

G54MDP

Mobile Device Programming

Touch

Coursework 2

- Coursework 1 (provisional) marks and feedback within 3 weeks
- Coursework 2 specification will be on Moodle by Friday
- Due 4pm Thursday 10th April
- Worth 30% of module mark
- Storage related

Facebook

- Design exercise
- Which...
 - Activities
 - Services
 - ContentProviders
 - BroadcastReceivers?

Interfaces

- Android UI interaction metaphor
 - So far has been seen to be similar to PC
 - Different syntax, but similar concepts
 - Widgets, buttons, scrolling
 - onClick events
- Significant difference between mobiles and PC
 - What?



Finder

Pointers

- Pointers provide accurate interaction
 - At a distance
 - Single-pixel accuracy
- Easy to see what you are clicking
- Single position
 - Position always known, even while not interacting
- C.f. HCI / Fitt's law

Touch Input

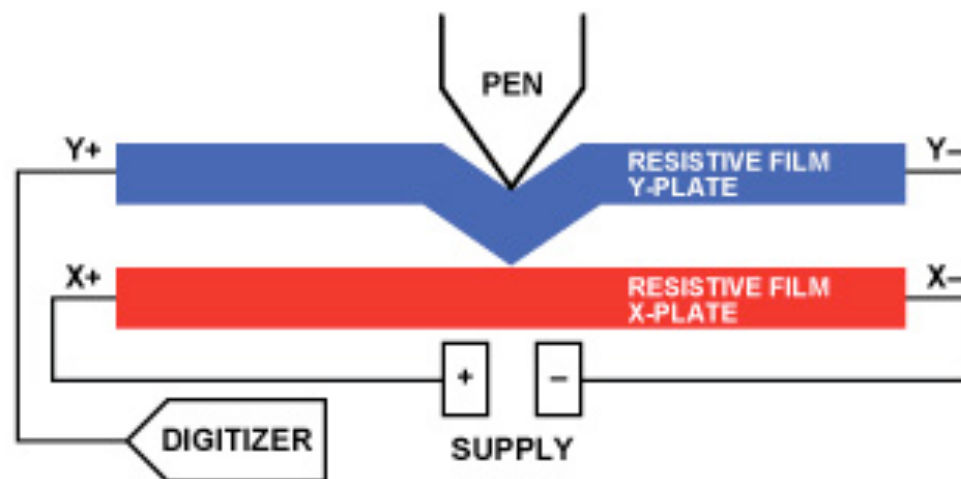
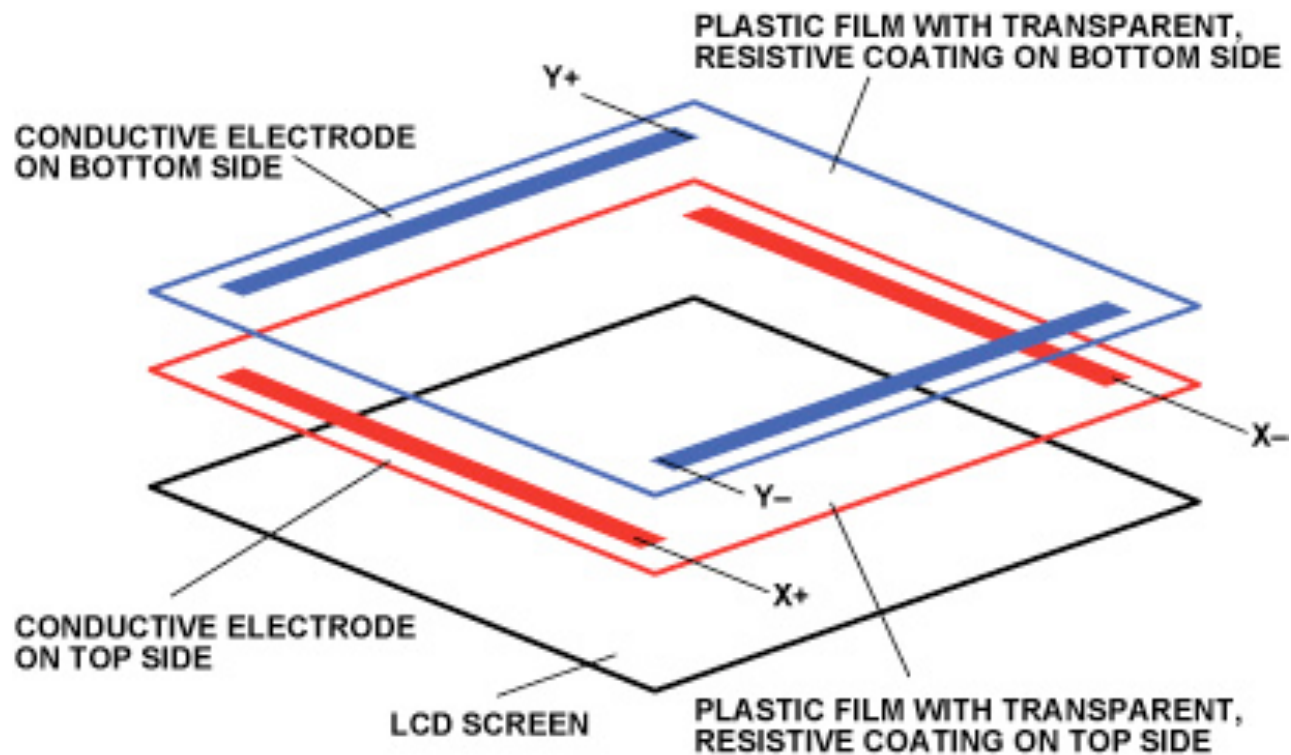
- Direct Contact
 - Not mediated via a mouse
- Inaccurate
 - Only the general area of touch known
 - My finger is larger than a pixel
- Interaction obscures the display
 - I cannot see through my finger
- Location known only when user touches
- Multi-touch
 - Touching the screen with multiple fingers concurrently
 - Which finger?





