ECE 1778:
Creative Applications for Mobile Devices

Lecture 3

January 24, 2012

Today

1. Logistics/Organization of Course & Project
2. Finish Overview of the Capabilities of Smartphones
3. Presentation from Michael Kosic, CEO of XYZ Interactive: a 3D Sensor
4. Project Group Forming, Idea Brainstorming and Creativity Inspiring
5. Assignment P2
6. Assignment A2

Logistics

Why We're Here

To bring together people from different disciplines to build an interesting & creative mobile application

- To learn how to do this & actually do it!

Assignments: Bringing you Up To Speed

- A1 and P1 were due yesterday
- A2 and P2 are out today, due next Monday at 6pm

- Not everyone appears to have submitted the assignment, please talk to me if there is a reason
- Please learn how to submit through Blackboard, from your colleagues

- Will be two more assignments after that, one each week

The Project Stages

1. **Forming Groups**
   - Within the first 2 weeks
2. **One-Page Proposal**
   - Due January 31st; Must receive my approval to proceed
3. **Project Plan**
   - Due Feb 7th
4. **Proposal/Plan Presentations**
   - Weeks of February 14 and 28 [No class in Reading Week]
5. **Spiral 2 & Spiral 4 Presentations**
   - 2: March 6/13 4: March 20/27
6. **Final Presentations**
   - Weeks of April 3 & 10
7. **Final Report Due April 12th**

Groups Need to be Formed Now!

- 52 students registered in course; not everyone has succeeded in registering yet

- 2 groups ‘formed’ as of Tuesday January 24th, 9:00am
  - Will spend some of this class helping form groups
  - Please email me your group information by tomorrow, or ask for help forming a group.

Send Me Your Group Info

- Send email to:
  - Me (jayar@eecg.utoronto.ca)
- Provide:
  - Names & Department of each group member
  - Who is Programmer, Who is Apper (1 Apper, 2 Programmers or 2 Programmers)
  - Student numbers
  - mobile platform you plan to do the project on
    - one of Android, iPhone (others require a special discussion)
    - if thinking about using Tablet
    - if you have your own device you can use

Phones Available for Loan

- We have 18 Google Nexus S phones available for loan, for those who need them for assignments and the Project
  - Running Android 4.0

- Contact course TAs to borrow:
  - Daniel Di Matteo daniel.dimatteo@utoronto.ca
  - Braiden Brouseau braiden.brousseau@utoronto.ca
  - Day-long loans till ascertain demand

Many thanks to Google for the donation of these phones!

Proposal: Due Next Week, January 31

- 1 Page Proposal for Project, max 300 words

Should contain:

- What & Why
  - Describe the idea, and its motivation
  - **Apper groups**: make clear how this app fits within the field of the Apper, and the contribution it makes to that field
- Scope
  - Give a good sense of functionality – what is involved
  - Show that you've thought about the pieces

Project Proposals

- Must be approved before proceeding

- Should have:
  - Sufficient Technical Depth to warrant 2 graduate-level programmers working for 2.5 months on it in a course
  - **Must have a reason to be mobile**
  - Apper projects must be driven by Apper's expertise
- Worth 10% of grade
- To Submit:
  - Send email to me, jayar@eecg.utoronto.ca
    - 1 page max, 300 words max
    - Make sure you get a confirmation of receipt

Plan Due Following Week: Feb 7

1. Reprise Goal, make more precise
   - Worth 10% of grade
2. Rough design of what the user sees
   - Mock-ups of screens
   - https://gomockingbird.com
   - Any drawing package will do
3. Block Diagrams overview of planned code
   - Top down
   - With short prose description of each
   - Should be linked to the screens

Plan, continued

4. Statement of Risks/Issues
   - What roadblocks/issues/challenges do you foresee?
   - App-wise, programming-wise, hardware-wise, ethics-wise
5. What do you need to learn that you don't know
   - all members
6. **Important:** for Groups with Appers
   - Submit a separate essay on how App relates to field of Apper, and how the Apper will contribute to project
   - 1000 words

