ECE 1778:
Creative Applications for Mobile Devices

Lecture 6

February 15, 2012

Today

1. Logistics
2. Assignments P4 and A4
3. Project Management and Execution
4. Programming Essentials for Android
5. Proposal Presentations

Logistics

Assignments

- A3 and P3 were due yesterday
- A4 and P4 are out today

Assignment P4

- Threads, Internet Files and Databases
  - Read a file from an Internet, put into a database
  - Emit searches on Google for the names on the thread, and display one by one
  - Use threads (separate processes) to do the separate tasks.
- Due in two weeks – Monday Feb 27 at 6pm.
- This is the last assignment.

Assignment A4: Creativity, Sensors and You

- Key outcome of this course is to have Appers always thinking of ways to use this new Canvas that is a mobile device

- Goal of this assignment is to have you come up with creative apps in your field that make use of the sensors available today, and perhaps some from tomorrow

Recall, Mobile devices are:

- Powerful computers, capable of:
  - Optimization
  - Signal Processing
  - Data searching and sorting
- Networked well to the Internet
- Capable of several kinds of ‘output’
  - Screen
  - Sound
  - Vibration
  - Light

Be Creative!

- Part 1
  - Reprise & augment the description of your field, like that in A1

- Part 2
  - Given these sensors:
    1. Accelerometer
    2. Gyroscope
    3. Barometer
    4. Camera
    5. Light Sensor
    6. Proximity Detector

A4, Part 2, continued

- Come up with 3 Novel apps that make use of these sensors, **in your field**
  - Novel = no direct hit as an app for a Google search
- Ask you to give some sense of the difficulty of the sensor processing you're asking for
  - e.g. Vision processing is hard, as you've heard
  - should calculate # of pieces of data that need to be looked at
- Can use any combination of sensors.
- Goal – give you practice being creative!

A4 Part 3

Consider the future, many more cool sensors invented:

1. 3D Sensing like the XYZ sensor presented in lecture 3.
2. An ultrasound sensor that can look inside a body.
3. An Emotion Sensor – which says which emotion is being felt by the holder of the phone, and gives the intensity on a scale from 1 to 10.
4. A Blood Pressure Sensor
5. Brain Electrical Activity Sensor – brain electrical map.

- Invent three more Novel apps in your field
- Due in 2 weeks – Monday, February 27th at 6pm

Project TimeLine

1. Forming Groups
2. One-Page Proposal
3. Project Plan
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

Project Management and Execution

Your Project Plans

- Should have given you a well-defined final goal
  - We'll look and see that today and next class
- Should also have broken up work up into pieces
  - The block diagrams required in proposal

Now: Start Executing! How?