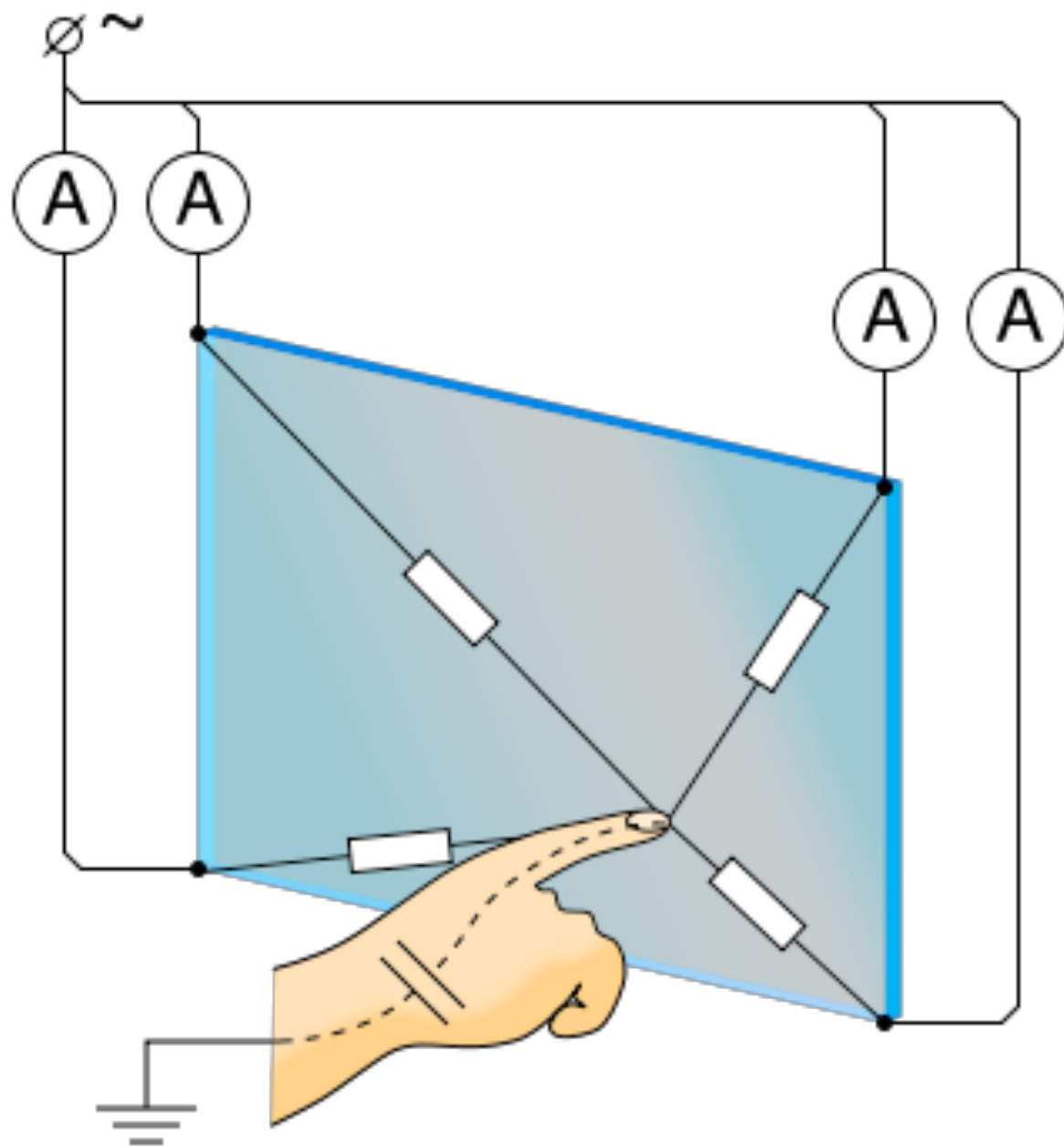
Touch Technologies

- (Optical / IR / Ultrasonic)
- Resistive
 - Cheap, but poor accuracy
 - Used with a stylus, finger
 - no special properties = “passive”
 - Two sheets of resistive material facing one another
 - Excite alternate axes with a voltage
 - Touch presses specific points together
 - Creates a connected circuit
 - Change in voltage allows determination of position along an axis