Plan Document

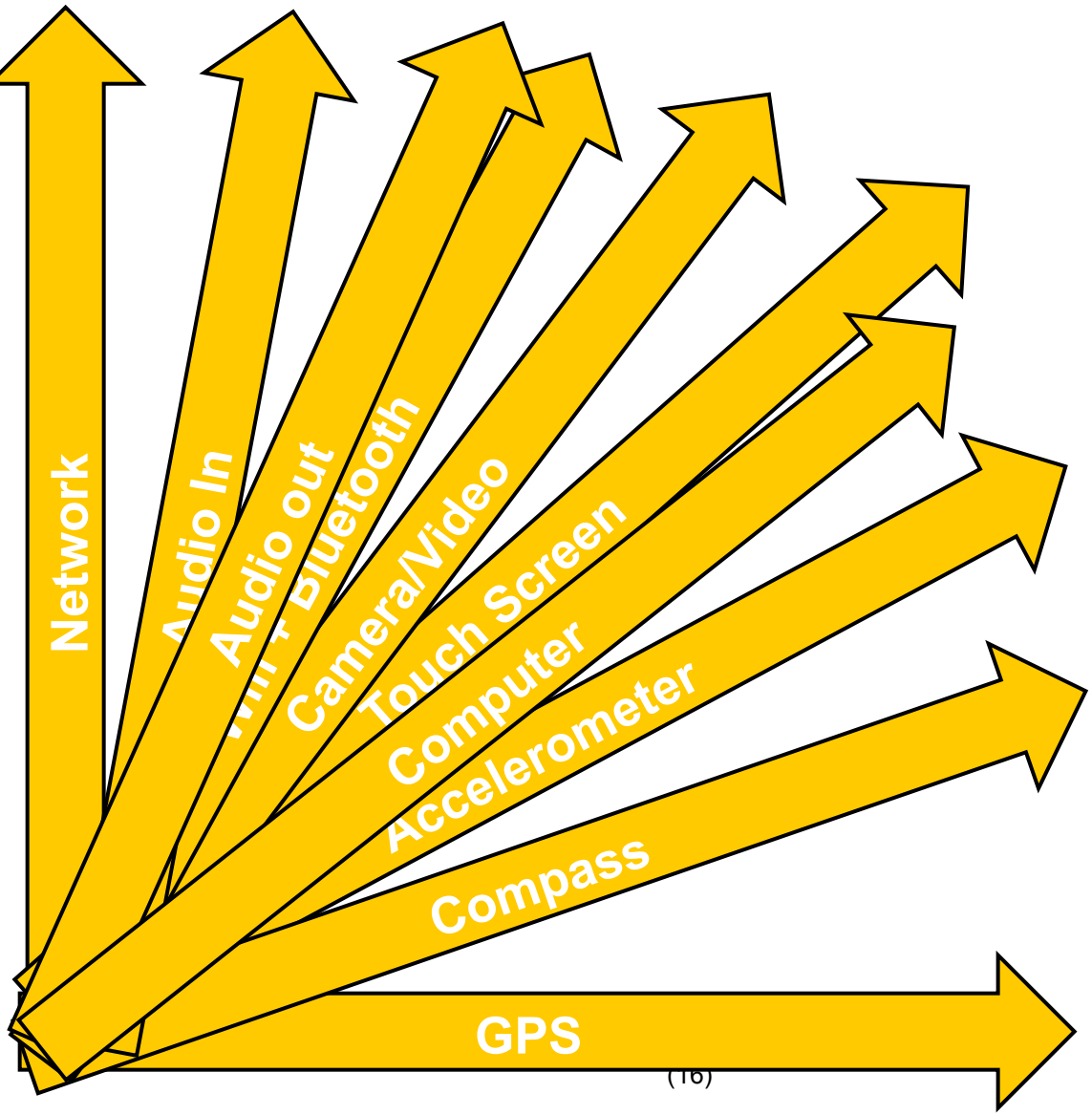
- Plan length: 2000 words max
  - not including Apper essay (#6)
  - Include word count, penalty for overage.

- Seeking clarity, not quantity of words
  - Omit needles words

Overview of Smartphone Capabilities Part 2

To Get You Thinking about the Project

Smartphones: A New Creative Canvas



A Smartphone is …

- A Computer small enough to unobtrusively carry, that
  - Is connected to the Internet – knowledge & compute power
  - Can **sense** its environment in many ways
  - Can **speak** to its environment in several ways
  - Can also make phone calls

- A *Computer*
  - Will do whatever you tell it to do, automating any drudgery
    - and never complain
  - Capable of sophisticated computation, including
    - analysis of its inputs
    - generating complex sound and images

