MOBILE COMPUTING
CSE 40814/60814
Spring 2018

Last time...
- What is mobile computing?
- What is IoT?
- What are the enablers of mobile computing?

Today: Course Project
- Semester-long development project in broad area of mobile computing, split into two sub-projects
- Individual or team-based (no more than three students)
- If help needed identifying team members, let me know!
- Teams are expected to “produce more” than individuals!
- Project can align with your doctoral, MS, honor’s thesis, or other projects (e.g., participation in coding competition), but this must be disclosed in proposal and approved by instructor!
Starter Proposal Requirements

- 1-page PDF document (<= 1 inch margins, <= 11 pt font):

  - Structure:
    - Project Title
    - Student Name
    - Problem Description
    - List of Skills Required/Acquired
    - List of Hardware/Software Needs

Starter Project

- Goal: learn something new while figuring out what to do for final project!
- Need to decide on “something”:
  - I know Android programming, but I would like to learn iOS/Swift
  - I know iOS/Swift, but have not developed anything for smartwatches yet
  - I want to learn how to control something with a Raspberry Pi, Arduino, or similar
  - I am interested in healthcare and want to build a health sensor
  - I am interested in analytics and would like to do some mobile data collection and analysis
  - I always wanted to fly a drone
  - I want to program a robot to do something cool
  - I want to write a smartphone app that will be useful for incoming students
  - I want to learn more about wireless networks, especially Bluetooth
  - I want to build something with virtual reality
  - …

- Once you know that “something”, try to figure out as much detail as you can for your proposal.
- Describe what skills you will be able to apply and what skills you will have to learn for project.
- Also try to think ahead for final project.
Final Project

• 2-page PDF document (<= 1inch margins, <=11pt font):

  • Structure:
    • Project Title
    • Student Name(s)
    • Problem Description
    • Solution Description
    • Timeline, Milestones, Outcomes
    • List of Hardware/Software Needs

Starter + Final Project

• Example 1:
  • Starter Project: I propose to write an iOS app that tracks my location at all times and shows me on a map a daily summary of my movements. (iOS/Swift, Google Maps API, on-device data storage, location tracking)
  • Final Project: I propose to expand this app so that it collects the data in the cloud, where the data is analyzed to extract certain habits/patterns that are also displayed to the user on the device; while also computing calories/steps/etc. The app also lets me track movements of my friends. (cloud storage, cloud processing, social networking, …)

Starter + Final Project

• Example 2:
  • Starter Project: I propose to develop a Raspberry Pi system that communicates with a smartphone via Bluetooth and I can send data both ways. (RPi programming, Bluetooth programming, smartphone programming)
  • Final Project: I propose to attach environmental sensors to the RPi (either directly or via an Arduino), where the sensing activities can be programmed via the smartphone app to provide updates & alerts; data will also be transferred to cloud for later analysis of trends and visualization. (sensors, Arduino programming, push notifications, cloud storage/analysis, trend analysis, data visualization)
Potential Project Features

- Camera, microphone
- Accelerometer, gyroscope, barometer, magnetometer, ...
- Social media
- Back-end integration
- Networking/communication features, NFC/RFID
- Push notifications
- Input/output features; control of objects; etc.
- Location-awareness
- Touch, swipe, etc., interface
- Account management, sign up, log in
- Mobile payment
- Build/design new hardware; 3D print
- Augmented reality, virtual reality
- Exploits various senses
- Third-party frameworks, libraries, services, features, ...
- ...

Project Structure

- 1 written progress report per project
  - Reports can also be used to adjust proposal if needed
- Final report (up to 3 pages), delivered with code
- Brief in-class demo/presentation of project

- Resources:
  - B30 Lab & other Engineering labs
  - Plenty of mobile/sensing/embedded devices (can purchase if needed)
  - Collaboration is encouraged!!

Hardware/Software Needs

- Clearly indicate if you already have access to HW/SW or if you need help
- Lots of equipment available in our lab (and if price reasonable, we can acquire what you need)
  - iOS devices, Android devices, smartwatches, fitness bands, robots, UAV’s, Raspberry Pi, Arduino, Intel Galileo, sensors, various electronics and tools for fabrication, 3D printer, Google Glass, RFID/NFC tags, ...
Biometrics Sensing
- Electrocardiography
- Electromyography
- Galvanic skin response
- Blood pressure
- Body position
- Air flow
- Temperature
- Blood sugar

HelpHub

BlitzPool
- Game engine
- Physics libraries
- Real-time features
- Game center
ND Sporter

- https://www.youtube.com/watch?v=KxeTRTN0t10

Camp-Arduino

ChargeButler
Pen Pal
- Anonymous communication anytime based on location and/or interest.

Scout

ClassShare
Monster Hunter

UAV Tracker

iPhone Doctor
RideAlong

Solution: RideAlong

- Ride-sharing app specific to Notre Dame
- Can directly connect students who have cars with students who do not have cars
  - More specific than the Notre Dame Facebook groups
  - More likely to be used for shorter trips (e.g., to the store, rather than only to the airport)
- Students can both offer and request rides

De-Icing Sensors

Automatic Infrared Temperature Sensors
- Long Range IR Temp. Measurements (360)
- Low Cost
- Accurate
- Real-Time Monitoring

Garden GROW
### Other Projects

- Book Club
- Parking Space Finder
- Movie Finder
- Pick Up Sports Organizer
- LYNX Taxi Service
- Hearing Assessment App
- MySquirrel
- Occupational Therapy Exercises
- Stress Detector
- SnapnSpray
- Twext: Learning Betwixt Texts

### That’s it for today...

- Next up: Mobile app development, tools, best practices