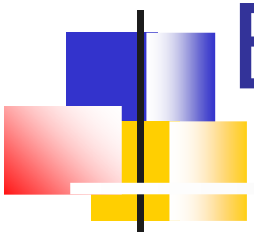


EECS 3461

Designing for Smartphones and Tablets

Based on slides by Dr. Maryam Davoudpour

WHAT ARE SMARTPHONES?

- A **smartphone** is a mobile phone that offers more advanced computing ability and connectivity than a traditional mobile phone.
- A **tablet** is almost the same as a smartphone, but with a bigger screen size and resolution. It is between a phone and a laptop.
- Revolutionary.

In one device:

- Portability
- Powerful computer
- Networking
- Sensors
- High quality displays

CHALLENGES OF DESIGNING INTERFACES FOR SMARTPHONES

- Physical differences
- Usage pattern differences
- Technical differences

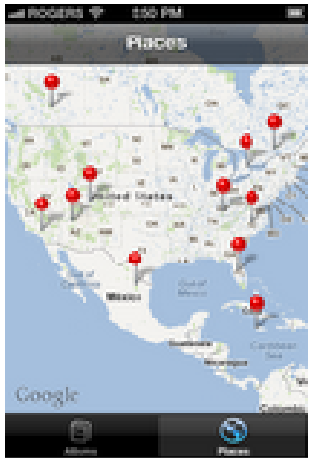
PHYSICAL DIFFERENCES

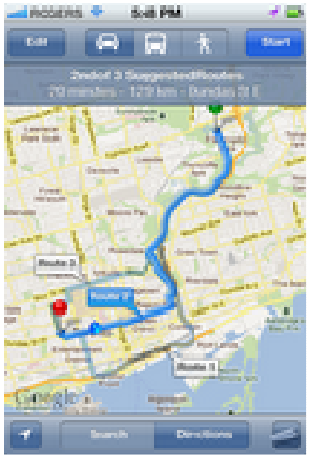
- Size, Mobility, Portability:
  - Can be carried everywhere and accessed any time

➢ Don't need to wait until you're at home/work to check email, play games, etc.

PHYSICAL DIFFERENCES

- Size, Mobility, Portability:
  - Because you can use them everywhere and because they have a GPS, there is a whole set of new location-based uses
  - Smartphones have access to the internet from nearly anywhere (wifi, cellular data)





PHYSICAL DIFFERENCES

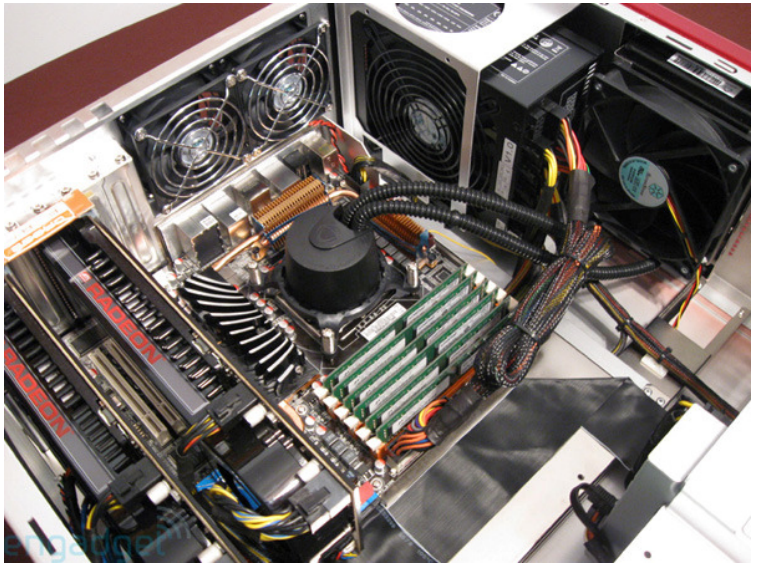
- Data Storage:
  - Regular PCs can store huge quantities of data; mobile devices usually have a smaller storage space.

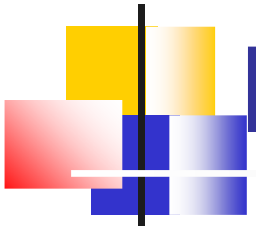
✓ Design considerations for Data Storage:

- For data-intensive applications, store data on servers instead of the phone and access it on demand (similar to how the web works).