Last Day: Inputs and Sensors

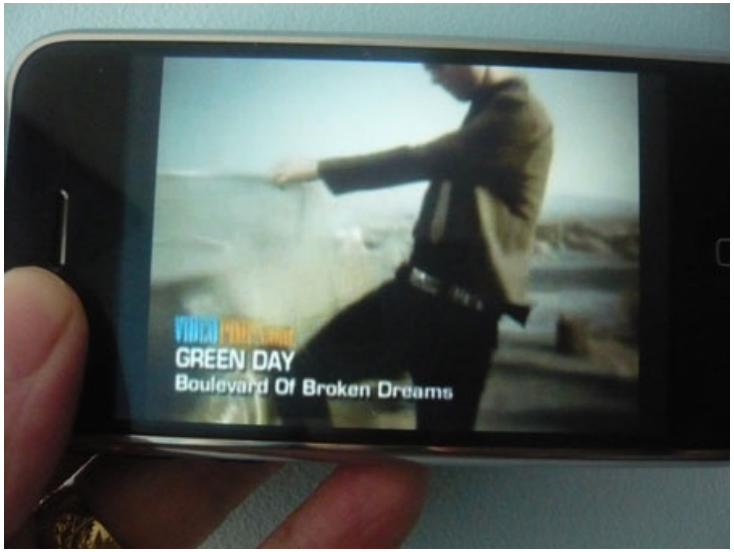
Output Devices

Hi-Resolution Screen

- Most recent phones have very high quality screens
- Resolution of Samsung Google Nexus S
  - 480x800 total resolution
- Eyes are the highest bandwidth connection to human – through this screen

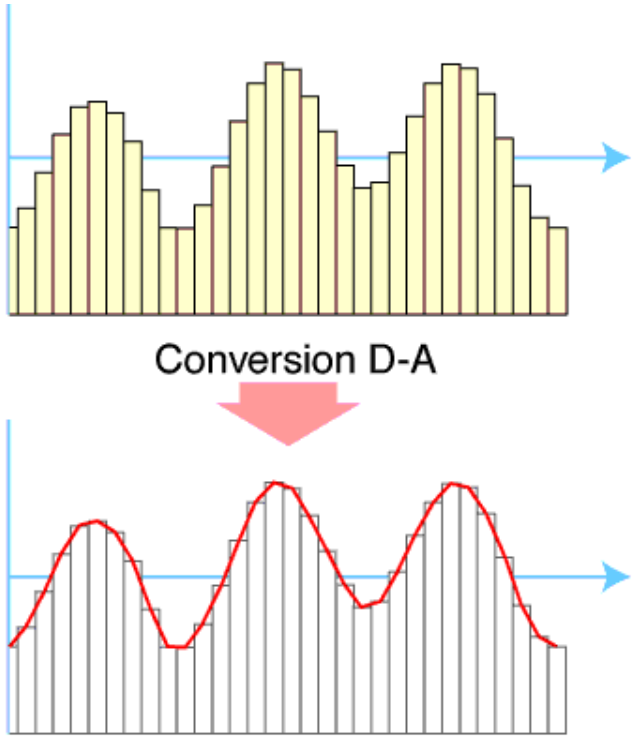
Video

- Special hardware to enable 30 frames/second video
- Displaying video can use up much or all of the processor's computational capacity;
  - Most phones have special hardware to handle this task
  - Nexus S has MP4/H.264/H.263 player



Speakers/Audio Out

- Sound Output
  - Two speakers
    - Quiet one for ear
    - Loud speaker
- Play previously recorded files
  - Should be able to do **text-to-speech**
- Many possible sound filters –
  - Auto-tune voices to make at right pitch
  - Make funny voices
  - Synthesized Musical instruments



Vibration Output

- Can create a short buzz
- Can control vibration pattern, duration and intensity
- This can be a significant output device – ‘haptic’ feedback
- Uses up battery fast if used too much

