User Interaction: Intro to Multi-Touch

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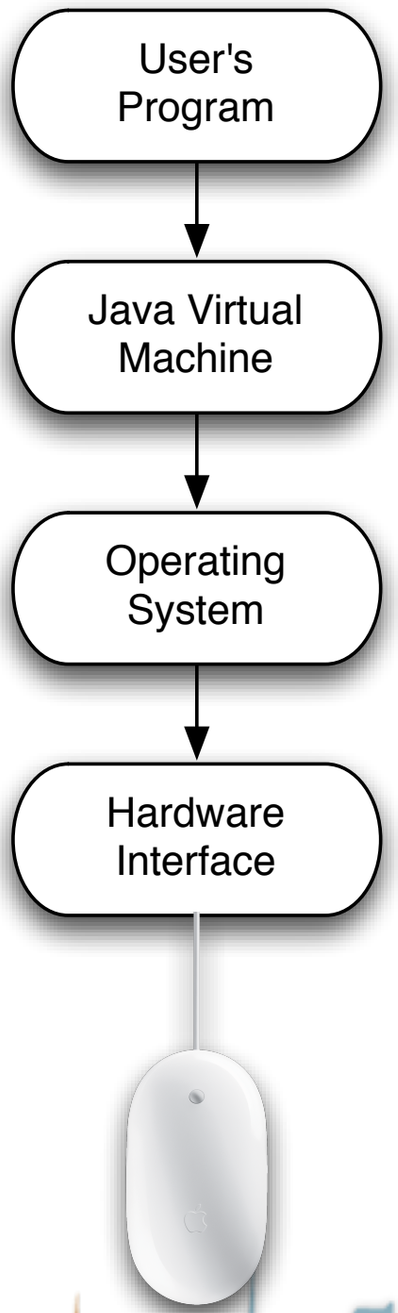
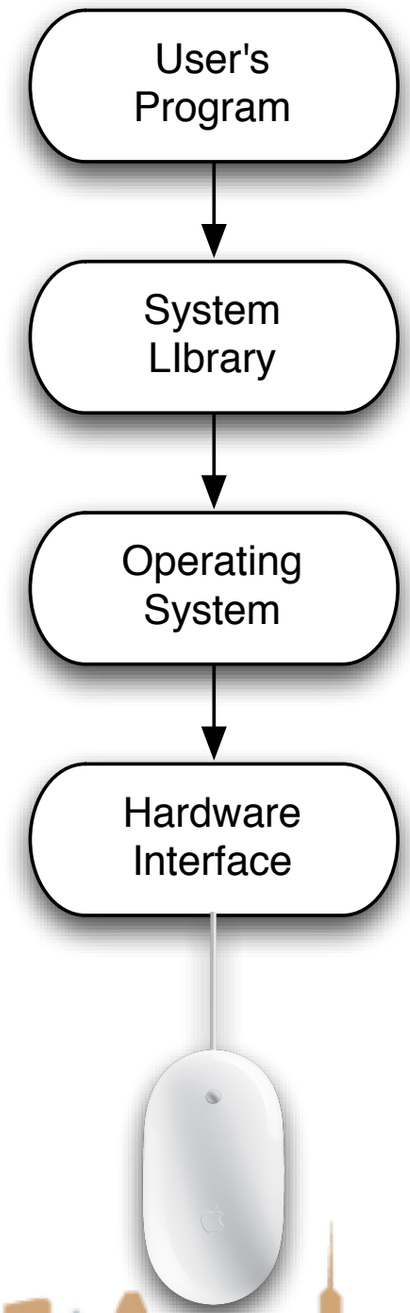
INF 133 Fall 2013