PHYSICAL DIFFERENCES

- Memory and processor:
  - Smartphones have less memory, less powerful processors, and weaker graphics chips than regular PC desktops.





PHYSICAL DIFFERENCES

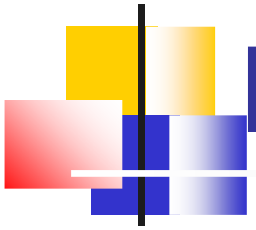
✓ Design considerations for Memory and Processor:

- Computationally intensive tasks should not be done on the phone itself, but may be moved to servers

- Apps need to be trimmed down to their core functionality

PHYSICAL DIFFERENCES

- Energy:
  - Smartphones have very small batteries, especially compared to laptops. They can supply much lower power to the processor.
  - Under low load, they last for a full day. Under intense operation they only last a few hours.



PHYSICAL DIFFERENCES

✓ Design considerations for energy saving:

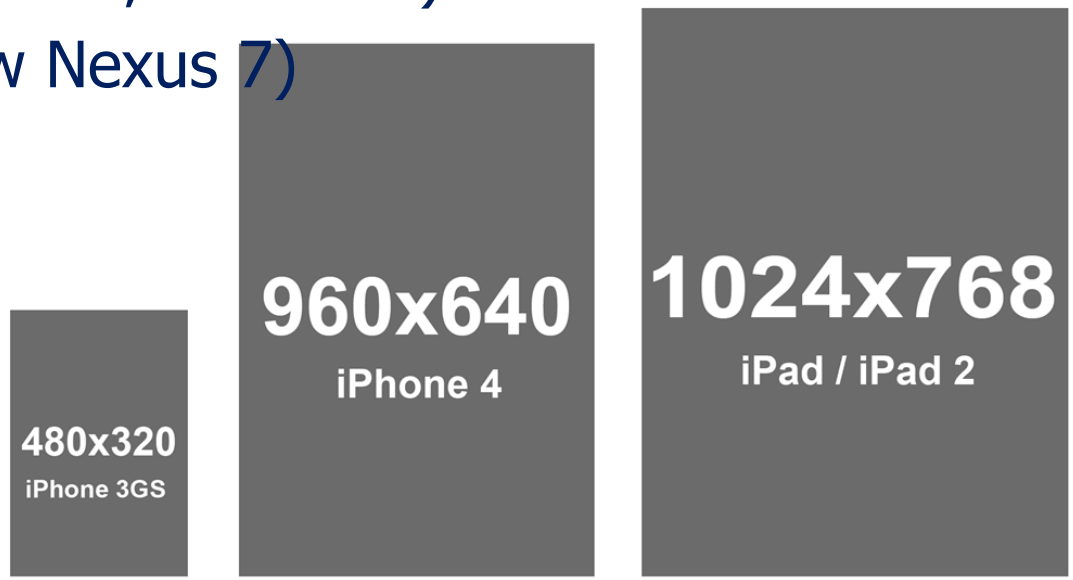
- Apps shouldn't consume much battery power
- Keep processor in idle state as much as possible
  - Multicore CPUs can shut down idle cores
- Rely on events more than on polling

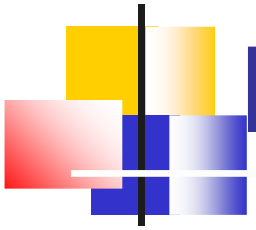
PHYSICAL DIFFERENCES

- Screen size and Resolution:
  - Smartphone screens are much smaller than monitors. They are easily obscured while touching them, and it is hard to precisely touch a screen that is physically small.

PHYSICAL DIFFERENCES

- Screen size and Resolution:
  - Smartphone screen sizes, resolution, and even aspect ratios vary between devices.
  - 2048x1536 (iPad Air, Oct 2013)
  - 1920x1200 (new Nexus 7)