Camera Flash

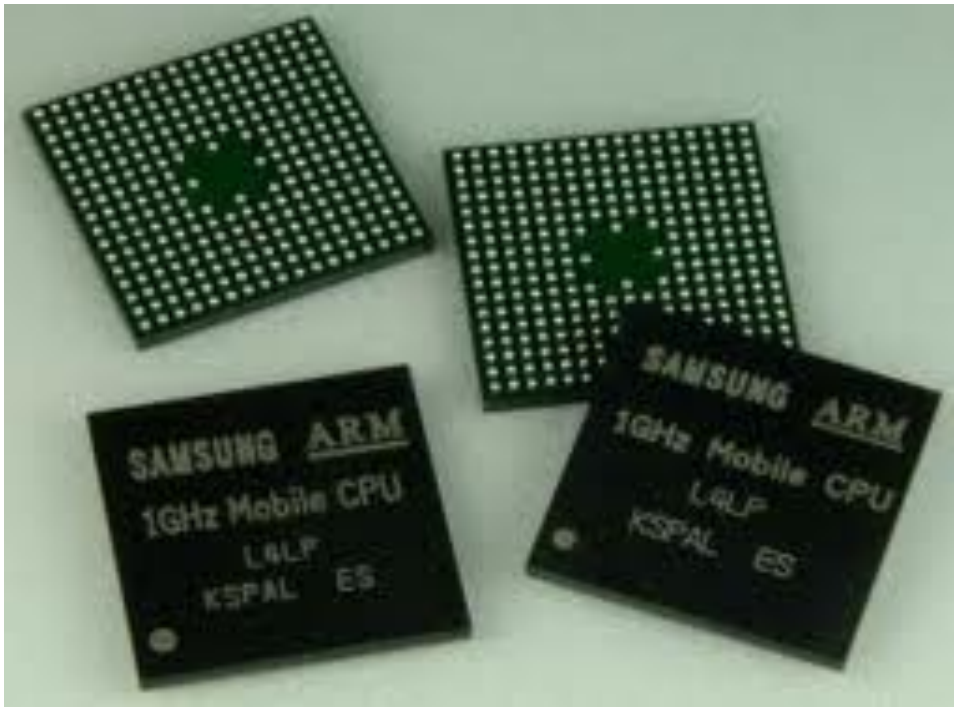
- Bright White LED
  - Meant for taking pictures
  - Can be used to light up a room
  - Signal someone
  - (transmit data?)

- Undergraduate project:
  - Evoke red-eye effect **on purpose**
  - Is a picture of retina
  - To do eye-disease diagnosis
    - with computer vision

The Computer: Storage, Networking and External Devices

Computer

- What can a computer do?
  - Processors are powerful
  - Nexus S has 1GHz ARM Cortex A8 processor



- Many things!
  - Optimization
  - Search
  - Sort
  - Artificial Intelligence

Storage Capacity

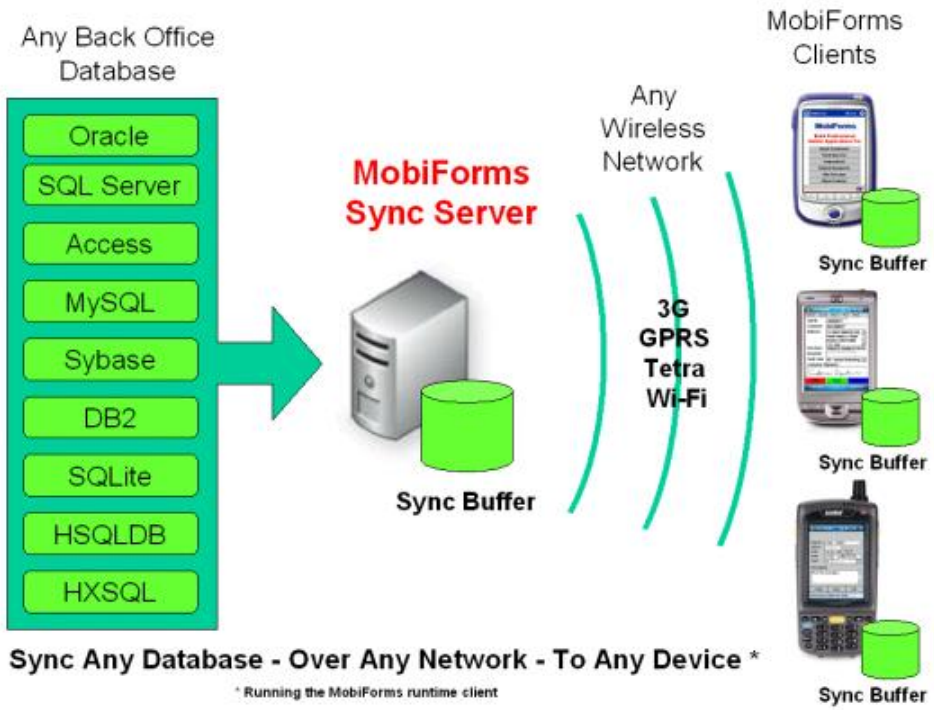
- Local storage of 2 to 64 Gbytes of permanent storage
  - Flash-based solid-state disk
- Can load many databases locally onto the device
  - Dictionaries, no problem!
  - Maps
  - Phonebooks
  - Location Services