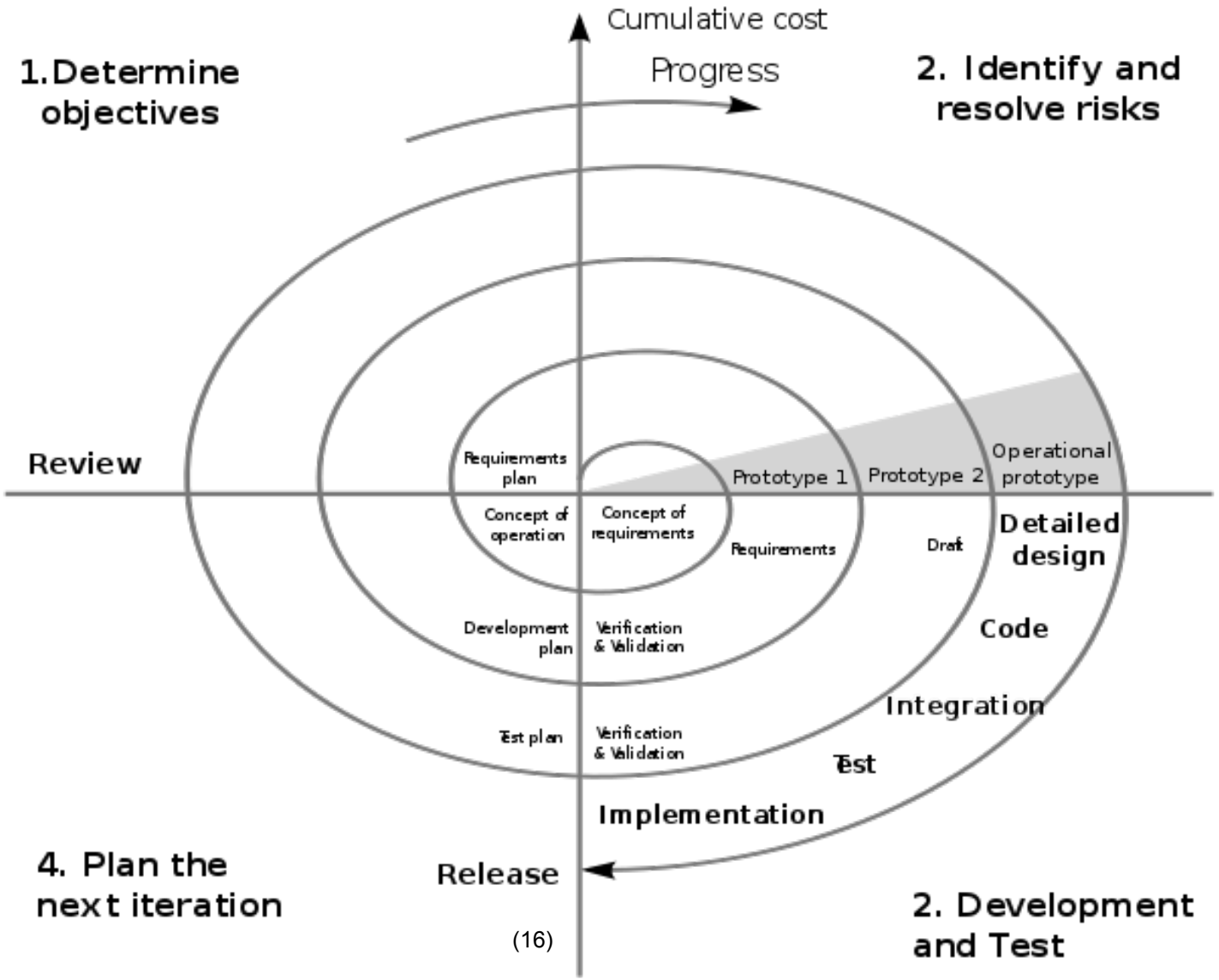
Focus: Spiral/Agile/Incremental Method

- Get the smallest part of your App working as soon as possible.
  - Exercise it, revise it, and build on it
  - Use your common sense to see if it is working, and if your goals need to be adjusted
  - In today's presentations, you will identify what the first working useful version should be 'Spiral 1' done in 2 weeks.

- Spiral vs. Waterfall method
  - Waterfall means plan everything out, documenting carefully
  - Software really needs to be exercised to see how well it works
  - Particularly true for user interface oriented software
    - but essentially true in all projects!

Waterfall vs. Spiral

Boehm's Spiral Model



Agile Software Manifesto

Agile Software Values:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

- while there is value in the items on the right, we value the items on the left more
  - From http://en.wikipedia.org/wiki/Agile_software_development

Spiral Method of Development

- To emphasize how important this is, the next key milestone in the course, Due March 6 is **Spiral 2**
  - A demonstration of a minimal working version of your app, after Spiral 1, or a crucial part of your app
  - Describe what it does, show it, say what next
  - In today's proposal discussion we'll discuss what your proposal of that will be

- Now, March 6 is three weeks from now, a long time
  - You should get a working version of something prior to then
  - Call that **Spiral 1**, which you'll we will also discuss today

Next Steps

- Identify a Spiral 1 and Spiral 2

- Take your block diagrams, and break down into tasks
  - That lead to Spiral 1 and Spiral 2
  - Be prepared, of course, to adjust goals as you go along

Then:

- Define the tasks that need to happen
- Estimate how long they will take
  - If too long, re-do goals
  - Estimation is difficult; have to try; failure OK; can ask for help
- Assign Tasks to Each Team Member

Project Execution

- You're in a team, and you need to find an effective way to coordinate the team's work
- Agree
  - Who is doing what
  - When work will be done
- Have weekly or more frequent meeting; every 3 days?
  - If not in person, use Skype video or phone

Rule 1 for Effective teams:

- Make commitments,
  - check on commitments (task execution) each meeting
- Don’t be mean if commitment’s not met, work together
  - Figure out if commitment was too ambitious
  - Re-work goals/commitments to be done next
- Do have expectation that contributions of each team member are equal

What About Disagreements?

