ECE 1778:
Creative Applications for Mobile Devices

Lecture 5

February 4, 2015

Today

1. Fierce Mobile
2. Logistics
3. Assignments P4 and A4
4. Project Management and Execution
5. Proposal Discussions

Fierce Mobile

Fierce Newsletters – Wireless, Health, IT

- There is a family of newsletters/websites in the mobile world, that keep you apprised on sometimes interesting things:
- Fierce Mobile IT general Info Tech & mobile
  - http://www.fiercemobileit.com
- Fierce Wireless – cellular industry & handsets
  - http://www.fiercewireless.com
- Fierce Mobile Health
  - http://www.fiercemobilehealthcare.com

- To Join – see 'Subscribe' link at bottom; many others
- Recent Examples ..

From This Week's Fierce Mobile Healthcare

Wearable tracking useful to patients, physicians for surgery recovery

Northwestern Medicine researchers are studying the use of a wearable fitness tracker for patients recuperating from spine surgery, and with promising results physicians believe the technology may lead to a universal recovery evaluation approach.

The research team used Fitbit devices, which they gave to patients four weeks prior to surgery, and then monitored the data for six months after surgery. The pre- and post-analysis provided objective, numerically exact and continuous measurement of functionality, and how much activity is regained during recovery, according to an article published by Northwestern Medicine. The study focused on patients undergoing minimally invasive spine surgeries for degenerative disease and deformity

"This may allow us to predict when a patient will be back to 50 percent activity, 100 percent activity or even 200 percent activity in the future," principal study investigator Zachary Smith, an assistant professor in neurological surgery, said.

Wearables are taking deeper root in healthcare as both physicians and consumers embrace advanced monitoring and tracking capabilities. Research firm ON World predicts that 700 million wearable devices will be shipped in the global market by 2018. The most popular health use of mobile devices is for fitness-related needs, such as tracking physical activity, according to a recent Harris Poll. Forty-three percent of individuals surveyed said they're very interested in embracing mHealth, with another 25 percent expressing mild interest.

The Northwestern research team found that nearly all patients go through a month to six-week period in which activity is decreased. Yet many, just a month from surgery, were back to pre-operative activity levels, according to the article.

While his study focuses on a particular procedure, Smith said that he sees the wearable monitoring approach as applicable to all spine operations.

"We hope to integrate this into our practice so that it becomes a universal and accepted means of evaluating patients and evaluating our outcomes," he said. "Most importantly, we hope to make patients more involved in their own self-evaluation, recovery and spinal health. I strongly believe that a motivated patient will get better results."

Another recent study conducted by the Harris Poll found that a majority of U.S. adults, 56 percent, embrace using a connected device at home to monitor health and share data with caregivers.

Logistics

Assignments

- A3 and P3 due next week
  - Except A3 part 1 due this Friday
- A4 and P4 are also available, won't be due until Feb 24
  - Discussed today
- A2 and P2 are finished being graded
  - Some interesting ideas in A2 for use of diarization
    - Some did not realize the requirement to create something beyond the basic ability to diarize.

Assignments A4 and P4

Assignment P4

- Threads, Internet Files and Databases
  - Read a file containing names, a bio and then a picture from an Internet-addressed file, do on a separate thread
  - Put names into a database
  - Emit searches on Google for the names, and display one by one
  - Use a separated thread to do a separate task and communicate back to main UI thread (used in many apps)
  - In addition, make appropriate use of fragments

- Due in two weeks – Tuesday Feb 24th at 6pm.

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 the future

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
    7. Humidity Sensor

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 that there is a mobile app that already does this.

- 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 e.g. XYZ sensor – see video.
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 – Tuesday, February 24th at 6pm

Project Time Line

Project Stages

1. **Forming Groups**
2. **Project Approval-in-Principle**
3. **Project Proposal/Plan**
   - Document Due yesterday
4. **Proposal & Plan Presentations**
   - February 11 & 12
   - **NOTE EXTRA LECTURE** Thursday Feb 12, 6-8pm**, SF 1101**
   - **No Lecture Reading Week (Feb 18)**
   - **Special User-Design Lecture Feb 25**
5. **Spiral 2 & Spiral 4 Presentations**
   - 2: March 4/11 4: March 18/25
6. **Final Presentations**
   - Weeks of April 1 & 8
7. **Final Report Due April 9th**

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Project Management and Execution