Network – 3G/Wifi: Gateway to the Internet

- All phones have at least 2 ways to talk to the internet
  - Local WIFI
  - 3G cellular data networks
- Connection to more computing and storage
- Connection to other phones

Not Just App: Probably Need Web Site

- Many apps need 'backing' website/ database
- Provides phone with:
  - Communication to other people
  - Data
  - Backup
  - Information from Internet



Bluetooth Connection

- Connect to a whole class of external devices, wirelessly
  - earphones
  - small spy cameras
- Could be important way to add other devices without physical connection
  - Make use of phone's capabilities without holding it

Near-Field Communications (NFC)

- Standard for smartphones to establish radio link
  - with each other by bringing them into close proximity, a few cm
- Covers protocols and formats, based on Radio-Frequency Identification (RFID) standards
- Used in contactless payment systems
- Simple setup, low power, but low speed
- Google Nexus S has NFC

Using All These & More

- Come up with an interesting & creative mobile app in your field
- Make it work!

3D Sensors: XYZ Interactive

Michael Kosic, CEO

More Sensors Coming

- As the sensors in mobile devices have become more useful, more and more companies are thinking about other sensors
  - Temperature
  - Ultrasound
  - …
- Mr. Kosic is going to present XYZ's 3D sensor
- It is a prototype
- They are looking for demonstrations of it, on an Android Tablet platform
- Think about how you could use this in a project

The Deal

- XYZ supplies a 3D sensor to your project, making a (hopefully) more interesting App
- In return, they get to use your App as a demonstration of their technology

Intermission & Group Forming

Un-formed groups please come to the front of the room.