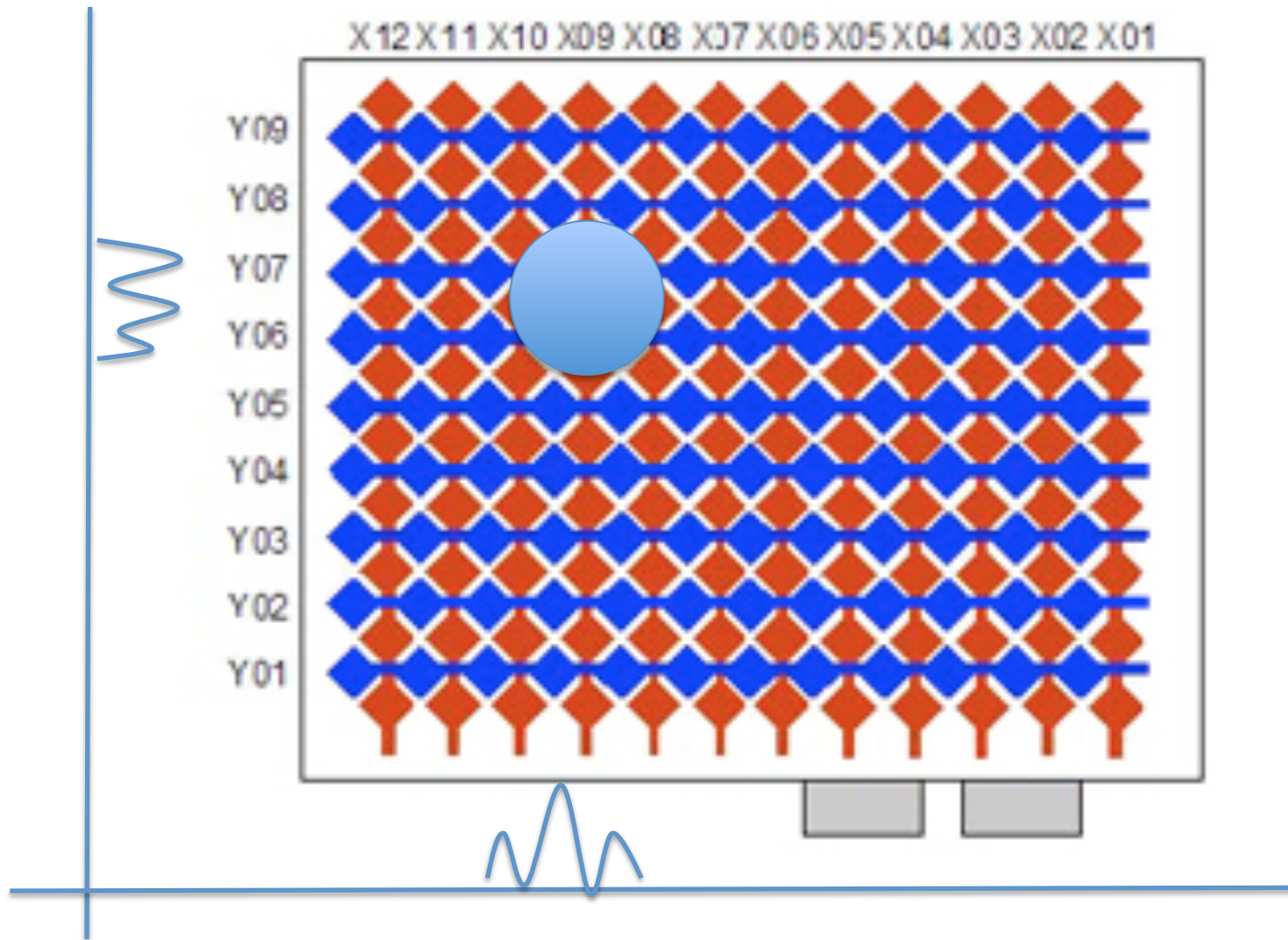
Touch Technologies

- Capacitive
 - Screen is covered in a capacitive material
 - Indium-tin-oxide
 - Rare, heavy metal
 - Conductive, optically transparent
 - Capacitance = ability to store electric charge
 - Relies on “body capacitance”
 - Human beings act as small capacitors
 - Touching the screen modifies it’s electrostatic field
- Surface capacitance
 - Cover the screen with a uniform conductive material
 - Apply a small voltage to generate an electrostatic field
 - Measure effective capacitance at each corner of the screen
 - When the screen is touched, the capacitance changes
 - The larger the change, the closer to the corner the touch is
 - Combine measurements from all corners = location of the touch

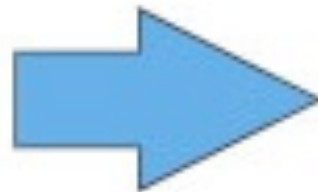


Touch Technologies

- Projected / Mutual capacitance
 - Material is etched with rows / columns
 - Measure capacitance at each point – more accurate / multi-touch
 - How wide is a finger / what resolution of touch should we have?
 - Original iPhone $10 \times 15 = 150$ “points”
 - 5mm x 5mm diamond grid
- All capacitive sensing requires an “active” touch
 - Non-conductive materials will not change the electrostatic field
 - Fingers / capacitive glove / capacitive stylus



