MOBILE COMPUTING
CSE 40814/60814
Spring 2018

Course Overview
• Instructor: Christian Poellabauer
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  • Office hours: Tue 10-11, Wed 11-12, and by appointment
  • TA: Ding Yukun, office hours/location TBD
• Website: schedule, grading, project info, ...

Course Goals
• Fundamentals of mobile computing
• Fundamentals of wireless networking
• Topics from closely related areas:
  • Pervasive Computing
  • Wearables
  • Internet of Things
  • Real-Time Systems
  • Embedded Systems
  • Wireless sensor networks
• Acquire and practice development skills
Mobile Computing & IoT Prospects

- Mobile App Developer
- Internet of Things Engineer

CNN Money 2017

Grading

- Midterm Exam 25%
- Final Exam 25%
- First Progress Report 5%
- Second Progress Report 5%
- Starter Project Deliverables 10%
- Final Project Deliverables 10%
- Project Demonstration/Presentation 10%
- Class Participation 10%

Course Project

- Starter Project:
  - Purpose: Learn/Improve skills
  - Individually or in teams (1-3)

- Final Project
  - Purpose: Develop innovative/unique "mobile computing solution"
  - Individually or in teams (1-3)

- Ideally: final project builds closely upon the starter project
- If possible (but not required): propose starter project with final project already in mind
- Use starter project period to identify final project topic and form team if desired
- Some collaboration between teams allowed/encouraged
Mobile Computing

• A simple definition could be: Mobile Computing is using a computer (of one kind or another) while on the move
• Another definition could be: Mobile Computing is when a work process is moved from a normal fixed position to a more dynamic position
• A third definition could be: Mobile Computing is when a work process is carried out somewhere where it was not previously possible
• Mobile Computing is an umbrella term used to describe technologies that enable people to access services anytime and anywhere

Mobile Computing

• Many other names/overlapping computing paradigms:
  • Pervasive Computing
  • Ubiquitous Computing
  • Wireless Systems
  • Internet of Things (IoT)
  • Embedded Computing
  • Nomadic Computing
  • Wireless Sensor Networks
  • (Mobile) Ad-Hoc Networks
  • Mesh Networks
  • Vehicular Networks
  • …

Mobile Computing

Applications
  • Location-awareness
  • Mobility Support
  • Security
  • Resource Management
Network Protocols
  • Broadcast
  • Technologies
  • Standards
  • Wireless Medium
Wired vs Wireless

**Wired Networks**
- high bandwidth
- low bandwidth variability
- can listen on wire
- high power machines
- high resource machines
- need physical access (security)
- low delay
- connected operation

**Mobile Networks**
- low bandwidth
- high bandwidth variability
- hidden terminal problem
- low power machines
- low resource machines
- need proximity
- higher delay
- disconnected operation

Why Go Mobile?

- Enable anywhere/anytime connectivity
- Bring computer communications to areas without pre-existing infrastructure
- Enable mobility
- Enable new applications
- An exciting new research area

Evolution

- Mobile computing can be categorized into **seven major categories of focus**
- These categories are the basis for the technology that is used today in research and design of mobile computing
- Each category or section is a different area that was focused on making mobile computing what it is today
- These seven categories are: Portability, Miniaturization, Connectivity, Convergence, Divergence, Apps, Digital Ecosystems
Portability
- Reducing the size of hardware to enable the creation of computers that could be physically moved around relatively easily

Miniaturization
- Creating new and significantly smaller mobile form factors that allowed the use of personal mobile devices while on the move

Connectivity
- Developing devices and applications that allowed users to be online and communicate via wireless data networks while on the move
Convergence

- Integrating emerging types of digital mobile devices, such as Personal Digital Assistants (PDAs), mobile phones, music players, cameras, games, etc., into hybrid devices

Divergence

- Opposite approach to interaction design by promoting information appliances with specialized functionality rather than generalized ones

Applications (Apps)

- The latest wave of applications (apps) is about developing matter and substance for use and consumption on mobile devices, and making access to this fun or functional interactive application content easy and enjoyable
Digital Ecosystems

- The emerging wave of digital ecosystems is about the larger wholes of pervasive and interrelated technologies that interactive mobile systems are increasingly becoming a part of

Example: Smartphone

- Portability: carry it anywhere you want
- Miniaturization: make it possible to build device to fit in your pocket
- Connectivity: Wi-Fi, LTE/4G, cellular, Bluetooth
- Convergence: phone, camera, gaming device, movie streaming, music player, ...
- Divergence: ?
- Applications: “Rise of the Apps”
- Digital Ecosystem: social networks, distributed gaming, video streaming, work apps, ...

App Store (iOS)

- 2003: iTunes Music Store
- 2008: iPhone App Store (iPhone 3G with App Store support)
- 2015: > 100 billion app downloads
- 2016: > 2 million apps
- 2016: China biggest App Store market
- 2016: App developers earned $20 billions
- Most downloaded app: Minecraft Pocket Edition (paid) and Pokemon GO (free)
Trends in Mobile: Phone Subscribers

Trends in Mobile: Shopping

In stores: 82% of smartphone users turn to their devices to help them make a product decision.

91% growth in B2B researchers using smartphones throughout the path to purchase.

Trends in Mobile: Wearables

Global Wearable Device Unit Shipments Forecast
That’s it for today...

- Questions, comments, concerns, ...?
- Up next: Project details/discussion/Q&A/etc. (Friday!)