- You're in a team, you're likely to have disagreements
- If this is your first project experience of this kind, this can be stressful

- **Resolution of disagreements is a crucial skill**
  - Take this as a opportunity to learn how to do it

Issues and Relationships

There are often two things going on when there is conflict:

1. Specific issues that give rise to a problem
   - Factual/strategic differences of opinion
2. Relationship between people
   - Trust, respect

Modified from: http://www.execstrategies.com/Facilitator/ConflictResolutionStrategies.htm

Relationship Focus

- Trust is at the root of all good relationships
  - Personal and professional
  - Must establish common goals and work towards them together
  - Trust is created when everyone believes that everyone else has the same goals

1. Maintain a fair, respectful communication style with careful listening
2. Expect and accept another's right to disagree
3. Realize the value of disagreement

Android Essentials

- Android Life Cycle
- Sensors
- Eclipse Debugging
- Pop-Up Messages – Toast & Alerts

Android Activity ‘Life Cycle’

Android Application Life Cycle

- Recall: Activities are screens that the user sees, and associated process
- Android manages these Activities as a **stack**.
- When a new activity is started, it is placed on the top of the stack and becomes the running activity

- The previous activity always remains below it in the stack,
  - and will not come to the foreground again until the new activity exits.

An Activity Can Be in 1 of 4 ‘States’

State 1: Active/Running

- Activity in the foreground of the screen (at the top of the stack)
- Has ‘focus’, meaning user interactions go to it.

State 2: Paused

- activity has lost focus but is still visible
- a new smaller or transparent activity has focus on top of the activity)
- A paused activity is completely alive (it maintains all state and member information and remains attached to the window manager), but can be killed by the system in extreme low memory situations.

Activity States 3 and 4

State 3: Stopped

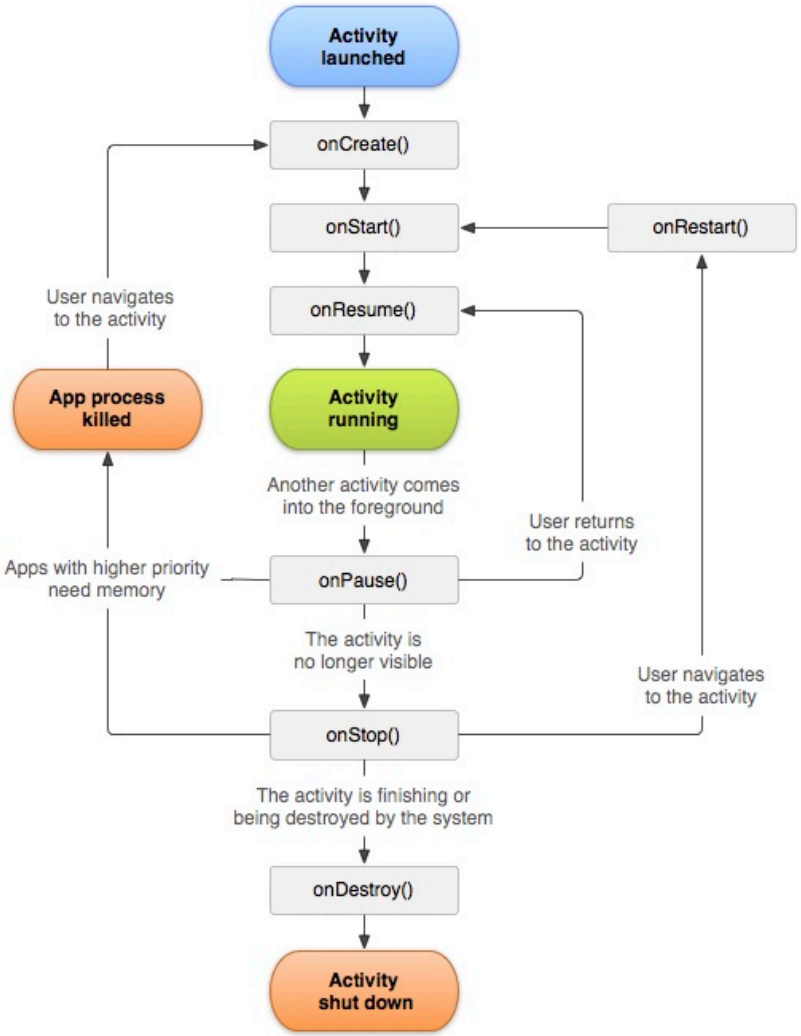
- activity is completely obscured by another activity
- retains all state and member information
- no longer visible to the user so its window is hidden
- it will often be killed by the system when memory is needed elsewhere.