1	5	10	5
5	15	25	10
2	12	15	5
0	2	5	1



Weighted Finger Position

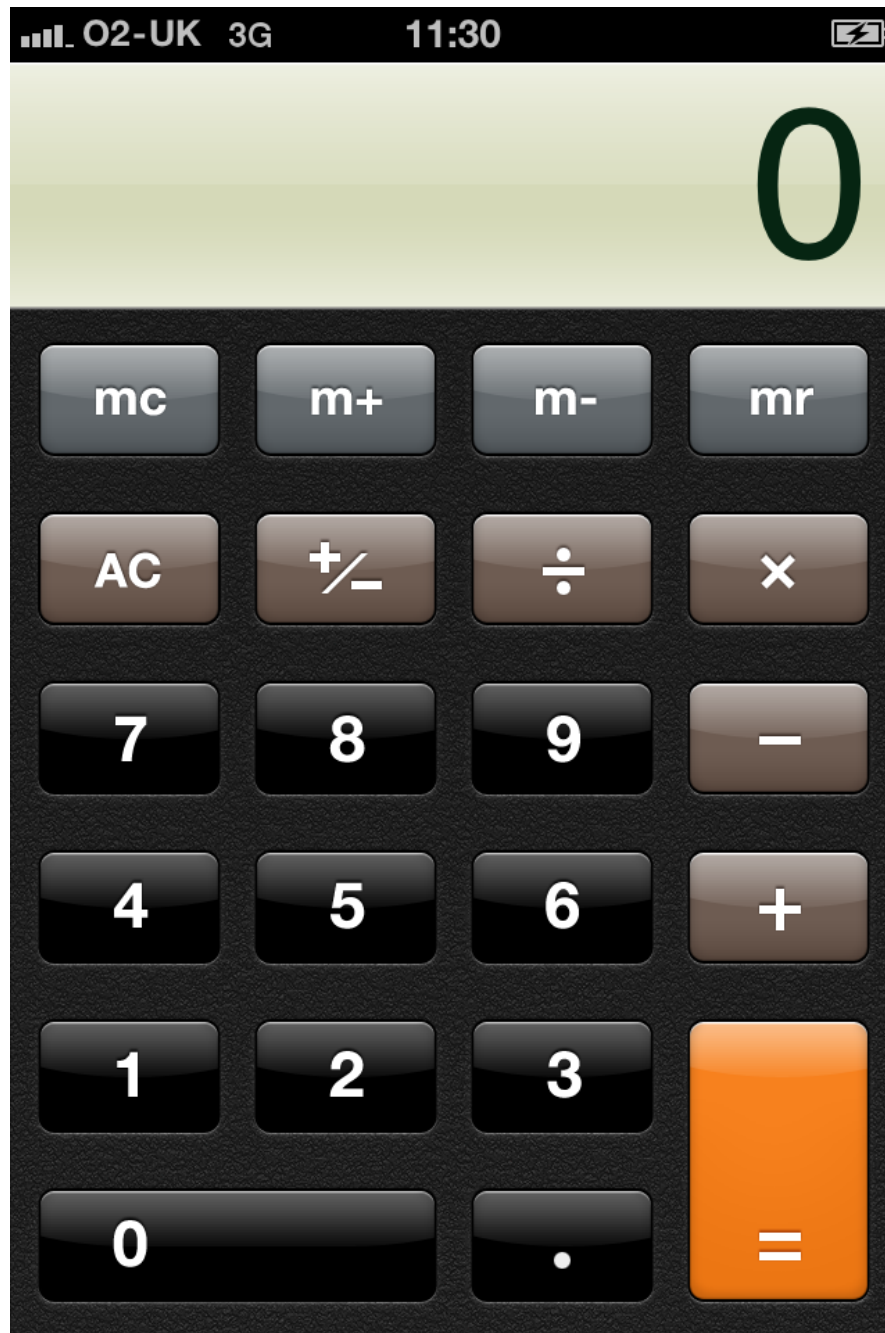
1	5	10	5
5	15	25	10
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0	2	5	1

Touch and the UI

- Touch relies on finger contact with the display
 - This has to alter the way we design our displays
- Size of the finger sets the properties of the UI, not the size of a display
 - 5” vs 1200 pixels
 - The size of ‘buttons’ must be big enough that the user can touch them
 - Ditto the spacing between them
 - If they get too small, or too close together then it will be hard for the user to accurately use them
- Size is fixed relative to display

What size?

