CIS 4930: Location-based Information Systems

Spring 2010
T/Th, 3:30-4:45
ENG 4

Tentative Syllabus

1. **Instructor**

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2. **Teaching Assistant**

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3. **Course Objectives**

This is a junior/senior level undergraduate course on location-based information systems. **The main goal of this course is to teach you how to design and develop complete location-based information systems involving mobile devices.** After completion, you should be able to:

   1. Understand the different location provider architectures.
   2. Understand location-based information systems architectures.
   3. Learn about the software and hardware architecture of a mobile device.
   4. Learn the Java ME platform and the most important APIs to develop MIDlets.
   5. Learn about programming aspects for resource-constrained devices such as memory management, concurrency, energy management, and security using the Java ME platform.
   6. Learn about global and local positioning systems and how to obtain the current location of a mobile device using the Java ME platform.

7. Learn how to send information over the network, store the information in a database, process the data, and visualize the data using Web 2.0 tools.
8. Learn how to implement Web services for mobile devices.
9. Implement a complete real-time location-based information system.

4. Prerequisites

Student must be a department major, at least junior status, and have completed Data Structures (EEL 4851).

5. Topics, tentative schedule and assignments

Week 1: Course description. The application development environment. How to upload applications in a real cell phone (Slides) (Lab 1: Your first MIDlet)
Week 2: Definition and classification of location-base services (LBS). Location provider architectures. LBS architectures. A complete LBS example. (Slides)
Week 3: Description of a resource constrained mobile device: software and hardware architectures. (Slides)
Week 4: The Java Platform Micro Edition (Java ME). The platform and the virtual machine. (Book and slides).
Week 5: The Java ME Platform (cont.). The Connected Limited Device Configuration (CLDC) Specification 1.1. (Book and slides).
Week 6: The Java ME Platform (cont.). The Mobile Information Device Profile (MIDP) Specification 2.0. (Book and slides).
Week 7: MIDlet Development. User interface and Media API. (Book and slides).
Week 8: MIDlet Development (cont.) The Record Management System and security. (Book and slides). (Lab 2: A Phone Book Application)
Week 9: Other Important Programming Aspects: memory management, concurrency, energy management, and security. (Slides)
Week 10: Local and global positioning systems. The Location API. (Book and slides).
Week 11: Storing and retrieving data from a database. (Book and slides).
Week 12: Sending and receiving data over a network. (Book and slides). (Lab 3: obtaining GPS fixes, and store them in a database over the network)
Week 13: Java ME Web Services. (Book and slides). (Lab 4: A remote calculator)
Week 14: Processing the data for improved application performance. (Slides)
Week 15: Visualizing the data in real-time using Web 2.0 tools. (Slides) (Lab 5: Showing your tracked devices in a Google map)

6. Grading

Sixty five percent (65%) of the course grade will consist of a class project where you will have to design, implement, report, and demonstrate a complete location-based information system. A list of example projects will be given as a reference. A project proposal with the description of the application and group members (up to three students per group) will have to be submitted by the assigned due date. All students in the group are expected to fully participate in both activities.

Projects will be graded against each other based on originality, complexity, end-user, community or environment impact, functionality, quality of paper, etc., i.e., the best project will obtain the best grade, the second best project, the second best grade, and so forth.

Project demonstrations are a MUST. During the demonstration we will not only check for the functionality of your system but also make specific technical questions to each member of the group about any part of the project, i.e., I expect every member of the group to know everything about the project. Therefore, this is going to be a demo and an exam at the same time.

The remaining thirty five percent (35%) of the course grade will consist of laboratory assignments and reports. You are required to submit a report per lab along with the code you developed. All labs will be worth the same. The number of labs and due dates will be given during the first week of classes. Students can do their labs anywhere and anytime in groups of up to three members, ideally, the same group that will do the class project.