Assignment P2 – for Programmers

Containers, Select, Lists and Files

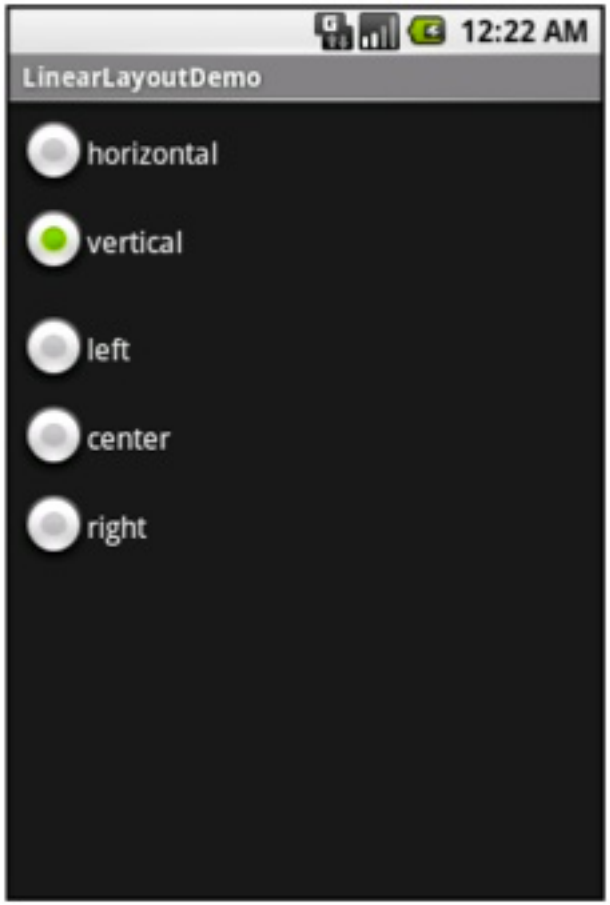
Assignment P2

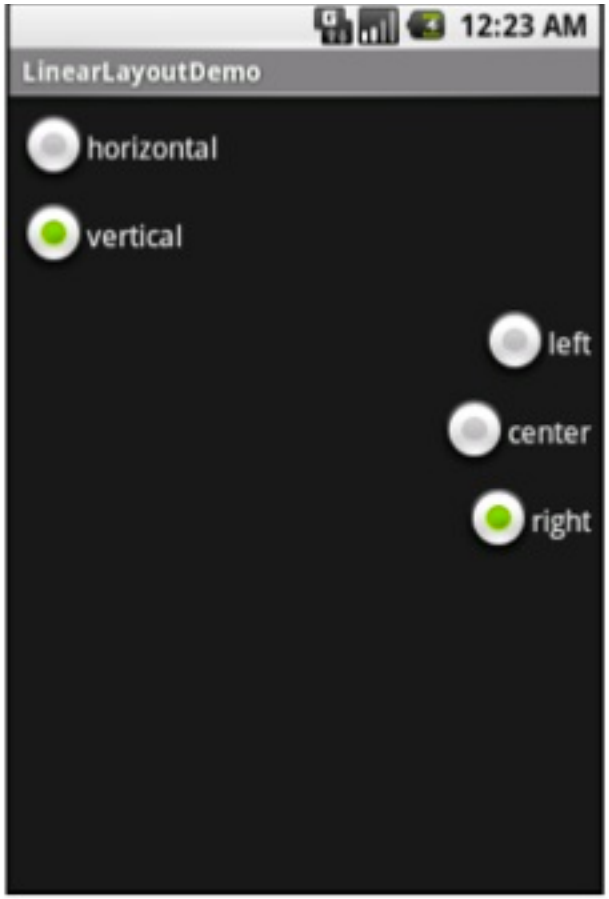
- Goal is to learn about
  - More complex containers of widgets
  - Lists – a very common way to display information
  - Files – persistent storage

- App for recording people's age and food preferences
  - Create a list of people
    - Record age and food preference from specific list of foods
    - Store List in a File
    - Be able to retrieve previously stored files & Display
- **Due next week, Monday at 6pm**.

Containers: Chapter 10

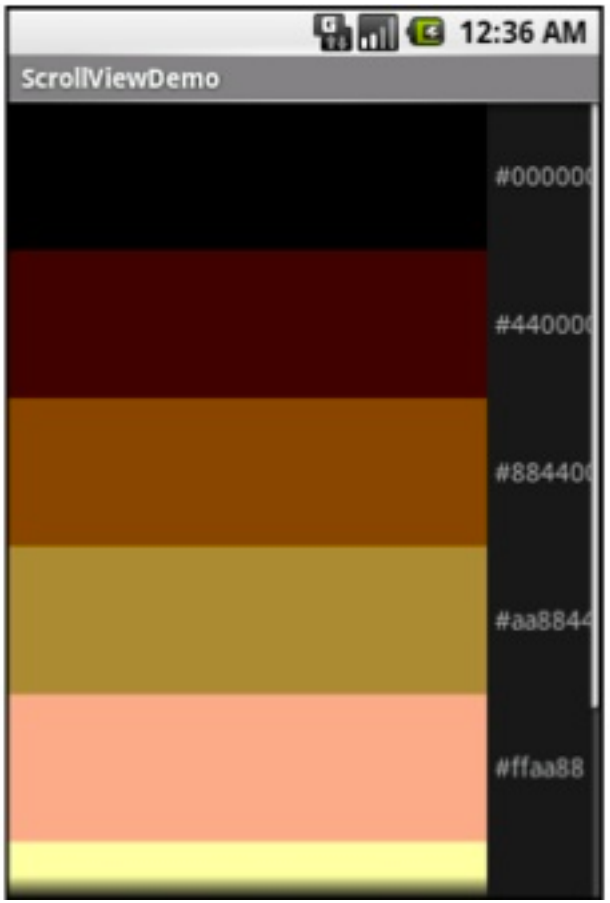
- How to use XML files to describe what you want to