Your Project Plans

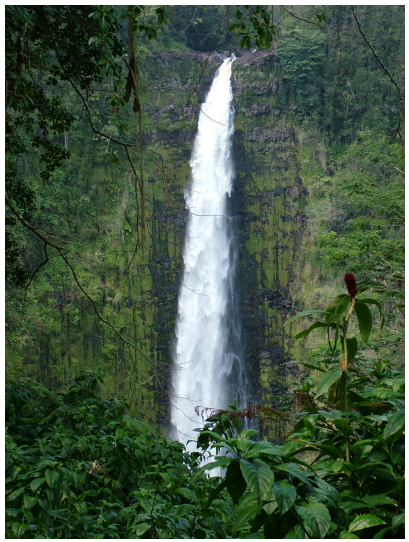
- Will have given you a well-defined final goal
- Should also have broken up work up into pieces
  - The block diagrams required in proposal

Soon: 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
  - After today's discussions, you should identify what the first working useful version should be 'Spiral 1' done in 3 weeks.

Waterfall vs. Spiral Method



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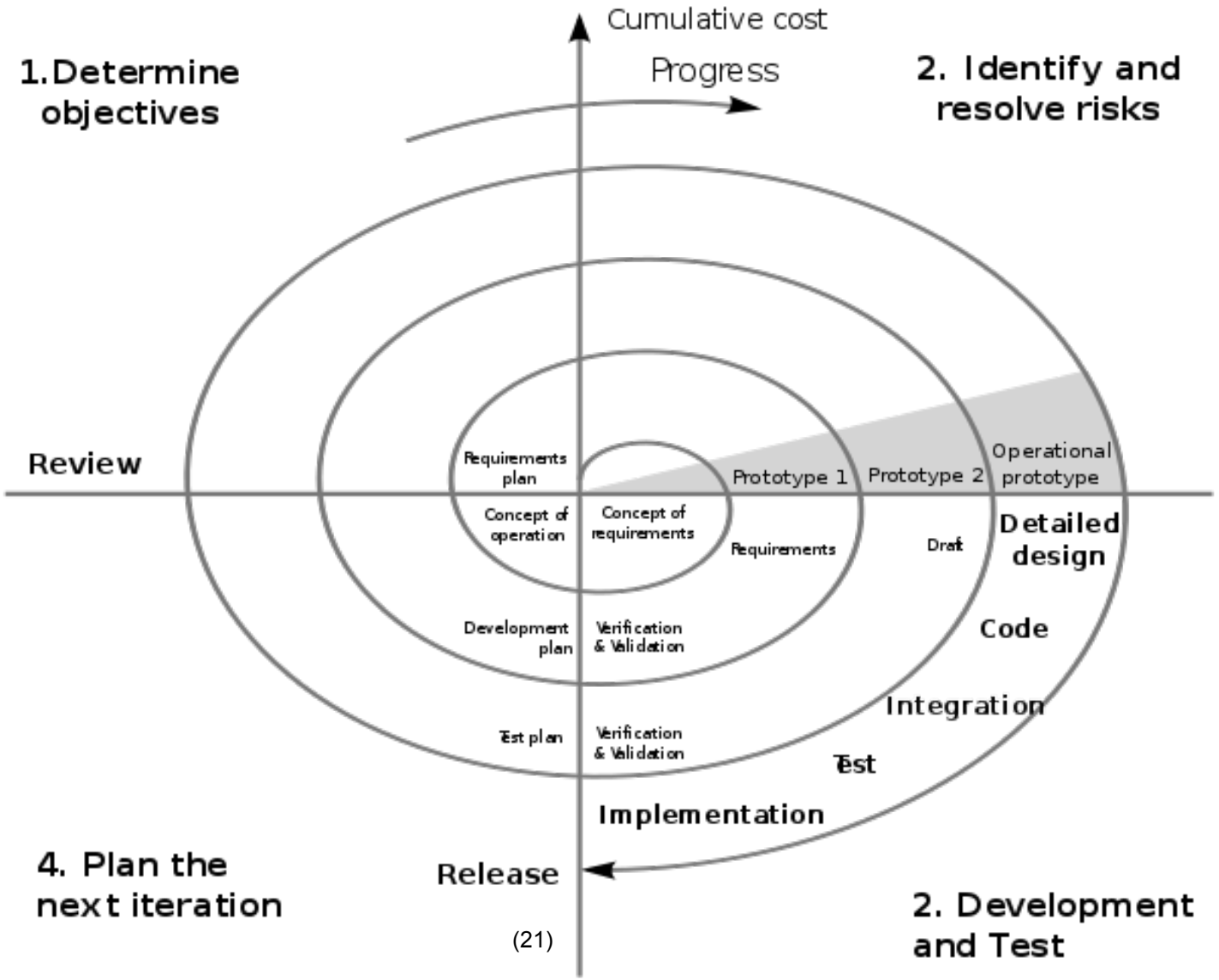
- Waterfall means plan everything out, documenting carefully
- But Software really needs to be exercised to see how well it works -> Spiral
- Particularly true for user interface oriented software
  - but essentially true in all projects!