State 4: Dead

- If an activity is paused or stopped, the system can drop the activity from memory by either asking it to finish, **or simply killing its process.**
- When displayed again to the user, it must be completely restarted and restored to its previous state.

Methods Called By Android to Change States

- Diagram shows states and methods that cause them to change
- Ovals: the 4 states
- Rectangles: methods called by android when it wants to change activity state



References

1. The Android Documentation:

http://developer.android.com/reference/android/app/Activity.html

2. Murphy, Busy Coder's Android, Chapter 18
   - "Handling Activity Lifecyle Events"

- Once your project gets going, it is really important to read through this and understand it
  - Last year's students pointed out that this was the key thing they had not understood in Android, that caused the most problems

The Key 'LifeCycle' Methods

OnCreate()

- Familiar with already – brings the activity to life

OnPause()

- Another Activity has gained the 'focus'
- Should stop any background threads, release large resources (such as a camera)
- **No guarantee that OnDestroy() will be called**, so best to save **all** state here

OnResume()

- Called as activity starts, **or** is restarted from a pause
- Can recall state from file, refresh the User Interface – see example

Key Loops in Life Cycle: 1 Entire Life

- The entire lifetime of an activity happens between the first call to onCreate(Bundle) through to a single final call to onDestroy().
- An activity will do all setup of "global" state in onCreate(), and release all remaining resources in onDestroy().
  - For example, if it has a thread running in the background to download data from the network, it should create that thread in onCreate() and then stop the thread in onDestroy().

2. Visible Lifetime

- The visible lifetime of an activity happens between a call to onStart() until a corresponding call to onStop().
- During this time the user can see the activity on-screen, though it may not be in the foreground and interacting with the user.
- Between these two methods you can maintain resources that are needed to show the activity to the user.
- For example, you can register a BroadcastReceiver in onStart() to monitor for changes that impact your UI, and unregister it in onStop() when the user an no longer see what you are displaying. The onStart() and onStop() methods can be called multiple times, as the activity becomes visible and hidden to the user.

3. Foreground Lifetime

- The foreground lifetime of an activity happens between a call to onResume() until a corresponding call to onPause(). During this time the activity is in front of all other activities and interacting with the user.
- An activity can frequently go between the resumed and paused states -- for example when the device goes to sleep, when an activity result is delivered, when a new intent is delivered -- so the code in these methods should be fairly lightweight.

Issue Focus

1. Identify and define the conflict in specific terms
   - Make sure each person is given a chance to speak
   - Make sure each person listens
   - Best way to be sure is to play back **other's** issues in your own words, and ask if that is correct
   - Be respectful while doing so
2. Generate alternative solutions
   - give all everyone opportunity to suggest; write down all concrete ideas
3. Select best course of action
   - In a consensus-based discussion
   - Ultimately will need to make a decision; if consensus doesn't succeed, then need to give decision to one person.

Project Plan Presentations Today

Time Limit

- **Five Minute Time Limit**
  - I will set my iPhone to time you!
- **Three Minutes for Questions**

Presentation Contents

The Essence of the Plan submitted today:

1. Reprise Goal, make more precise
2. Give Mock-ups of What User Sees
3. Block Diagram of Code
4. Statement of Risks/Issues
5. What do you need to learn that you don't know
6. For Groups with Appers
   - 1 extra minute, for Apper to say how this fits into their field

Plan Discussions

- Each group member should contribute to discussion
- Come up to front
  - Others contributions welcome!
  - Please be constructive

- Pick a good Name for your project
  - Names are important!
  - Feel free to change the one we picked last week.

- Identify a **Spiral 1** goal
- Identify a **Spiral 2** goal – for presentation March 8!