Traditional Mouse Input



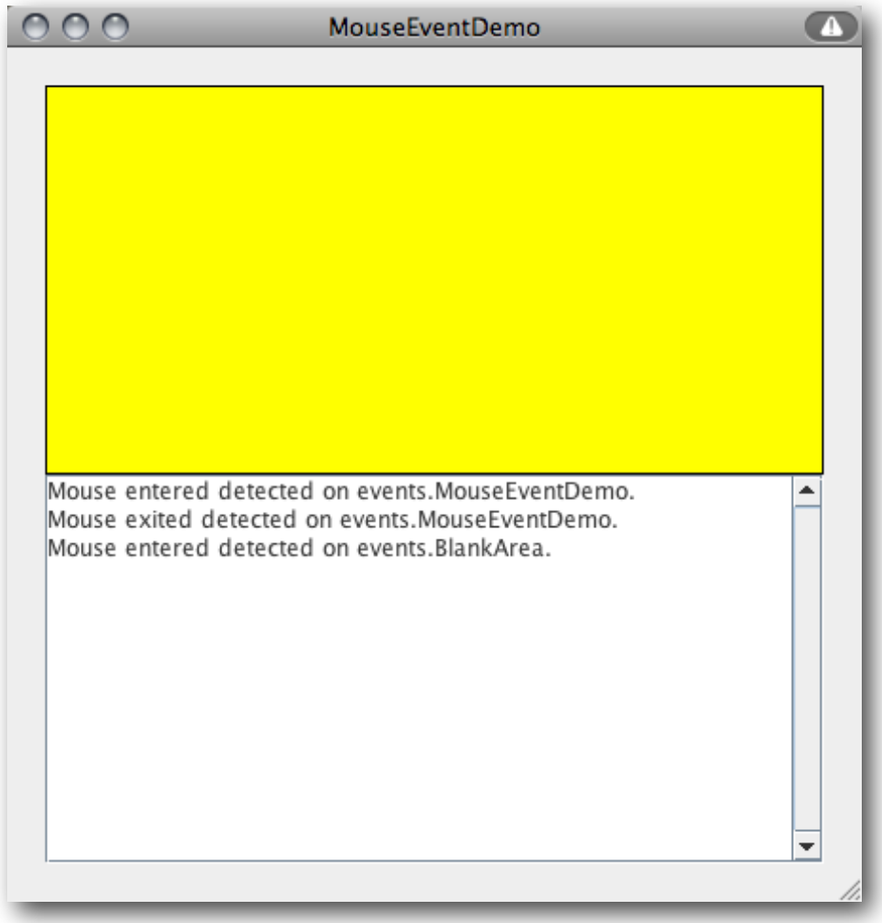


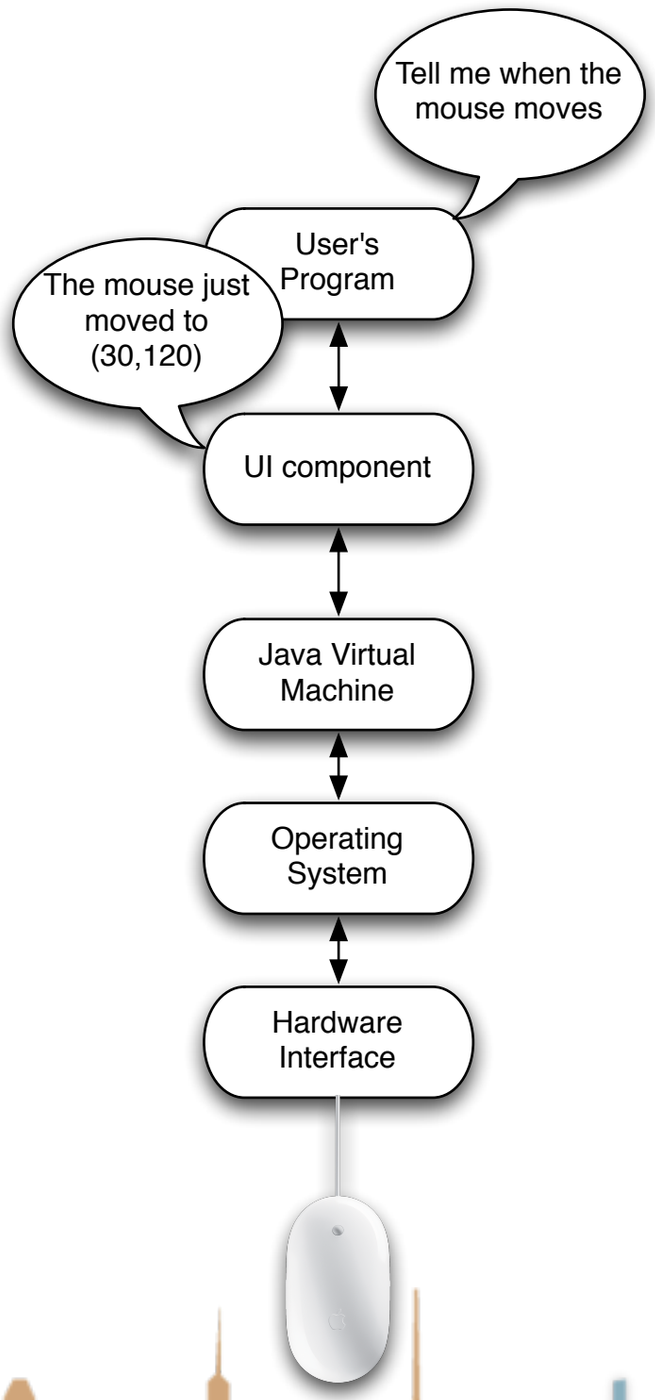
Java uses a "MouseListener" model

- The user asks the virtual machine to tell it when mouse events occur
  - Mouse movements
  - Mouse button press, release, click
    - button 1,2,3
  - Mouse wheel movements

Traditional Mouse Input

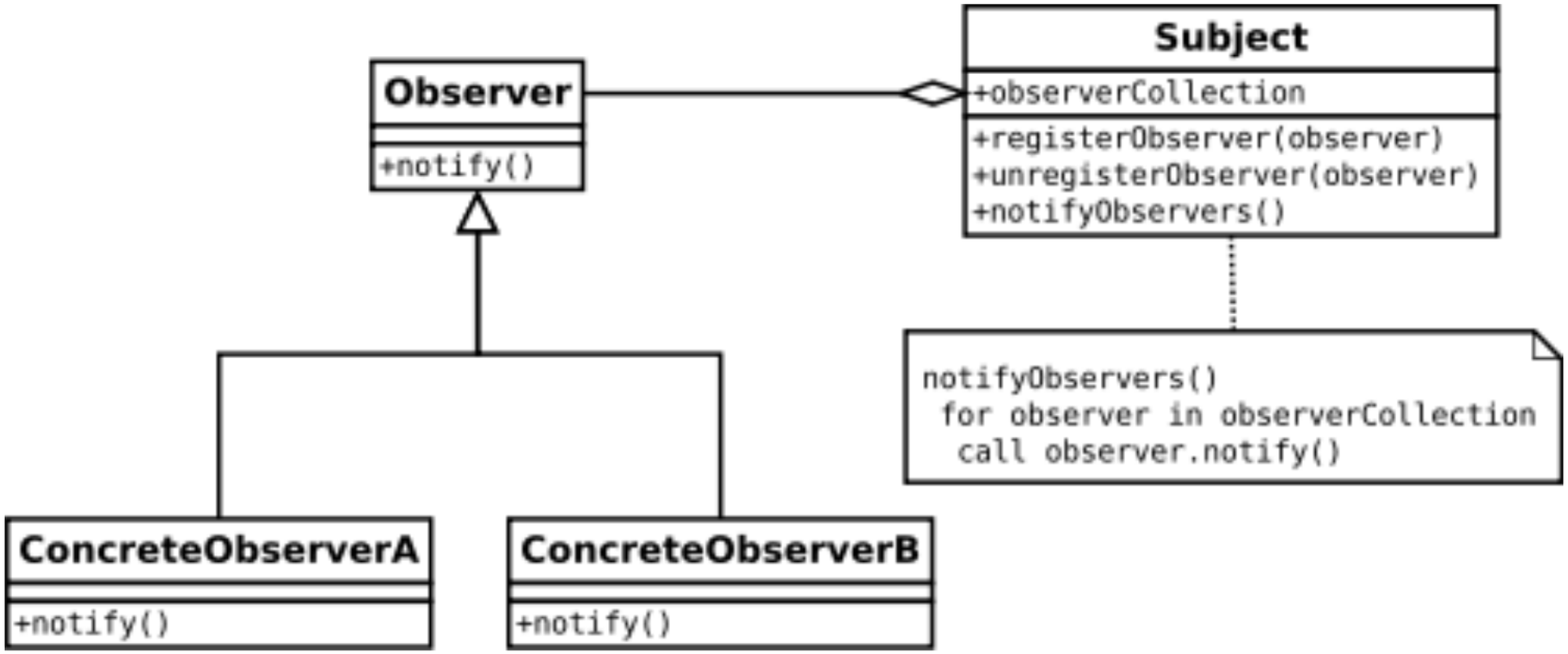
Java uses a "MouseListener"





