KTH Teknik och hälsa

Course-PM HI1033 Mobil Sports Applications and Data Mining, P4 VT20

Background and course objectives

Today, there is a processor in almost every device that contains electronics, such as cell phones, washing machines, cars, sensors and medical equipment. Many of these devices communicate wirelessly with surrounding systems. When developing software for this type of system, it is important to take into account the limitations that exist, such as memory and computational capacity or low communication speed in communication.

In this course, you will study such mobile systems and how these systems communicate with surrounding systems. The course includes an introduction to wireless communication especially for portable devices such as mobile phones and wireless sensor networks. Programming of smartphones and associated sensors on Android. The programming labs can be performed on Android, iOS or other similar platforms. This is a practically oriented course in the development of mobile applications, including data mining techniques, for sports and health.

The following topics are included in the course:

How mobile applications can be used in sports and health.

- Common mobile platforms, such as smartphones, tablets, smart watches and bracelets, and wearables.
- Hardware, operating systems, and development tools for mobile platforms as well as API:s for third party tools.
- Mobile application programming:
    - Application components
    - User interfaces
    - Handling of persistent data
    - Sensors in mobile devices
- Platform-independent development
- Cloud and messaging services for mobile systems
- The usage of camera for video analysis

Intended learning outcomes

After successful completion of the course the student will be able to:

- design and develop applications for mobile devices, both self-contained and those that communicate over networks, including the ability to consider hardware and network limitations during design

- develop usage-tailored user interfaces for mobile devices and judge whether they are sufficiently functional for their intended use.
- develop mobile phone software that uses both internal and external sensors, such as GPS, accelerometer, wearables, and camera.
- describe several cloud and messaging services for mobile devices in connection with data analysis for sports and health applications.
- apply existing data analysis methods on sensor data to find patterns and insights for sports and health

For higher grades it is also required that the student

- has the ability to explain, analyze, and critically evaluate some recent trends within the area of mobile applications for sports and health
- demonstrate a large degree of independence and ability to present one's own work

Teacher

Course responsible teacher and examinator: Martin Jacobsson, marjacob@kth.se
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Prerequisites

Knowledge of object-oriented programming, e.g. corresponding to the course HI1027 Object oriented programming.

Course material

Development for the Android and iOS platforms

If you are developing for Android, there are tutorials and other documentation at developer.android.com, https://developer.android.com/guide/

For those who want to develop for iOS instead of Android, a Stanford course is recommended through iTunes University, "Developing iOS 11 Apps with Swift",

https://itunes.apple.com/us/podcast/developing-ios-11-apps-with-swift/id1315130780

Course webpage

The course material is available on Canvas. Contact your study guide if you cannot access the course at Canvas.

Software

Android SDK and IDE Android Studio:
https://developer.android.com/studio/
Android Studio is also installed on the computers in room T64.

iOS SDK and IDE Xcode:
https://developer.apple.com/

Examination

LAB1

Laboratory work, (Lab 1 and 2), 2 hp, grading scale: P,F.

1. Network communication and multi-threading (individual)
2. Sensors. Communication with Bluetooth (2 persons, approved lab 1 required)

Details about these labs are available in Canvas.

LAB2

Laboratory work/project work, (Lab 3), 2 hp, grading scale: A, B, C, D, E, FX, F.

3. A larger application of your choice that apply existing data analysis methods on sensor data to find patterns and insights for sports and/or health. This work is done in groups of 2-3 students. It includes a feasibility study, with idea, use cases, scenarios, a mockup of the user interface, and a preliminary system design diagram (e.g., a class diagram). The work will be presented at the seminar on 30/4.

4. Finally, working prototype will be made. Some data should be collected so that the data analytics can be demonstrated.

RED1

Oral and written examination, 2 hp, grading scale: A, B, C, D, E, FX, F.

5. This part is the continuation of the activities in lab 3. The work of lab 3 will be presented and demonstrated at the seminar on 28/5. If difficult to demonstrate at the lecture room, a video clip should be recorded and showed instead. The video clip should demonstrate the app in action and not be longer than 3 minutes.

6. A written report describing possible extension and/or enhancement of lab 3. The report must include a literature survey that evaluates some recent trends relevant to your lab 3 application. As well as describe cloud and messaging services in connection with data analysis for your lab 3 application. Canvas contains a template that you are expected use.

7. Provide peer-review feedback to the other reports in the course. You are also expected to take the peer-review feedback that you receive into account and enhance your own report. Note that you need to provide high quality and constructive feedback. Your feedback can never fail your fellow students.

Criteria for the written report:

- Everything that is important to the project should be included in the report only once, repetition in condensed form is only allowed in the summary.
- It needs to be readable with a good language.

- It should be possible to repeat what you have done based on your report, given unlimited resources. Space-consuming materials can be added as appendix.
- The report should be written in the passive form imperfect (Ex: "the report was written", "the equipment was built", "the programming was carried out").
- Everything in the report must be true.
- When you have used other people's work, the source must be stated. This applies, for example, to text, program code, and images. **Submitted reports are checked for plagiarism with an effective online tool**.
- Use a standard reference style (e.g., Harvard or Vancouver) and stick to it always.
- We expect several references of different types, including research papers, product descriptions, news articles, etc.
- Figures should be clear and have appropriate resolution. If they contain text, the font should be about the same size as other text in the report. Each figure should have a number that is referred to at least once in the body text and a figure caption that briefly describes the figure.
- Follow other relevant recommendations for writing good scientific papers. See for instance IEEE Author Guidelines (http://ieeeauthorcenter.ieee.org/wp-content/uploads/Transactions-instructions-only.pdf).
- The report must not exceed 2-3 pages, not counting appendices and supplemental material.
- Put everything on Canvas. The report is uploaded in the designated assignment area. The other material is placed in the group's file section.
- The deadline for the initial report is May 13, at 1:00 pm.
- Deadline for peer review feedback is May 18 at 1:00 pm.
- Deadline for the final report is May 27 at 1:00 pm.

Final grade

The final grade is the lowest grade of LAB2 and RED1 given that LAB1 is passed.

Detailed planning

Reading instructions can be found on the course web.

F1	16/3	Curse introduction (MaJa)
F2	17/3	General questions about OOP (MaJa and JoWi)
F3	18/3	Introduction to the Android OS and the ART. Activity and Application lifecycles. User interfaces, events (AsLm)
Ö1	19/3	
F4	23/3	More Android UI. Concurrency: Thread, Handler, ASyncTask, Services (AsLm)
Ö2	31/10	
F5	26/3	Android networking, using Internet resources. XML and JSON parsing. Intents and Broadcast receivers. (AsLm)
Ö3	26/3	
F6	30/3	Usability (JoWi)
Ö4	31/3	
RED	2/4	Laboration 1 (AsLm)
F7	6/4	Sensors (JsWn, AsLm)
Ö5	7/4	
F8	9/4	Bluetooth (AsLm)
Ö6	9/4	
F9	20/4	State of Art (JsWn, MaJa)
RED	21/4	Laboration 2 (AsLm)
F10	22/4	Data Mining (MaJa)
	23/4	Supervision of projects (JsWn, AsLm)
F11	27/4	Video (JsWn)
	28/4	Supervision of projects (JsWn, AsLm, MaJa)
RED	30/4	Halftime seminar of project (JsWn, AsLM, MaJa)
~~**F12**~~	~~4/5~~	~~Guest lecture?~~
	5/5	Supervision of projects (JsWn, AsLm, MaJa)
	14/5	Supervision of projects (JsWn, AsLm, MaJa)
RED	28/5	Final presentation of project (JsWn, AsLM, MaJa)