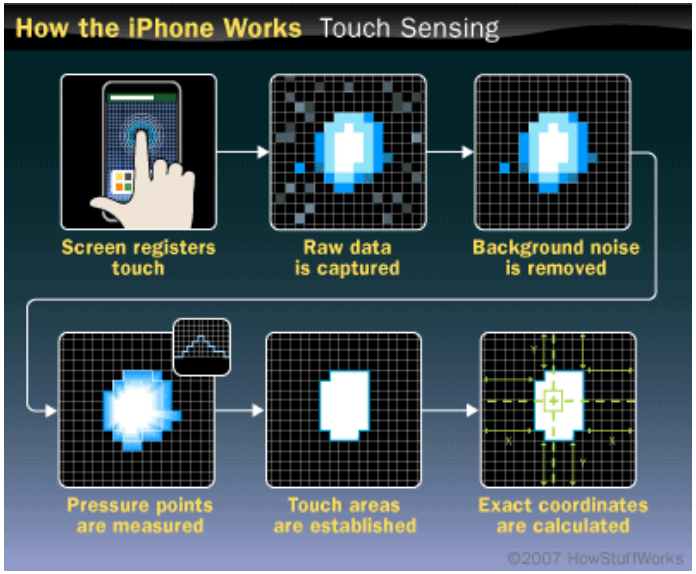
PHYSICAL DIFFERENCES

✓ Design considerations for Screen size and resolution:

- Do not show many items or information on one screen.
- Design apps that adjust the size to any screen size.

PHYSICAL DIFFERENCES

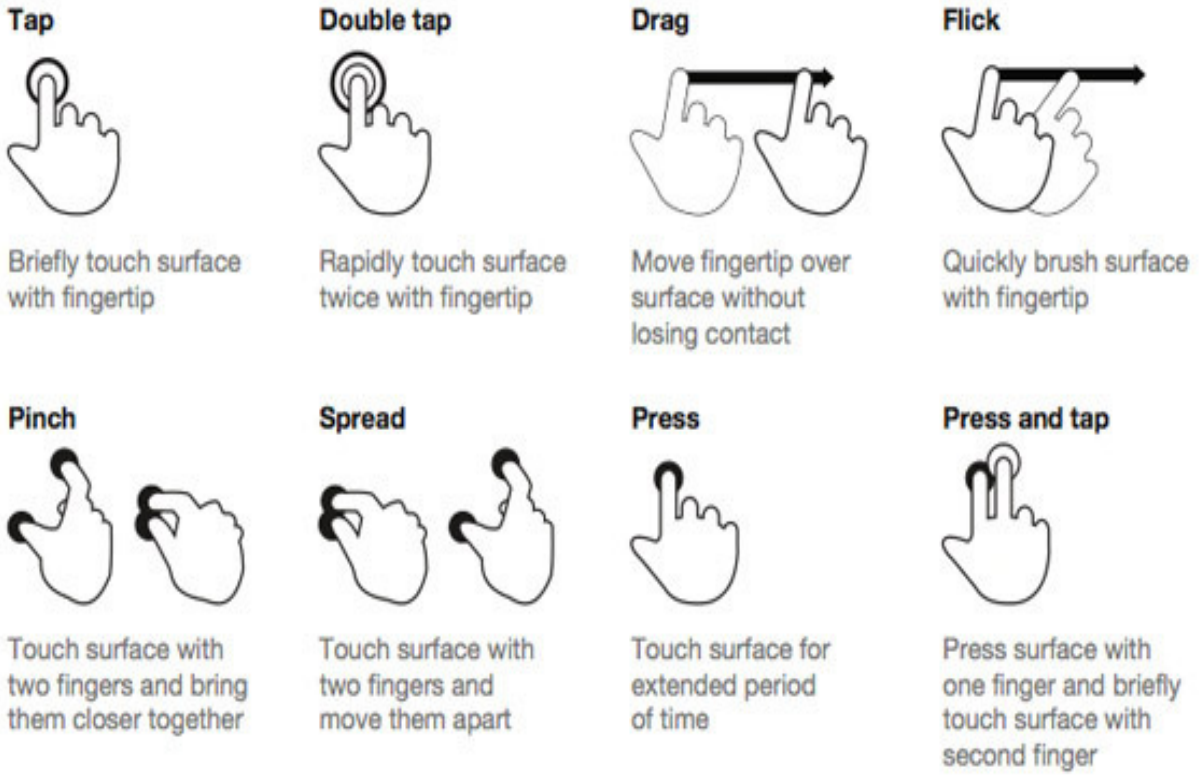
- Input Methods:
  - Smartphones keyboards are either very small or entirely touch-based.
  - They have developed a set of gestural conventions to scroll, zoom, navigate, etc.
  - Smartphones usually have other types of inputs (e.g. they might respond to voice)

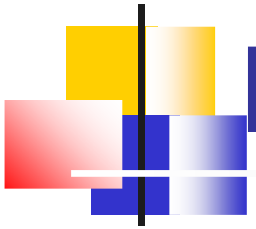


PHYSICAL DIFFERENCES

✓ Design considerations for Input Methods:

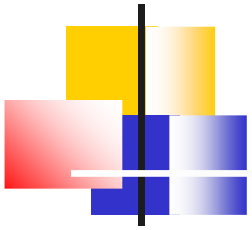
- Multitouch provides more interaction possibilities. But, right-clicking is not possible, click and drag is difficult for small items that get obscured by your finger.