- "Observer" design pattern
- Example:
  - http://java.sun.com/docs/books/tutorialJWS/uiswing/events/ex6/MouseEventDemo.jnlp

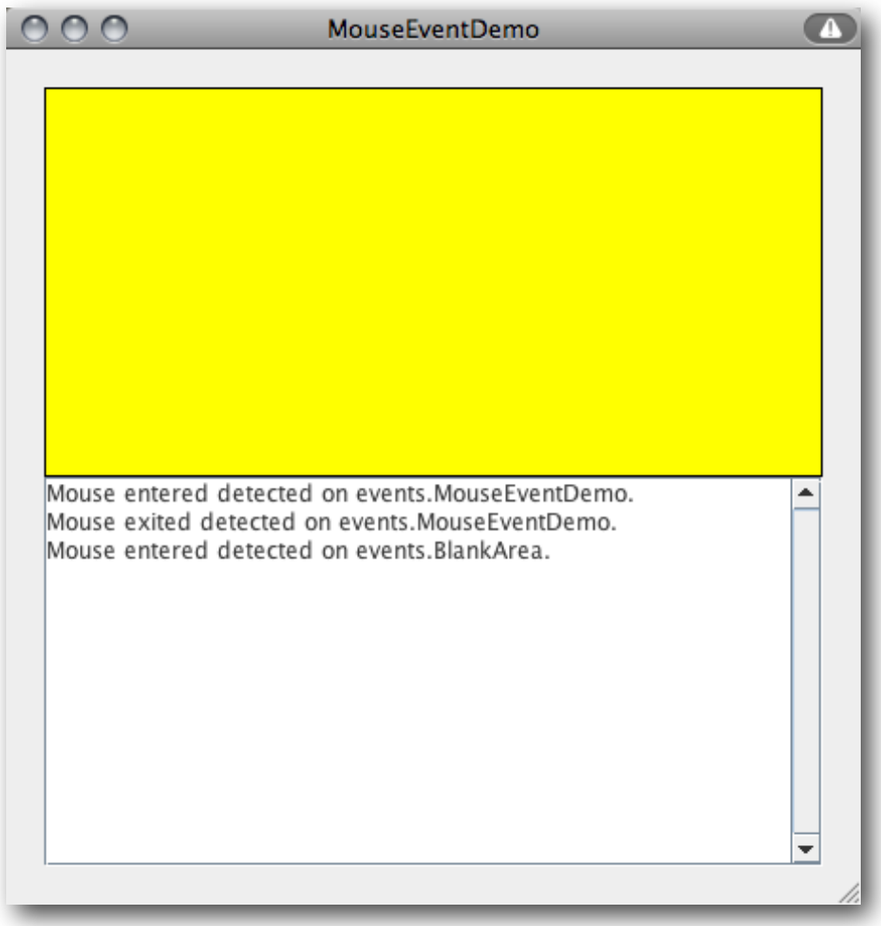
Observer Design Pattern



- The “Observer” gets callbacks from the “Subject”
- Same pattern we saw in AJAX
- Common pattern in event-driven User Interface software
- “MouseListener” maps to the “Observer”

http://en.wikipedia.org/wiki/Observer_pattern

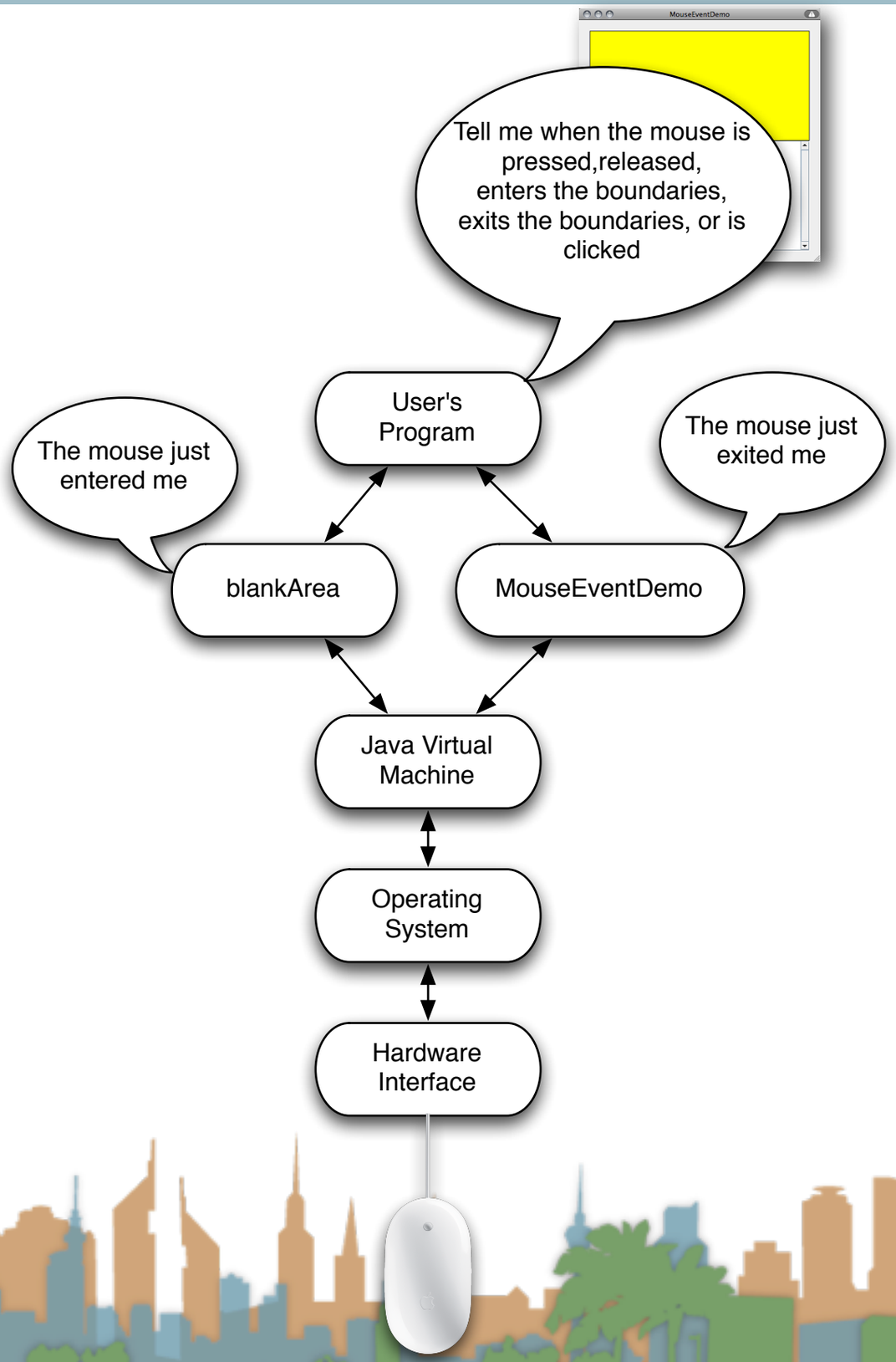
Traditional Mouse Input




```
public class MouseEventDemo ... implements MouseListener {
        //where initialization occurs:
        //Register for mouse events on blankArea and the panel.
        blankArea.addMouseListener(this);
        addMouseListener(this);
    ...

    public void mousePressed(MouseEvent e) {
       saySomething("Mouse pressed; # of clicks: "
                    + e.getClickCount(), e);
    }

    public void mouseReleased(MouseEvent e) {
       saySomething("Mouse released; # of clicks: "
                    + e.getClickCount(), e);
    }

    public void mouseEntered(MouseEvent e) {
       saySomething("Mouse entered", e);
    }

    public void mouseExited(MouseEvent e) {
       saySomething("Mouse exited", e);
    }

    public void mouseClicked(MouseEvent e) {
       saySomething("Mouse clicked (# of clicks: "
                    + e.getClickCount() + ")", e);
    }

    void saySomething(String eventDescription, MouseEvent e) {
        textArea.append(eventDescription + " detected on "
                        + e.getComponent().getClass().getName()
                        + "." + newline);
    }
}
```

