Cyber Engineering Pilot Senior Capstone 2012

Louisiana Tech University
May 4, 2012

Outline

- Objective
- Related Work
- Our Approach
- Management
- Labs
- Conclusion

Objective

- Develop introductory curriculum for new Cyber Engineering program
- 12 labs split across two classes
- Android with Java

Related Work

- California Polytechnic State University
  - Android Labs
  - Not CS specific

Our Approach

- Focused on teaching fundamentals with Android as framework
- Android framework provides students with practical application of the concepts they learn

Project Management

- Agile process model
- Considerations
  - Group organization
  - Modular nature of project
  - Regular feedback

Configuration Management

- Github
  - Free online code repository
  - Version control

Risk Management

- Risk: Missed Deadline
  - 2 people per lab
  - Labs completed in two sets of 6
- Risk: Wasted Effort / Rejection
  - Pilot course provides feedback and direction
  - Ensures less time spent in revision

Quality Assurance

- Pilot course (closed beta)
- Review process at end of implementation
- Black box testing
  - Ensure labs perform as intended
  - Students do not get poor directions
- White box testing
  - Not completely applicable
  - Problem solution is of average complexity

Lab Topics

- Flashlight
- Image Editor
- Play a Tune
- Alarm System
- Debug a Tune
- Tuner
- Animal Sounds
- Calculator I
- Gravity Simulator
- Calculator II
- Text Encryption
- Scavenger Hunt

Flashlight

- A switch that turns camera LED on and off
- First lab
- Reinforces
  - Proper class and method construction
  - Basic Android programming practices

Image Editor

- Captures and edits an image
- Uses instances of camera object and editor object to get desired image
- Reinforces
  - Object interaction

Play a Tune

- Plays musical notes stored in an array
- Reinforces
  - Basic data structures (arrays)
  - Iteration (loops)

Alarm System

- Plays alarm if it detects sounds above certain decibel
- Students must find Android APIs to play and listen for sound
- Reinforces
  - Android APIs

Debug a Tune

- Continuation of Play a Tune
- Compiler, linker, runtime errors
- Reinforces
  - Different types of errors during development
  - Use of debugger to correct errors

Chromatic Tuner

- Analyzes input sound
- Displays nearest note and octave
- Reinforces
  - Prior material
  - Loops, control structures, data structures, APIs, etc.

Animal Sound System

- Students given animal pictures and sounds
- Maps pictures to sounds
- Touching picture plays corresponding sound
- Reinforces
  - Inheritance
  - Polymorphism

Calculator 1

- Student given mostly complete GUI
- Implement functionality behind the GUI
- Reinforces
  - Working with GUIs
  - Use of API’s
  - Programming logic

Gravity Simulator

- Touching screen creates planets
- Planets interact with each other using gravity and other physical laws
- Reinforces
  - Creating a GUI
  - Touch handling
  - Animation rendering

Calculator 2

- Students start with completed Calculator 1
- Add order of operations and recursive mathematical operations
- Reinforces
  - Recursion
  - Complex use of data structures

Text Encryption

- User enters text and uses buttons to encrypt or decrypt the text
- App displays encrypted/decrypted text
- Reinforces
  - Error checking/handling
  - Try, catch, and throw blocks for exceptions
  - Development of robust software

GPS Scavenger Hunt

- A “scavenger hunt” that uses NFC and GPS
- Search for locations on campus
- Reinforces
  - Everything learned so far
  - APIs, GUIs, methods/classes, inheritance, etc.

Conclusion

- 12 labs will form core of introductory curriculum for new Cyber Engineering major
- Labs may eventually migrate to Computer Science curriculum