Boehm's Spiral Model



Agile Software Manifesto

Agile Software Values: Choose

- **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, is **Spiral 2**

- **Spiral 1** is what you get plan to get working the week of Feb 25
  - You should describe what this will be in your plan presentation next week – functionality and features achieved.

- **Spiral 2** is what you get working by Wed March 4
  - The complete set of (additional to Spiral 1) features and functions

You'll Present Spiral 2 March 4

- March 4 is four weeks from now, a long time
  - You'll want the Spiral 1 working well before!
  - You should think now what your Spiral 1 is going to be
  - Include Spiral 1 and Spiral 2 description in the plan you present next week

Key Coming Steps in Project

1. **Identify a Spiral 1 and Spiral 2**
   - Take your block diagrams, and break down into tasks
   - Those tasks will tell help you decide what to shoot for in Spiral 1 and Spiral 2
   - Be prepared, of course, to adjust goals as you go along

2. 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 unpleasant or nasty if commitment's not met, work together
  - However, don't 'look away' from it – face it and make a plan
  - 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
   - it can lead to something better

Project Plan Presentations

Next Week in 2 Classes:

Wednesday February 11th 9-11am (Usual)

Thursday February 12th, 6-8pm (SF 1101)

Plan Presentations on Feb 11and Feb 12

- Formal Presentation
  - Using PowerPoint, Keynote, PDF or OpenOffice
- Recall extra lecture on Feb 12, 6-8pm, SF 1101
- You will not know in advance if you're presenting on the 11th or 12th, to be fair, so come prepared to talk
  - Unless you've expressed a hard constraint to me, already (or soon)

- Send the presentation to me by email by **Tuesday, February 10th, at 6pm**
  - Jonathan.Rose@ece.utoronto.ca

Time Limit

- **6 Minute Time Limit**
  - I will start timer that makes annoying sound when done, and expect you to be finished within 10 seconds after that.
  - **Omit needless words**
- Three Minutes for Questions

Proposal/Plan Presentation Contents

The Essence of the Proposal/Plan submitted today:

1. Goal (What & Why)
2. Give Mock-ups of What User Will See
3. Block Diagram of Code & explain – recall Lecture 4
4. Statement of Risks/Issues
5. What do you need to learn that you don't know
6. **Spiral 1, 2 and 4 goals**
7. Apper Statement
   - 1 minute, for Apper to say how this fits into their field & what their contribution will be

Notes on Time Limit & Clarity

- Time Limit is both serious and important
  - To this course and your ability to communicate going forward
- How many slides can there be in 5 or 6 minutes?
- How much can go on a slide?
- Are pictures good things in presentations?
- Do you start with the details or the big picture?
- What place does deep jargon have in a short presentation?

How Do You Know if Presentation is Good?

- Practice it, standing up, in front of:
  - First, no-one
  - Then, a few others
  - Not too much, though, either, as it shouldn't sound memorized

- **Time it**
  - if too long, cut it
  - Get to the point quicker

- Gulak's law: "You can describe anything to anyone in any amount of time"
  - Just have to pick the right level of abstraction

How Do You Know if Presentation is Good?

In Practice:

- Listen to what you are saying
- Does it make sense **listening with the ears of the audience?**

Who is Your Audience?

- A mixture of technically-literate and people with expertise in some another area [different from your own!]
- Make sure the lay people know **what** you're doing - the goal
- OK to go somewhat technical after that, but don't assume we're all expert in every sub-field of ECE and CS

Selected Proposal Discussions

Proposal Discussions

- Would like to review some (not all) of the proposals submitted last week, and engage in a discussion
  - To help all of you with your planning & execution

- Be prepared to stand up, and describe your proposal
  - What & Why
    - Describe the idea, and its motivation
  - Scope
    - Give a good sense of functionality – what is involved
    - Show that you've thought about the pieces
  - Apper: how it relates to field/expertise

Project Names

Focus	To Stop or Not To Stop
Drone-Security	PUPL
myACL	Foldr
Motivus	Ergo
ChemoBrain	PipetteAid
FlapCheck	Standby Home
Audiobook Club	Footprints
Stegosaurus	Eye Exam

Stegosaurus

What:

A password storage and management application that uses steganography and cryptography, as opposed to only cryptography, to secure the passwords. The main premise of the app is to allow users to securely store their passwords inside images. The app is consisted of several parts including the Image Encoder, Image Decoder, Image Gallery, and a Password Generator. The user may choose to input a password or have one generated using the Password Generator. The image may be chosen from the Android Gallery or the user may choose to take one using the mobile phone camera. In the Image Encoder, a tag for the associated account (e.g. Facebook, Google+, etc.), selected by the user, and a password will be encoded in the chosen image. In the Image Decoder, the information will be accessed from one of the previously encoded images.