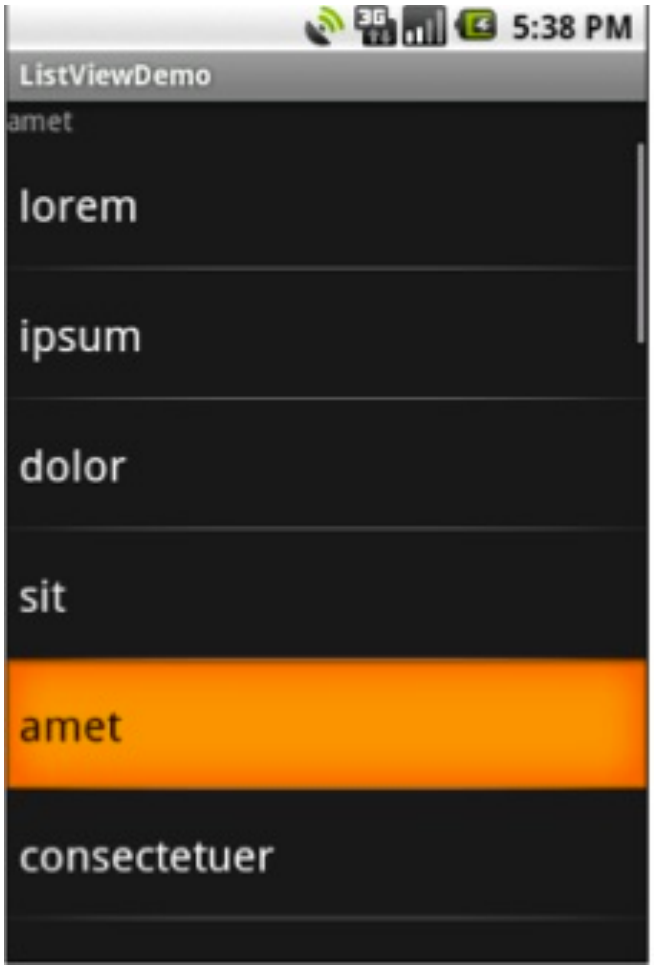
Containers

- Relative vs. Linear Layouts



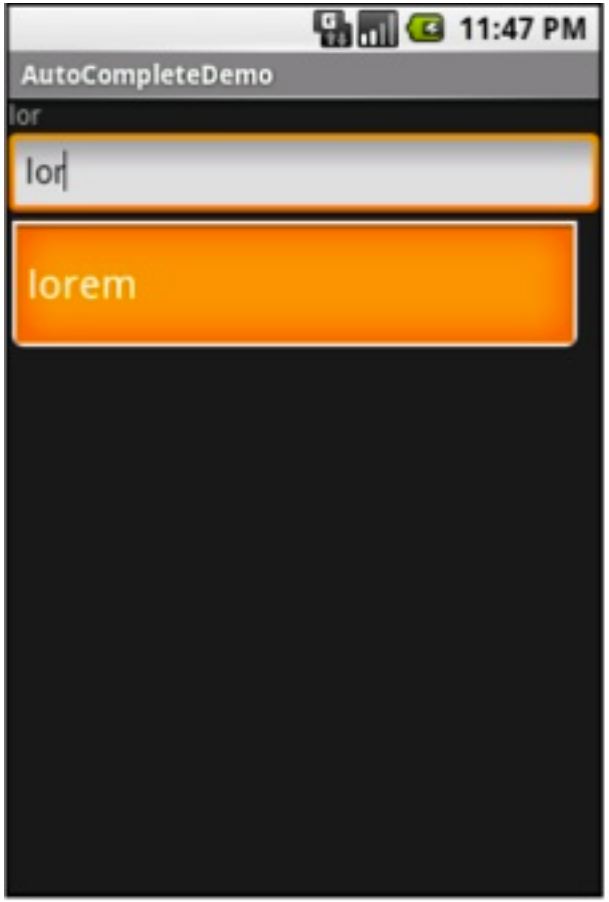
Lists: Chapter 11, 12

- Very commonly used in all applications
  - Different ways to select, fill in



Autocomplete

- For text fields, based on contents of list



Files, Chapter 30

- There are several places to put files
- Anything that you place in res/raw project folder is shipped with the application
  - Can read it as described in Chapter 30
  - Static files, application can't change
- Can read/write files using basic Java I/O
  - See example; note '**on resume**' is in mobile context
  - Limited size ~ 70 Mbyte total
- Larger files can go on SD card

iPhone Developers

- Assignment points to relevant chapters from iPhone iOS 5 development book

Assignment A2 – for Appers

Mockingbird Mockups

Design of Apps from UI Perspective

1. Learn Mockingbird basics by going to website and reading help (look also for youtube instructional videos)
   - Demo: https://gomockingbird.com/

2. Learn some user/app design basics:
   - Android
   - Apple

3. Design a New App That Diarizes

- Diarization: measuring the fraction of conversation that each person takes up.

- Given that you have software that can do this, invent and interesting app that makes use of this.

- Design the app, and mock it up using Mockingbird
- Describe the design principles you're using in the decisions you make to the design the app (from Part 2)

- **Due Next week, Monday Jan 31 at 6pm.**