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Statement of Topic: New Trends in Automated Project Grading for Web Programming Classes

Abstract: A sophisticated course project in a web programming class usually involves complex graphical user interface, back-end database, server configuration and asynchronous data exchange. To automatically grade such projects raises new challenges to automated grading tools. This poster introduces several on-going explorations in the area. APOGEE is an automated grader for web programming projects, which adopts a trial-and-failure teaching strategy. Students can submit projects multiple times to APOGEE before deadline. Each submission is graded instantly, consistently, and fairly. Failure scenario is demonstrated to students interactively online, step by step. The poster will address several interesting topics such as configuration of virtual execution environment, design of project specification, creating testing packs, analysis of student responses. More details of the APOGEE project are available at: http://people.hofstra.edu/Xiang_Fu/XiangFu/Projects/APOGEEHomepage/.

Significance and Relevance of the Topic: Automated project grading is very valuable at elevating faculty productivity and improving student learning experiences. The uniqueness of APOGEE [1,4] is its ability to handle complex graphical user interface and asynchronous data exchange in web programming projects. We believe our experiences in handling many practical issues, e.g., virtual execution environment, would be valuable for colleagues teaching courses related to web programming.

Content: The poster will address the following components.

- (1) APOGEE System Demo: Screen-shots of the system will be provided for demonstrating how to create a web programming project, design testing pack, load pre-compiled testing scripts, review submissions, and generate grading reports.
- (2) Configuration of Virtual Execution Environment: We discuss how to set up virtual running environment for deployment of student project submissions. This involves several alternative approaches such as virtual laboratory based on remote connection, automated project uploading, and configuration of database connections.
- (3) User Experiences: We will summarize the experiences of using APOGEE for improving instructional effectiveness at the universities that have adopted the APOGEE system. Analysis of student and faculty evaluation will be presented.
- (4) APOGEE Courseware: A collection of project packs (project specification, sample solution, test cases) have been developed for APOGEE. They are freely available for use and can be easily loaded into APOGEE. Handout will be available for several project packages that cover various aspects of web application design, e.g., client and server side scripting, back-end database, session management, AJAX technique, and topics related to web security vulnerability (e.g., SQL injection and Cross Site Scripting attack).

(5) Extension of APOGEE: As a test case replayer, APOGEE can be potentially integrated with automated web application security penetration tools like SAFELI [2,3]. We will demonstrate the function using a case study example.

References

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[2] X. Fu, X. Lu, K. Qian, B. Peltzberger, L. Tao, and S. Chen. "A Static Analysis Framework for Detecting SQL Injection Vulnerabilities." In Proceedings of the 31st IEEE Annual Computer Software and Applications Conference (COMPSAC 2007), pp. 87-96, Beijing, July 23-27, 2007.

[3] X. Fu, and K. Qian, " SAFELI: SQL injection scanner using symbolic execution." In Proceedings of the 2008 Workshop on Testing, Analysis, and Verification of Web Services and Applications, held in conjunction with the ACM SIGSOFT International Symposium on Software Testing and Analysis, (TAV-WEB 2008), pp. 34-39, Seattle, Washington, July 21,2008.

[4] X. Fu, K. Qian, C. Li, B. Lim, NSF-CCLI-0836859, CCLI-0837275, CCLI-0837020, "Collaborative Research: A Trial-and-Failure Project Tutoring System." 2008 - 2010.