Chapter 4.13

Open Source Implementation of Mobile Pair Programming for Java Programming Class

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ABSTRACT

Pair programming has been used to improve the learning of programming by many computer science educators. Implementing pair programming on the mobile learning platform can significantly improve the availability and collaboration between pair programming partners. This chapter explores a set of open source mobile technologies that can be used to implement mobile pair programming. It shows that mobile pair programming can be implemented entirely with open source or free software.

INTRODUCTION

As mobile technology advances, mobile learning has been adopted by more and more educational institutions. Instructors and students of universities and schools have developed various effective solutions to implement mobile learning in many academic fields. For non-technical academic fields such as English, history, communication, and so on, the implementation of mobile learn-

ing requires less effort. On the other hand, in lab intensive academic fields such as computer science, biology, and so on, the implementation of mobile learning has to consider how to implement lab activities through a mobile network. The mobile learning designer needs to consider the usability, compatibility, and affordability of a mobile network infrastructure when implementing the lab activities required by the curriculum. The designer is required to thoroughly understand the lab activities' requirements and the technologies used to carry out the mobile learning. To illustrate

some strategies and methods for implementing lab activities over a mobile network, this chapter considers the implementation of mobile pair programming with open source and free products.

The discussion starts with the investigation of the behaviors of novices in learning programming. This chapter briefly reviews the literature of research in teaching beginning programming classes. One of the methods suggested by these researchers to improve learning programming is pair programming. Several articles discussed the use of pair programming and gave the evaluation results. Most of the pair programming studies have been done in the lab environment. A pair of students works together in front of one computer. In a mobile learning environment, it is challenging for two students to do the same. Currently, it is hard to find research on implementing pair programming in a mobile learning environment, especially with open source products. This situation leads to the discussion in this chapter.

This chapter gives an overview of mobile pair programming. Originally, pair programming is a method used by professional programmers to efficiently develop computer software. This chapter briefly discusses how pair programming can also improve programming skills. It explains the methods of pair programming and how pair programming is used in a programming class. This chapter also examines the difficulties in implementing mobile pair programming.

This chapter discusses how mobile pair programming is implemented with open source or free software. It introduces a list of open source and free software that can possibly be used in a mobile pair programming project. The list includes the software on the server side, the software on the client side, and the software for collaboration. The server side software includes the server operating system, integrated development environment (IDE), software development kit (SDK) for mobile devices, and virtualization software. The client software includes the mobile device emulator, Internet voice service, Web browser, messaging

service client and social service client software. For the implementation of pair programming, this chapter also introduces several collaboration software and screen sharing software. It briefly describes the features and functionalities of the open source and free software.

This chapter illustrates the implementation of pair programming through a case study project. The software used in this project is either open source or free software and can be freely downloaded from the Web. The project includes the implementation of the server operating system Ubuntu, the virtual machine VMware, Eclipse IDE, Android Application SDK, VNC screen sharing, the integrated voice service Nimbuzz, the social service software Skype, and the Android mobile device emulator. The project demonstrates software selection strategies, installation procedures, and the configuration of software to meet the pair programming requirements.

BACKGROUND

Due to its ease of use, versatility, security, cross-platform capabilities, and multimedia features, Java as a programming language has been widely used in computing related curriculums (Klawonn, 2008). Java is often the choice for the courses such as introduction to programming, multimedia applications, Web development, operating systems, human computer interfaces, and so on.

On the other hand, in computing and technology education, learning programming posts some challenges to students who are new to programming. Programming has been identified as one of the great challenges in computing education (McGettrick et al., 2005). The challenge of programming has contributed to the relatively low enrollment and retention rate in the computing related programs at higher education institutions (Denning, 2004). Robins et al. (2003) described the characteristics of the novice programmers as below.

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