FlapCheck

- Free flap reconstruction (the transfer of tissue from one part of the body to another) has evolved to be the method of choice for reconstructing large defects over the last 50 years. Although these procedures have a high success rate, the consequences of microvascular flap failure are devastating. It has previously been shown that the time interval between the onset of poor blood flow to the flap is inversely correlated with the ability to save the flap. For this reason, the monitoring of free flaps is of utmost importance.
- Numerous devices have been developed to aid the conventional clinical monitoring of assessing colour, temperature, capillary refill, skin turgor and doppler flow. Such new devices include implantable doppler systems, color duplex sonography, near-infrared spectroscopy, microdialysis, and laser doppler flowmetry. However, despite their development and in some cases proof that they lead to earlier diagnosis of flap compromise, there has only been a 10% adoption of this technology due to invasiveness, cost, time to use and practicality (1).
- The ideal free flap monitoring device should be harmless, rapidly responsive, accurate, reliable, and applicable to all types of flaps (2). The evolution of smartphone technology has given rise to exciting applications within the medical community and the potential for a free flap monitor that satisfies the above criteria. In 2014, the first and only smartphone free flap monitor was developed that monitored colour only (3). With the continued advancements in smartphone sensor technology, there is the prospect of developing a more comprehensive and capable smartphone application to monitor free flaps.
- We propose utilizing the smartphones as well as Bluetooth connected sensor technology to develop a comprehensive application to monitor free flaps.

Audiobook Club

Research into circulation rates at libraries has found that the circulation of classic literature is extremely low in comparison to modern literature. Similarly, a recent survey of audiobook usage has shown that out the of free audiobook providers, the one that provides modern literature is 26 times more popular than the one that provides classic literature1. These findings are problematic because classic literature is filled with wisdom that has been collected over the centuries and has withstood the test of time. In response to this problem, goal of this app is to get users to complete and engage with classic works of literature. This app meets this goal by allowing users to comment on audiobook chapters and having them receive rewards for completing books. This app will also help people gain some of the wisdom from those classic works by having people reflect upon and read others' reflections about those classic works through commenting. Essentially, the app will be an audiobook club for listening to and discussing classic literature audiobooks.

The following is a list of the main functions of this app, Audiobook Club:

- Allows users to download and listen to public domain audiobooks
- Allows users to comment and read other comments at the end of each chapter (these comments can be text or audio files)
- Allows users to gain rewards by completing chapters and audiobooks
- Tracks listening habits to show progress

Drone Security

- Recent survey shows that there are about 31 million total crimes reported annually. Thefts, assaults, robberies, assault, sexual assault makes up 76% of the total crime and were commonly perform between the hours between 6 pm to 4 am [1]. In U.S., 37% of the people do not feel safe walking alone at night in their neighborhood [2], and 38 per cent of students felt unsafe when travelling from the University to their accommodation at night. Women between the ages of 18-29 make up the majority of the numbers.
- By having a drone to follow closely with an individual and provides actions when alerted, we can ward off potential attackers to an individual when walking alone at night. The action of the drone can be set up and controlled through the mobile app. Using 2 mobile devices, 1 in client pocket (phone#1), and 1 on drone (phone#2), the drone is able to follow the client and provides person tracking using phone#2. Using person tracking, when it is recognized that another person is approaching, the drone goes into “alert mode” and performs a series of actions. Furthermore, the individual can also control the drone’s movement freely through the mobile app UI.

Standby Home

- Many systems in the house, such as heating and lighting, consume large amounts of energy but are not used for the often-lengthy periods of time the residents are away. Shutting these systems down manually on a daily basis is not convenient for residence and will likely not be done. There are some products available on the market that enable user to pre-program the heating and lighting device so that they turn off between certain set times. However, this has the potential to greatly inconvenience the user. If they don't follow the pattern they have programmed into the system, they may return to a cold and dark home.
- For this project, the team will design "Standby Home", an android application that will automatically determine whether the heating and lighting in the house can be turned down without inconveniencing the users. Standby Home will use GPS to track the users location and will lower the homes heating if they appear to be away from home. The temperature will be set with the goal of having sufficient time to return the home to room temperature if the resident started returning immediately. Factors such as whether the user appears to be at their place of work will also be taken into consideration and if it is estimated that they are unlikely to return in the near future, a more aggressively low temperature will be set.