PHYSICAL DIFFERENCES

- Multitasking/ Concurrency:
  - Smartphones can display an app at a time, while regular PCs can display multiple applications concurrently.
  - The OS usually provides a way to alert users.



Windows in Android OS
7″ tablet computer

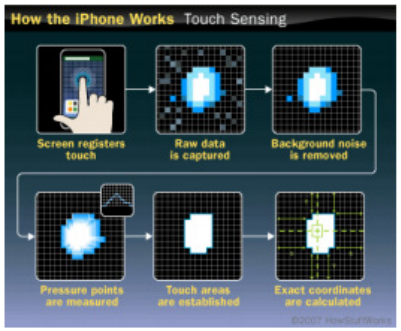
PHYSICAL DIFFERENCES

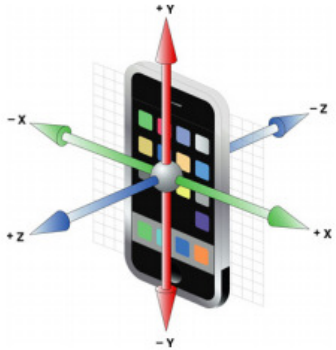
✓ Design considerations for Multitasking and Concurrency:

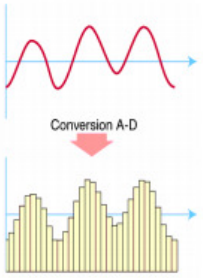
- Provide update information in a way that alerts but does not interrupt the user.

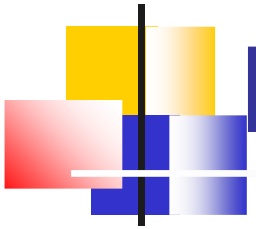
PHYSICAL DIFFERENCES

Touch, Feel, Locate, Hear, See, Connect



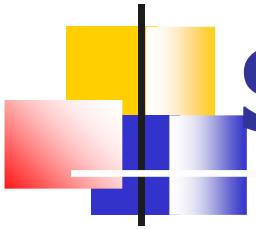






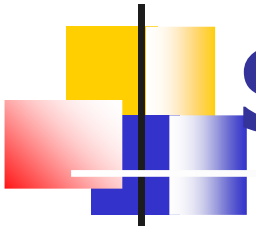
PHYSICAL DIFFERENCES

- Common Hardware:
  - Smart phones provide common hardware that might not always be present in normal computers like microphone, speakers, wi-fi, and bluetooth.
- Non-Common Hardware:
  - They also have hardware not commonly found in normal computers: cellular data, GPS, camera(s), flash/light, accelerometer, gyroscope, compass, vibration, pressure, humidity, temperature, proximity…



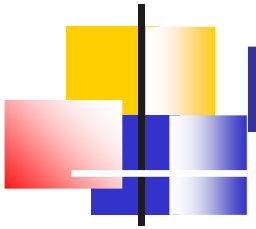
Sensors

- Accelerometer
  - Measures linear acceleration (can also give orientation*)
- Gyroscope
  - Measures angular rate of rotation
  - Linear position, speed, acceleration do not matter
- Magnetometer
  - Measures magnetic field in 3 axes
  - Can be used as a compass after some corrections



Sensors (2)

- Light sensor
  - Measures environment illuminance in lx – "lux"
  - Can allow to set screen brightness automatically
- Sound level meter
  - Measures noise level (usually the main microphone)
- GPS/GLONASS
  - Measures geographical coordinates from satellites
  - Can help provide location specific services