http://java.sun.com/docs/books/tutorial/uiswing/events/mouselistener.html

Traditional Mouse Input

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Mouse Event

- When your program is told that something happened, you get extra info with the event
  - Single or double click?
  - (X,Y) of event
    - global and local coordinates
- which button was pushed (1,2,3)
- Modifier keys
  - “Shift” click

Mouse Event (cont)

- When your program is told that something happened, you get extra info with the event
  - Which UI component is reporting
    - “blankArea”
  - timestamp
  - and a few more things

Traditional Mouse Input

Class MouseEvent

java.lang.Object
  java.util.EventObject
    java.awt.AWTEvent
      java.awt.event.ComponentEvent
        java.awt.event.InputEvent
          java.awt.event.MouseEvent

Method Summary

Methods

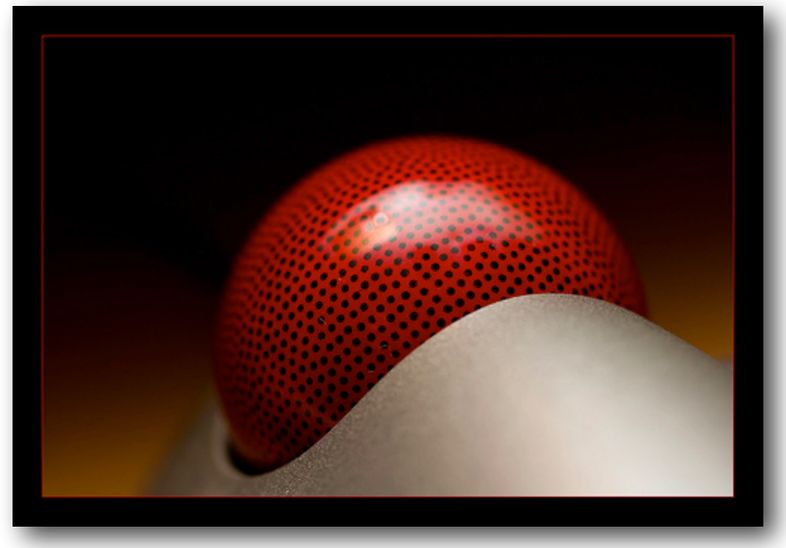
Modifier and Type	Method and Description
`int`	**`getButton()`** Returns which, if any, of the mouse buttons has changed state.
`int`	**`getClickCount()`** Returns the number of mouse clicks associated with this event.
`Point`	**`getLocationOnScreen()`** Returns the absolute x, y position of the event.
`int`	**`getModifiersEx()`** Returns the extended modifier mask for this event.
`static String`	**`getMouseModifiersText(int modifiers)`** Returns a `String` instance describing the modifier keys and mouse buttons that were down during the event, such as "Shift", or "Ctrl+Shift".
`Point`	**`getPoint()`** Returns the x,y position of the event relative to the source component.
`int`	**`getX()`** Returns the horizontal x position of the event relative to the source component.
`int`	**`getXOnScreen()`** Returns the absolute horizontal x position of the event.
`int`	**`getY()`** Returns the vertical y position of the event relative to the source component.
`int`	**`getYOnScreen()`** Returns the absolute vertical y position of the event.
`boolean`	**`isPopupTrigger()`** Returns whether or not this mouse event is the popup menu trigger event for the platform.
`String`	**`paramString()`** Returns a parameter string identifying this event.
`void`	**`translatePoint(int x, int y)`** Translates the event's coordinates to a new position by adding specified `x` (horizontal) and `y` (vertical) offsets.

http://docs.oracle.com/javase/7/docs/api/java/awt/event/MouseEvent.html

Traditional Mouse Input

Different types of input devices

- What about trackpads?
- What about tablets?
- What about rollerballs?