- Depends on size of finger relative to display
- Not number of pixels
- Apple recommend about 44x44 points for the iPhone (480x320 pixel screen)
- Equates to roughly the size of a finger

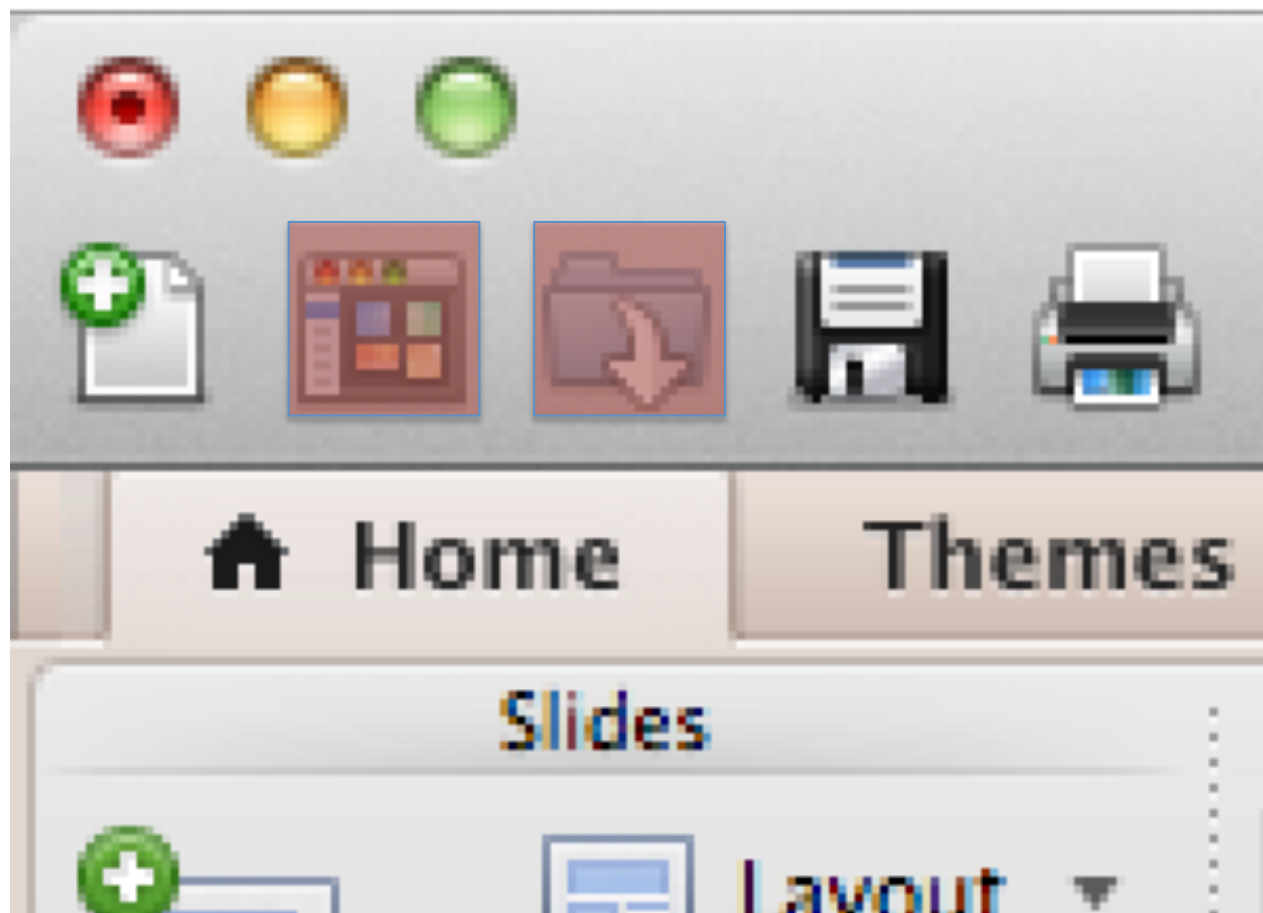


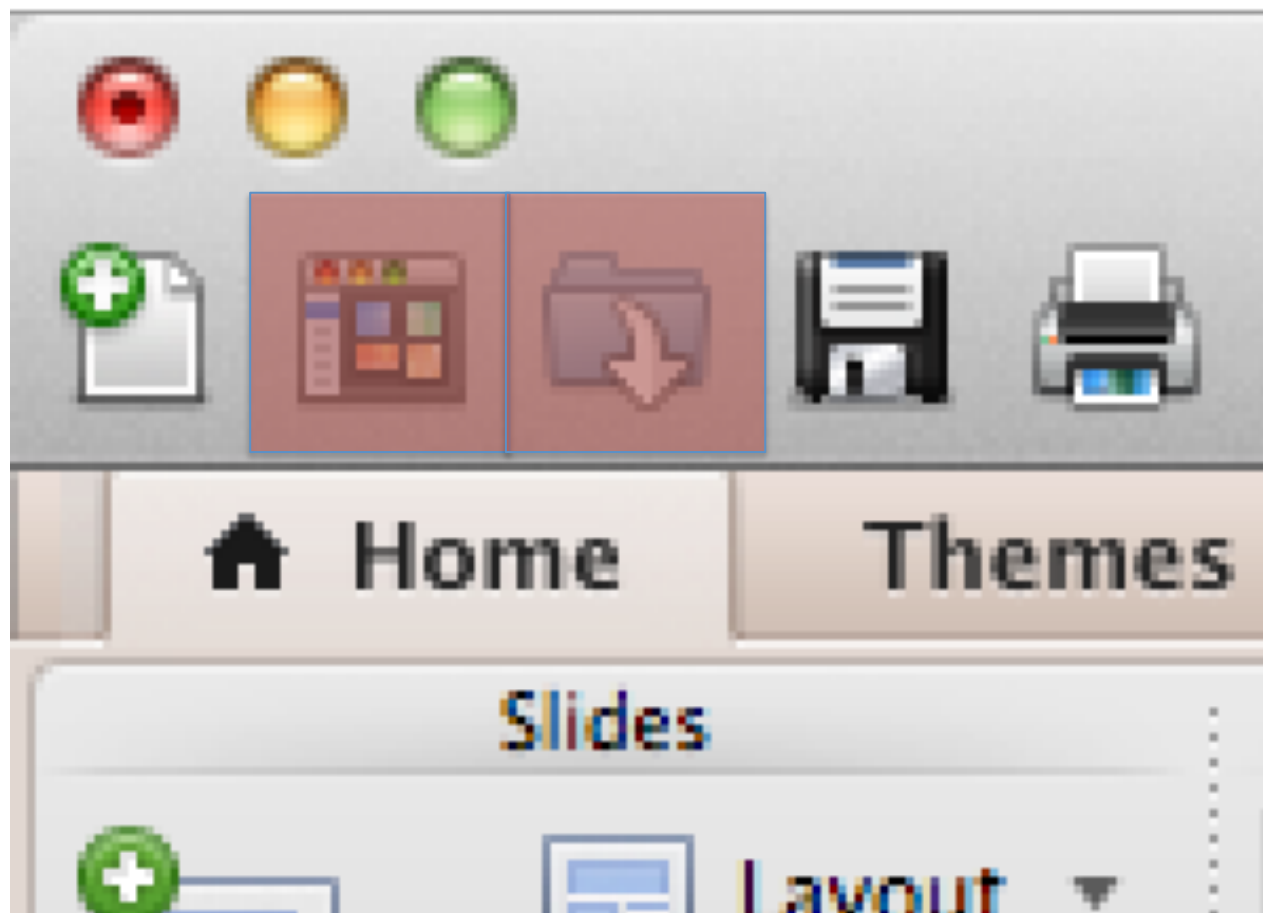
What size?

- Things are slightly more complicated on Android
- Display size, shape and resolution varies considerably from device to device
- A button that is the right size on one device would be too small/large on another
- Hence, the use of relative layouts
 - Not just about filling white-space

Hit-box size

- Has the user touched a widget or not
 - A touch has “hit” within a bounding box
- Think about the handles used to interact with a text frame in Word or something
- Need to be big enough that the user can accurately touch them
- Or rather the hit test area needs to be big enough
- Potentially decouple visual area from tested area





Device size

- On mobile devices, the UI is constrained by the ratio of the device size - finger size - resolution
 - Apple 44x44 pixels
 - Microsoft min 26 pixels, ideal 34
 - Nokia 1cmx1cm, 28x28 pixels
- A UI that works on a 10" display won't necessarily "work" on a 7"
 - Steve Jobs comments about "not having to sand your fingers"
- Is a 7" device a distinct enough class of device?

Natural finger position,
completely covers visible target



Using finger tip shows target,
but have to reposition hand