Derived Sensors

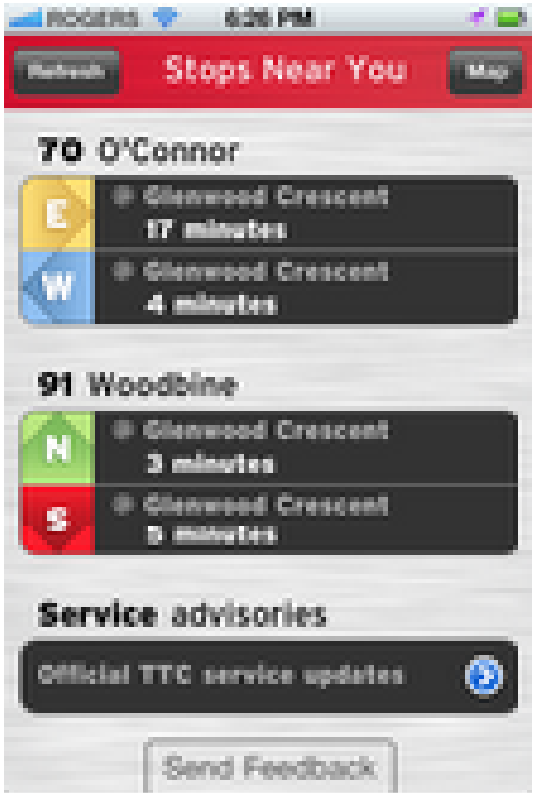
- Some information can be obtained after integrating the data from more than one sensor
  - Sometimes the OS/API does it for you
  - E.g., linear acceleration: accelerometer output with gravity acceleration excluded
  - Orientation: can combine magnetic sensor and accelerometer

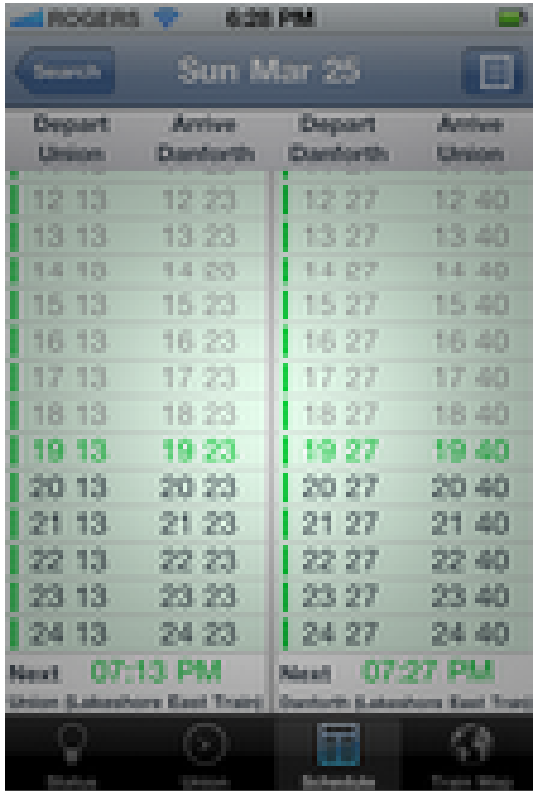
USAGE PATTERN DIFFERENCES

- Usage:
  - Smartphones users want immediate, short pieces of relevant information.
  - Smartphones users expectations are:
    - To get the information they need FAST (instant on and fast load times).
    - To get relevant information by just having to touch a few buttons.
    - To get the results without having to think too much. Apps serve very special purpose tasks, and do those tasks efficiently.

USAGE PATTERN DIFFERENCES

- Examples of fast, special-purpose apps:





USAGE PATTERN DIFFERENCES

- Because smartphones are used so frequently, small interface changes have a big impact on users.
  - Example: Delivery notifications for iMessage (vs. SMS)

USAGE PATTERN DIFFERENCES

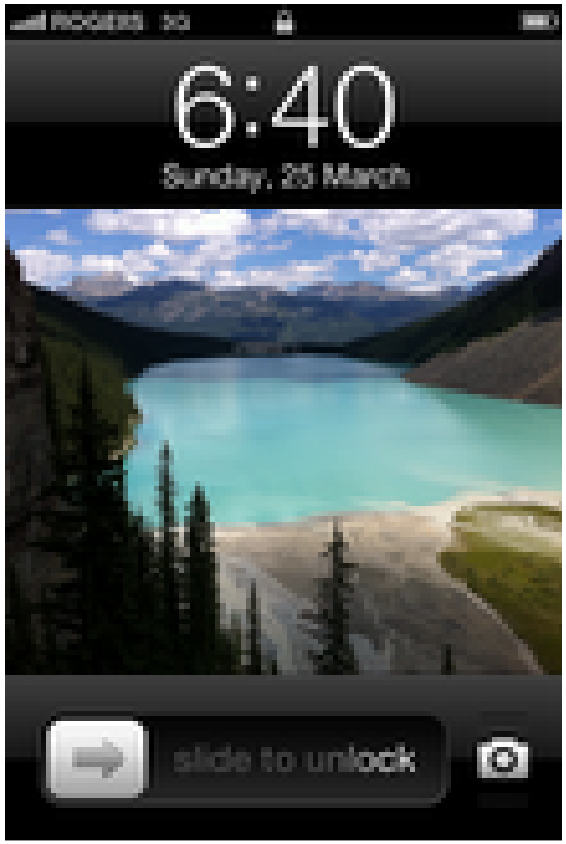
- Examples (Cont):
  - A camera on the front of the phone (enables facetime)