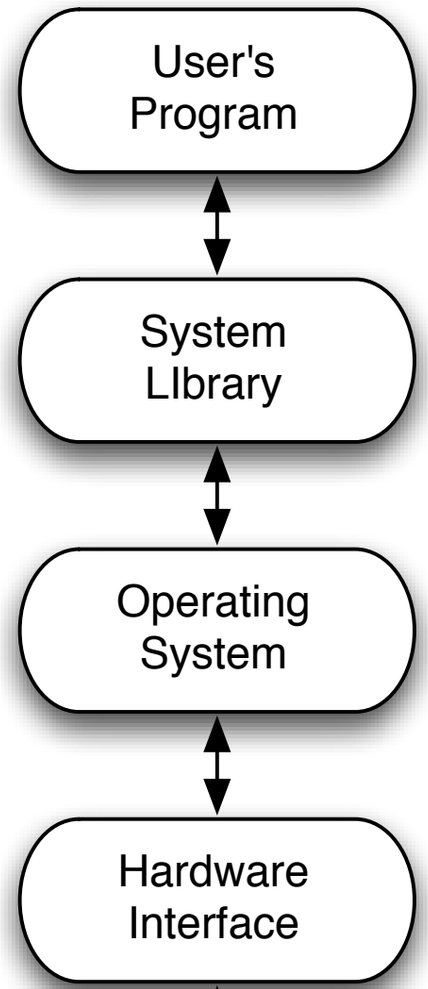


flickr: goodrob12, viagallery.com, somewhereinAK

Traditional Mouse Input

Different types of input devices

- As long as the OS can translate the hardware interaction into the same events then programs are compatible.
- A stylus on a tablet can “click”
- A rollerball “enters” and “exits”
- A finger on a trackpad has an (X,Y)



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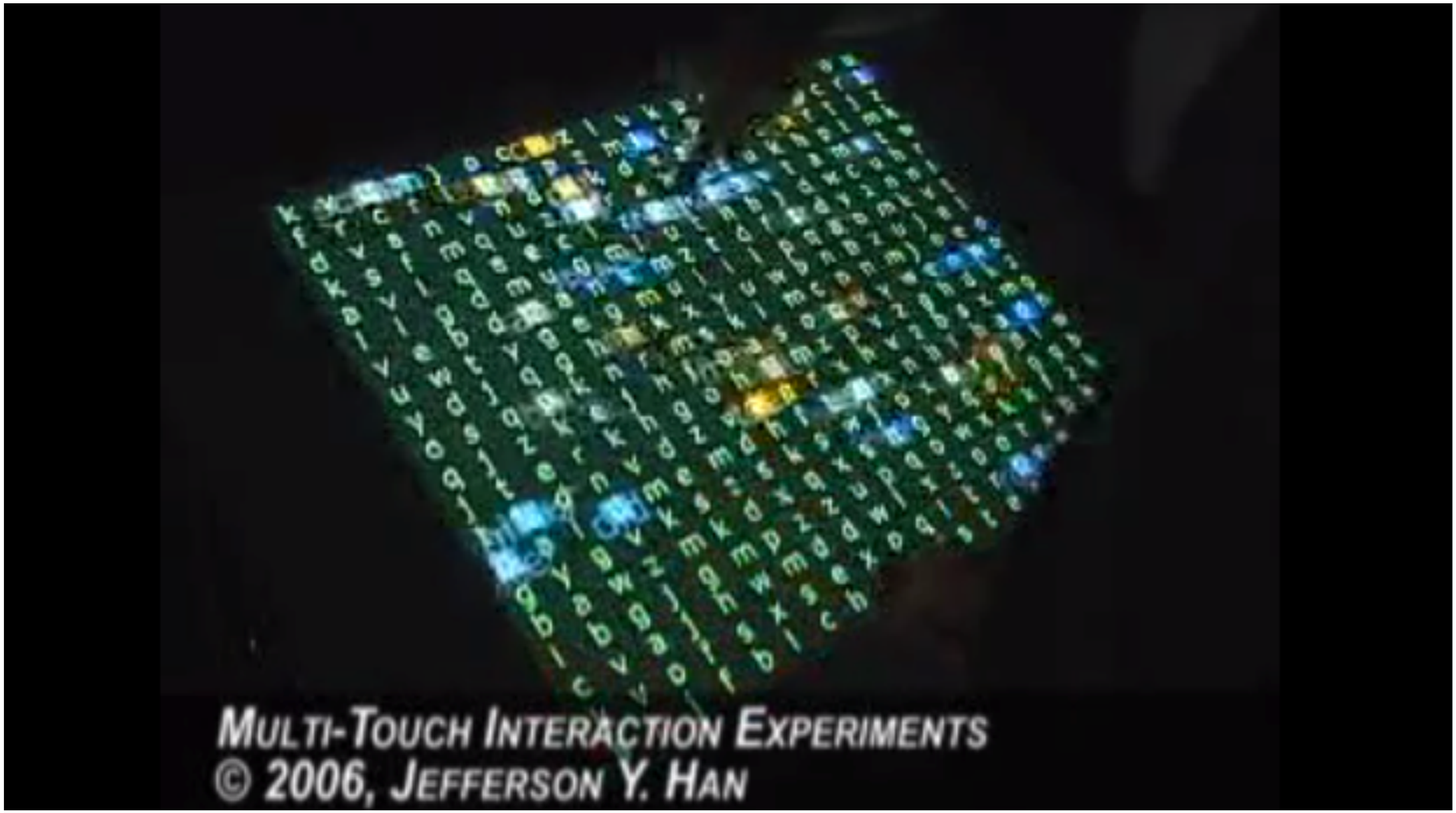
Multi-touch is different