All Windows computers in the C4 lab are loaded with all the applications and tools needed in the course, including the database and application server, so you can test everything locally, using one computer. There is also a server (IP 131.247.3.164), that you can use to test your applications over the network. You will be assigned a domain and database account per group. We will also have a limited set of cellular phones for you to do your labs and projects. They will have to be shared. The TA will have them and they will be given out on a FIFO basis for a total of 48 hours. You have to return the cell phones once your 48 hours expire and you will be able to get them right away again only if there are phones available. If not, the FIFO queue will prevail. Cell phones will be requested on a per group basis. If you keep the cell phones longer than 48 hrs, you will be penalized with 20% of the grade each day. This assignment will be the same for labs and projects so please take this into consideration. Please do not use the cell phones to make phone calls or any other use than the one expected for the class. **Under no circumstance use the cell phones for personal use. You will be penalized with 30% of the grade plus the dollar amount. You will be responsible for replacing the device if lost or damaged because of misusage. No grades will be posted to your assignments until the replacement is turned in.**

Deliverables:

Your first task is to identify your team and your project, and submit a project proposal with the description of the project and the group membership information. This should be a typed report worth 5% of the grade submitted on the announced date.

A high quality report will have to be submitted by the announced deadline. No extensions will be given. The report will be submitted in two parts, one by mid semester and one at the end of the semester (Deadlines will be given in class). It is expected that the first part of the report will be part of the final report and therefore will be graded only once.

The first part of the report (FPR) should contain all the sections to be included in the final report; however, only the items marked with FPR should be fully finished by the deadline. The following list is the **minimum** information that I request for the report:

1. Title, authors information (FPR)
2. Executive summary
3. Introduction and motivation (FPR)
4. Literature review (FPR)
5. Detailed project description (FPR)
    a. Hardware and software utilized, versions, etc.
    b. Software architecture
    c. System design with block diagrams and data flows
6. Description of each system component: Functional description, logical description, interfaces, relationships
    a. Graphical User Interface
    b. Database
    c. Communication choices and rationale
    d. Data processing at the device component: detailed description, rationale and expected benefit
    e. Data processing at the server component: detailed description, rationale and expected benefit
    f. Web service implementation: detailed description, rationale and expected benefit
    g. Visualization: detailed description
7. Conclusions
8. References

Include code as example in each section as appropriate.

Finally, during the last week of classes all projects will be demonstrated. The demonstration will be worth 25% of the project's grade. It is expected that all group members will attend and participate in the demonstration; otherwise, they will get zero credit in this grade item. At that time, I am also expecting a CD or similar with all the programs utilized in your system.

7. Course Evaluation and Grades

Project: 65%
        Project proposal (5%)
        Project midterm report (15%)
        Project final report (20%)
        Project demonstration (25%)

Labs: Reports and code 35%

A: 90 – 100
B: 80 – 89
C: 70 – 79
D: 60 – 69
E: Less than 60

You can view your grades in the course Web Page @ https://my.usf.edu.

Reading References

1. Programming Wireless Devices with the Java 2 Platform Micro Edition by R. Riggs, A. Taivalsaari, J. Van Peursem, J. Huopahe Addison Wesley, Sun Microsystems Java Series, Second Edition, 2003. ISBN 0-321-19789-4.
2. Java Software Solutions by Lewis and Loftus, Addison Wesley, 6th Edittion, 2008, ISBN 0-321-53205-8.
3. Location-Based Services by A. Kupper, Wiley, 2005, ISBN 0-470-09231-9.
4. Global Positioning Systems, Inertial Navigation, and Integration by Grewal, Weill and Andrews, Wiley, 2007, ISBN 0-470-04190-0.
5. Local Positioning Systems –LBS Applications and Services, by Kolodziej and Hjelm, CRC Press, 2006, ISBN 0-8493-3349-0.
6. Mobile Communications by Jochen Schiller, Addison Wiley 2003, ISBN 0-321-12381-6.
7. Many online references in Sun's web site. You just need to Google it!

b. Other material:

1. Class lecture notes
2. Hand outs
3. Journal papers

8. **USF Policy on Observance of Religious Holy Days**

   Students who anticipate being absent from class due to a major religious observance must provide written notice of the date(s) and event(s) to the instructor by the second class meeting

9. **Academic Dishonesty**

   "Students attending USF are awarded degrees in recognition of successful completion of coursework in their chosen fields of study. Each individual is expected to earn his/her degree on the basis of personal effort. Consequently, any form **of cheating** on examinations or **plagiarism** on assigned papers constitutes unacceptable deceit and dishonesty. "

   Taken from the 2000-2001 Undergraduate Catalog – Pages 44-46

   For more information visit www.ugs.usf.edu/catalogs/0001/ADADAP.HTM