another program
- The code provides *logical input*
 - A number (an `int`) is returned to the program regardless of the physical device

Graphical Logical Devices

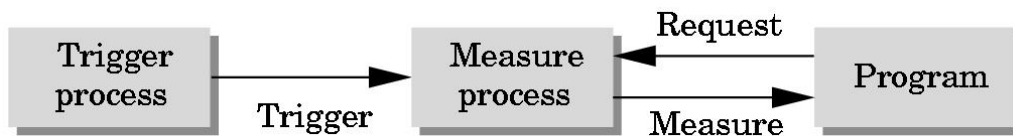
- Graphical input is more varied than input to standard programs which is usually numbers, characters, or bits
- Two older APIs (GKS, PHIGS) defined six types of logical input
 - **Locator**: return a position
 - **Pick**: return ID of an object
 - **Keyboard**: return strings of characters
 - **Stroke**: return array of positions
 - **Valuator**: return floating point number
 - **Choice**: return one of n items

Input Modes

- Input devices contain a *trigger* which can be used to send a signal to the operating system
 - Button on mouse
 - Pressing or releasing a key
- When triggered, input devices return information (their *measure*) to the system
 - Mouse returns position information
 - Keyboard returns ASCII code

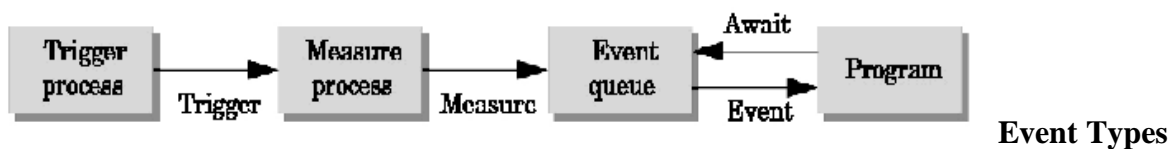
Request Mode

- Input provided to program only when user triggers the device
- Typical of keyboard input
 - Can erase (backspace), edit, correct until enter (return) key (the trigger) is depressed



Event Mode

- Most systems have more than one input device, each of which can be triggered at an arbitrary time by a user
- Each trigger generates an *event* whose measure is put in an *event queue* which can be examined by the user program



- Window: resize, expose, iconify
- Mouse: click one or more buttons
- Motion: move mouse
- Keyboard: press or release a key
- Idle: nonevent
 - Define what should be done if no other event is in queue

Source : <http://elearningatria.files.wordpress.com/2013/10/cse-vi-computer-graphics-and-visualization-10cs65-notes.pdf>