http://www.youtube.com/watch?v=EiS-W9aeG0s

Multi-touch is different

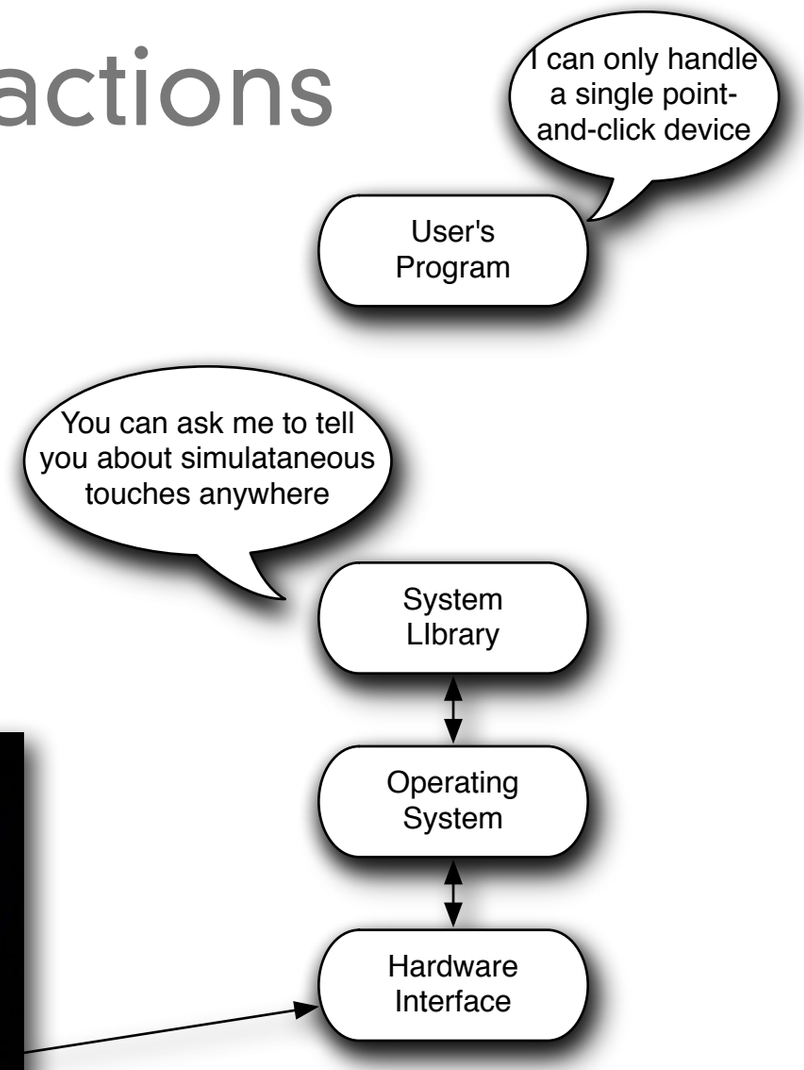
http://www.youtube.com/embed/Cog8b8ojji0?rel=0

:)

http://www.youtube.com/embed/CZrr7AZ9nCY?rel=0

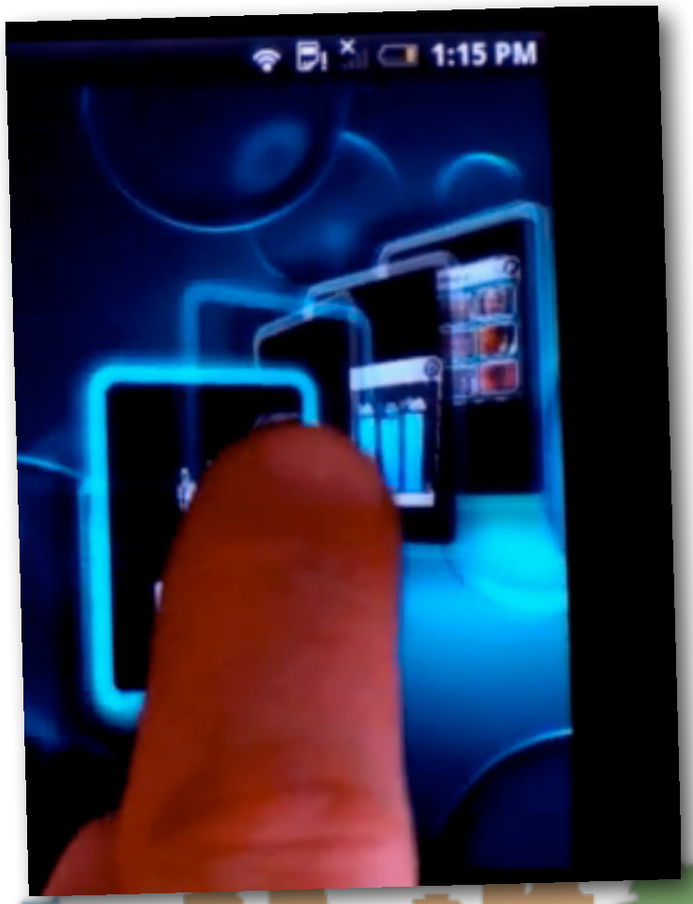
Multi-touch creates new interactions

- This breaks old programs
- unless the OS makes the multi-touch look like a mouse to the program



Multi-touch creates new interactions

- Watch Android 3D widget video
- What is different from working with a mouse?

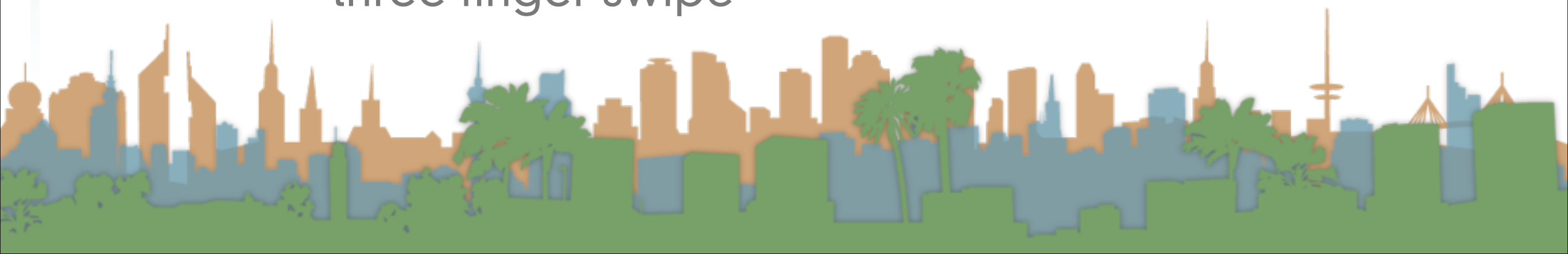


Multi-touch creates new interactions

- pointer is gone
  - all interaction is active
- hover is gone
- you can’t see what you are clicking
- “clicking” isn’t [as] natural
- “swiping” is natural

Multi-touch creates new interactions

- Software has to be (re)written to be
  - “multi-touch” aware
- The OS can give some support
  - exposing new events like
    - “pinch” (tell me when a pinch occurs)
    - “rotate” (tell me when a rotate occurs)
    - “two finger swipe”
    - “three finger swipe”



Multi-touch creates new interactions

- But multi-touch is really computer vision

Where is the mouse clicking?