  - Background applications that can poll for notifications

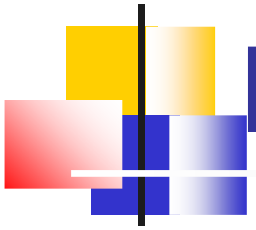
USAGE PATTERN DIFFERENCES

- Examples (Cont):
  - Extreme example of the need for instant access to a program: The camera slider on the home page of iOS 5.1.

  Desktop equivalents?



USAGE PATTERN DIFFERENCES



- Because of these differences in usage, mobile apps often receive more thought about usability than many desktop and web applications.

- The advances in mobile interface design (and their conventions) are making their way into traditional interfaces: app stores, touch interfaces, animated transitions.

USAGE PATTERN DIFFERENCES

- Another huge difference in the smartphone/tablet world is how apps are found, downloaded, installed, managed, and purchased (app store, android marketplace).

- Before smartphones, each software vendor had their own web site to market, sell, and let you download their program.

USAGE PATTERN DIFFERENCES

- Before the existence of online app stores:
  - It was difficult to know if you could trust a site that didn't look professional (Did it contain a virus? Would they your steal credit card information?)
  - It was difficult to search for programs and there was no uniform presentation of programs (short description, screenshots).
  - You had to manage multiple logins and deal with difficult purchase processes (you couldn't just type a password and be done)

USAGE PATTERN DIFFERENCES

- Before the existence of online app stores (continued):
  - The installation experience was less than friendly.
  - There was no nice way of knowing what programs are popular.
- The app store model has proven so valuable that it is appearing in the desktop world (Mac app store, Windows 8 store).

USAGE PATTERN DIFFERENCES

- Pricing:
  - Another big difference in the smartphone/table market is the pricing:
    - Paid apps are often $0.99 - $2.99.
    - Free trials of a "lite" version are commonplace.
    - Paid apps are more accepted because the prices are low enough that people will pay.

USAGE PATTERN DIFFERENCES

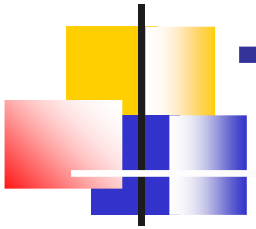
✓ Design considerations for apps:

- **KISS** approach: Keep it simple, stupid!

- Simplify access to common features. Reduce the number of steps to achieve the goal.

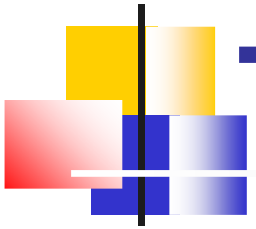
TECHNICAL DIFFERENCES

- Variety of Operating Systems, APIs and programming languages:
  - The different smartphone/tablet types use different programming languages and completely different APIs:
    - iOS: C, C++ and Objective-C
    - Blackberry: Java
    - Android: Java (with a different API)



TECHNICAL DIFFERENCES

- Browsers in smartphones:
  - Smartphones have fully-compliant web browsers (but the resolution is sometimes lower, they may be slower, they can't right-click, no pop-ups, no Flash, etc).
  - One way to deal with porting applications between iOS, Android, Windows phone, and Blackberry (and even desktops) is to not try to port to the native APIs:
    - Instead, you can use modern web applications (e.g. using HTML5) to build cross-platform apps.



TECHNICAL DIFFERENCES

- Variety of Screen Resolutions:
  - Huge variety of different possible screen resolutions:
    - iPhone/iPhone 3G/IPhone 3GS
    - iPhone 4/iPhone 4S
    - iPad/iPad 2
    - iPad 3
    - many different possible resolutions between Android devices(phones and tablets)
  - Unlike desktop applications, where your program runs in a window than can occupy less than the full screen, smartphone/tablet applications must use the full screen space available.