A New Paradigm for Teaching Mobile Application Development

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ABSTRACT

We present a new paradigm for teaching mobile application development, focusing on software development and software engineering capstone projects with industrial sponsors. We support our new approach by showcasing a number of student projects conducted at three di erent post

> evolution of mobile devices is di erent from the traditional desktop environments as new kinds of devices are appearing in the marketplace that are not general-purpose but their usage is focused (e.g., tracking tness activities)" [10].

Some challenges of teaching mobile applications are \too complex and too big" [11]. Students like to have more practical sessions with a tutor, just to follow practical examples. The authors reported that time restrictions are very critical and really they could not feasibly implement everything they planned.

Authors in [12] describe \an e ective way of introducing iPhone application development to undergraduate students". They found that the students \can quickly grasp the essentials in iPhone application development. These include the unique syntax features in Objective-C and new Apple's programming language Swift, the iPhone SDK and core frameworks, development tools, and design patterns".

3. MOBILE APPS DEVELOPMENT IN OUR COURSES AND PROJECTS

At Okanagan College (OC) we involved industrial sponsors since 2005 in both our programs: Bachelor of Computer Information Systems Degree (BCIS) [13] and Computer Information Systems Diploma (CIS) [14]. Brief information about CIS/BCIS courses can be found online[1].

Currently we involve industrial sponsors starting from the rst capstone project course COSC 224 \Projects in Computer Science" (CIS/BCIS programs) in Winter, but students begin project requirements analysis and initial design in the Fall in COSC 236 \Object-Oriented Systems Analysis and Design". In the BCIS program students have COSC 470 \Software Engineering" and COSC 471 \Software Engineering Project" in which they start \design and implementation of large, multi-module-program systems" [15]. In the last decade the Computer Science department was able to o er 2 additional courses every second year for mobile to oment, COS].(io)1(s-132.A1(tri)1(m)-32in)1(li)11i thions -10.461 Td [(A)1(u)1(th)1(o1(u)1(t)31(.5(c)1(a)1(p)3))1cne jut.p1(t)1(")-344(i

the topic selection, the topic chosen must relate to mobile device implementation. The key of an application development project is to find a target application that solves real life problems. Because of the nature of the problem, the first group of the projects require to develop only the mobile application version. In this case the desktop application version is not suitable or would not bring any benefits to the client. One of the examples belongs to this category - a wide spectrum of context-aware applications. For this projects, students used different device sensors (motion, environmental, position, etc.) and communication (including users' interaction, identification and personalization) to understand the user's context. These components work together to continuously acquire, model, and notify the user of the mobile application. The recognition of the context and automation of anticipated response by offering contextually relevant information and service is the main challenge of context-aware systems.

Having the mobile context advantage, students face higher level of technological complexity and a number of problems. Many context information sources may be different, unreliable, sometimes unavailable or replaced dynamically. Secondly, one of the most important issues is a task of deriving high-level context information by constructing low-level context information. This can be very complex and sometimes impossible.

In this case, potential errors could occur because of a wrong interpretation of the context. And finally, with the development of context-aware applications, the privacy issue is increasingly capturing our attention. To address those challenges we have to use an encryption mechanism for data and to make sure that the sandboxing mechanism works correctly on a device, in order to guarantee that malware without root privileges cannot access data stored in an applications context.

The second project type - the situation when students require to design and develop mobile and desktop applications at the same time, but for different product functions. For example, the desktop application could be responsible

oped in 2012 for both Android and iPhone. Some technical and management problems arose during the project development. The PhoneGap framework was utilized by the students during the project. They nished a prototype for the Android platform. They lacked project management skills and have never before developed any applications for mobile

In mobile applications development, Cloud should be used for permanent storage mostly, including encryption on both client and Cloud sites. All processing should be done mostly on mobile devices. Many mobile devices have enough processing power for many applications, but network interruption or lack of Internet services (or too expensive services) create problems for the networked applications on mobile devices.

Middleware application servers for mobile devices should be used only when it's really necessary. We had several projects in the past where students developed mobile applications with the main processing part on a middle server. The developed projects were dead in 6 - 12 months, because the middle-ware or application servers require additional support and maintenance. This is a typical problem with the mobile applications development.

All data processing and computations may be done on mobile devices in many cases, but Cloud may be used for the data exchange and for endusers data storage. In many cases it's better to use native programming languages or code generators like Lua for both Android and for Apple mobile platforms in multi-platform projects.

All data and tra c must be encrypted on both sides and even during data transmission, but this is another challenge for the students.

Mobile devices can share processing power, especially by using Peer-to-Peer (\P2P") technology. On the other

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