What abstractions will the OS expose?

Multi-touch creates new interactions

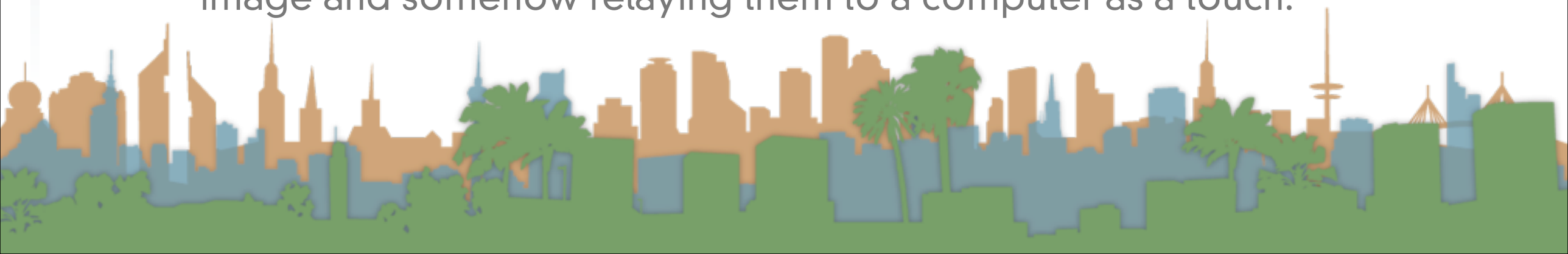
- Watch 10/GUI video
  - http://10gui.com/video/

Multi-touch terminology

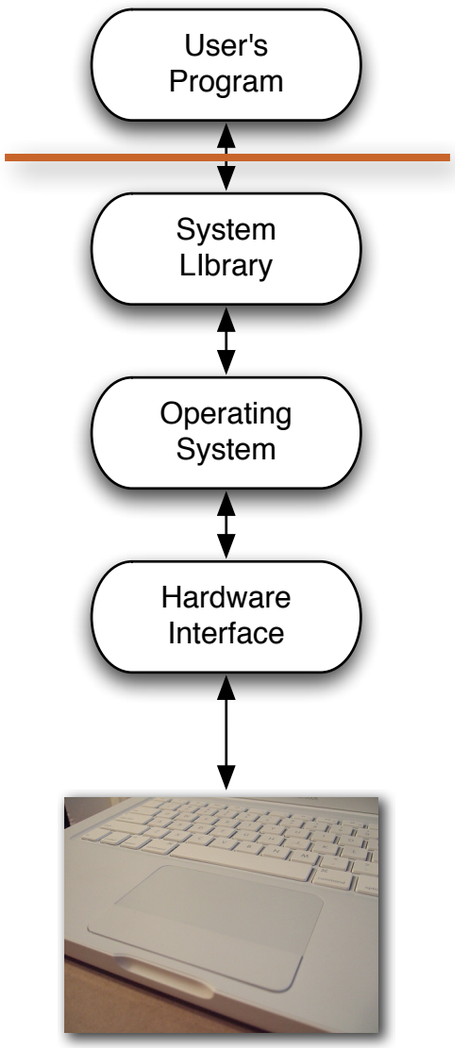
- **Multi-touch** – An interactive technique that allows single or multiple users to control graphical displays with more than one simultaneous finger.
- **Multi-point** – An interactive technique that makes use of points of contact rather than movement. A multi-point kiosk with buttons would be an example.
- **Multi-user** – A multi-touch device that accepts more than one user. Larger multi-touch devices are said to be inherently multi-user.
- **Multi-modal** – A form of interaction using multiple modes of interfacing with a system.

Multi-touch terminology

- Tabletop Computing – Interactive computer displays that take place in the form of tabletops.
- Direct Manipulation – The ability to use the body itself (hands, fingers, etc) to directly manage digital workspaces.
- Blob tracking - Assigning each blob an ID (identifier). Each frame we try to determine which blob is which by comparing each with the previous frame.
- Blob detection - Process of picking out bright areas of a camera image and somehow relaying them to a computer as a touch.

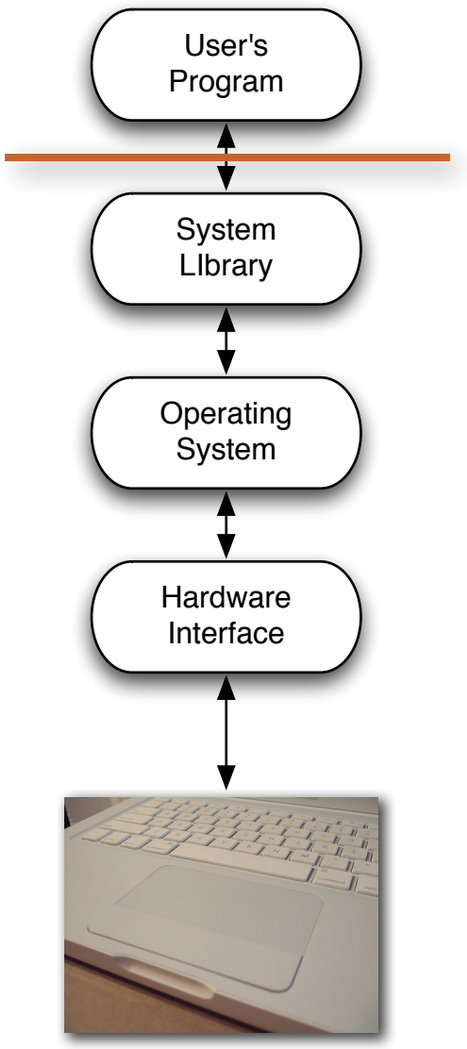


Multi-Touch Approach #1 - rebuild the Observer Pattern



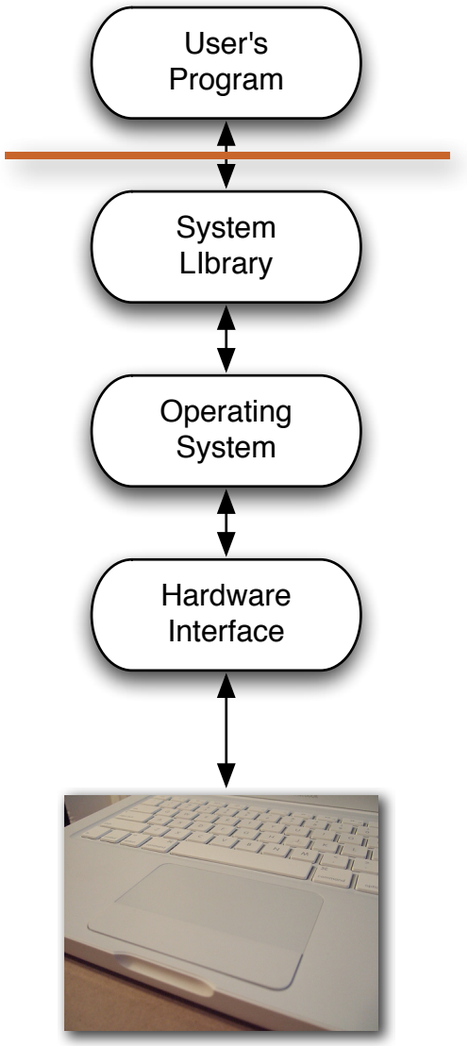
- Design specific multi-touch/gesture events that you can register for:
  - Pinching movements (in or out)
    - meaning zoom out or zoom in
  - Rotate: Two fingers moving in opposite semicircles is a gesture meaning rotate.
  - Swipe: Three fingers brushing across the trackpad surface in a common direction.
  - Scroll: Two fingers moving vertically or horizontally is a scroll gesture.

Multi-Touch Approach #1 - rebuild the Observer Pattern

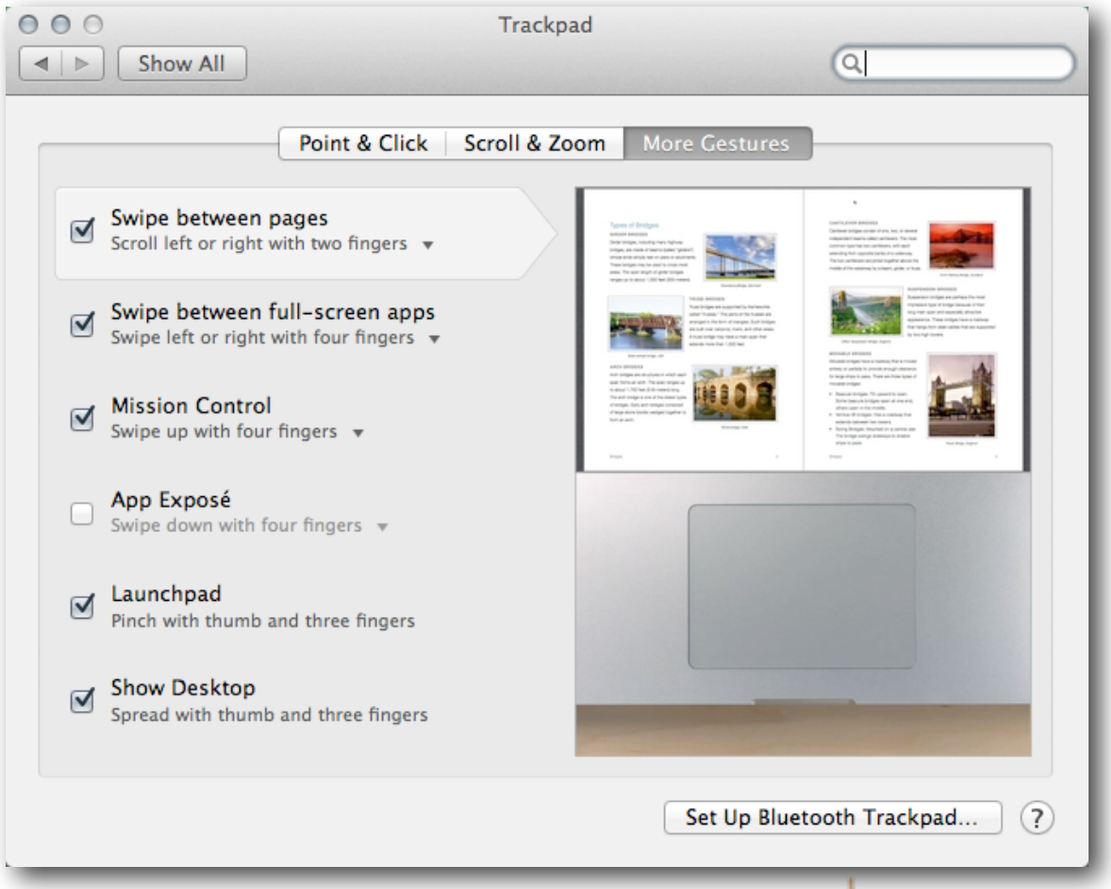


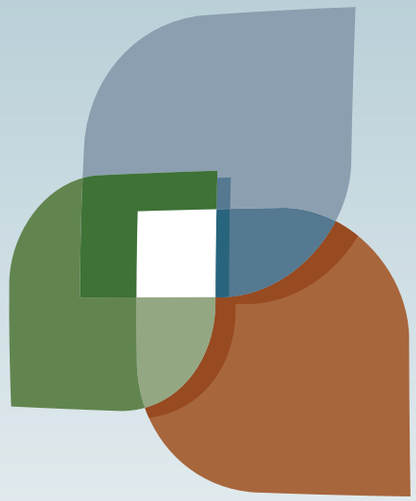
- Advantages:
  - Simple to code
  - Library/OS does all the work
- Disadvantages
  - No flexibility
  - Limited to supported events

Multi-Touch Approach #1 - rebuild the Observer Pattern



- Examples (demo):
  - Document browsing in Preview
    - Zoom
    - Scale
    - Swipe





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