Incorporate PDC Topics into University Level Digital Computer Principles Class at Jackson State University

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Abstract_ Digital Computer Principles (CSC 115) is a university level course offered by the Computer Science department at Jackson State University (JSU) for non Computer Science and Engineering majors. This course offers a wide range of topics including Introduction to computers, Internet and www, operating systems, utilities and computer security. In an effort to update the contents of this course, some contemporary Parallel and Distributed Computing (PDC) topics and their essence in higher education will be incorporated into the course during fall 2015. Currently, Digital Computer Principles (CSC 115) course is in the processes of restructuring to become a digital core course. PDC digital contents will be developed for this purpose this fall and next spring semesters. In order to assess students' perception of PDC topics; specific test questions, homework assignments and projects will be developed. We plan to categorize the assessment results by major and college in order to share our findings with all colleges at JSU. We will also share our experience with other institutions through conference publications and make our course material and assessment data available on CDER website. Based on some initial feedback from students enrolled in CSC 115, most students expressed no previous knowledge of PDC. In fact, most students are counting on this course to build their PDC knowledge.

BACKGROUND

Jackson State University has a student population that is over 90% from under-represented groups. This project will therefore have a direct impact on minority's technology education. Not only will this project enhance the quality of JSU graduates, but also, it will introduce them to the latest advancements in the area of PDC.

The Computer Science department at JSU offers Digital Computer Principles (CSC 115) course which is mandatory for all non Computer Science and non Engineering majors. It is offered every semester; with about ten sections with an approximate average of thirty five students, making the total number of students registering for this course more than three hundred and fifty students every semester.

THE EARLY ADOPTER COURSE

The current course description is: *CSC 115 (3 credits) Digital Computer Principles. Subject matter consists of Internet and world wide web, Computer hardware consisting of systems components, i/o devices; system software which includes operating systems and utility programs; application software consisting of word processing, spreadsheet, database, graphics, and multimedia, and Internet explorer 8; computer security and safety issues; number systems, internal data representation and an introduction to a high-level programming language.*

An ongoing effort has started at JSU to restructure this course. Some Parallel and Distributed Computing (PDC) topics will be added to this course and included in the digital core course. The following is a brief discussion of these topics:

- Distributed Computing Overview: Students will learn how multiple computers and processors work as a distributed system.

- Client/Server paradigm: The most commonly used communication paradigm in the Internet. It consists of a server and multiple clients. The client request information from the server and the server respond to the client request. Examples include: World Wide Web (www), web search, online gaming, social networks, email, ecommerce, etc.
- Peer-to-peer paradigm: Peer-to-peer (P2P) computing was influenced by three major systems: Napster sharing system, Freenet data store; and SETI volunteer-based computing projects. The Napster allowed its users share files through the Internet. The P2P communication has been widely used in Open Source Software communities and industry. Examples of P2P systems are BitTorrent, Skype, PPlive, Cool Streaming and iPlayer.
- Parallel Computing: It is a computation that is carried out simultaneously by many processors sharing some data. There are several ways to implement forms of parallel computing: task, data, instruction, and bit-level parallelism. High Performance Computers (HPCs) can be categorized into three levels: multi-cores, multi-processors, and multi-computers parallel computers. Some of the HPCs consist of multiple forms of parallel hardware components.
- Internet of Things (IoT): Nowadays, a lot of devices used in many different applications are equipped with firmware, sensors, electronics, and connectivity to allow them produce new types of services.

It is expected that the total number of hours to cover PDC topics will be close to five hours. The following topics in the current CSC 115 course listing will be reduced or eliminated to accommodate for the newly added PDC topics: Microsoft Word (reduced by 1.5 hours), Microsoft Access (eliminated 3 hours).

PROJECT EVALUATION PLAN

In order to assess student's knowledge of PDC concepts, special exam questions, quizzes, homework assignments will be developed. Surveys asking about student's PDC knowledge before and after taking this course will be distributed. We plan to categorize the assessment results by majors and colleges. We would like to know which majors feel that PDC knowledge is crucial to their field of study and why. Our goal is to share the assessment results with all departments and colleges at JSU in order to develop a plan to enhance their curriculum and respond to our students' technology needs. The findings of this project will be shared with the research community through publications and presentations in relevant conferences/workshops and through the CDER website.

CURRENT AND FUTURE ACTIVITIES

So far this fall semester, we were able to develop the PDC material that will be integrated into CSC 115 class. A survey was conducted for initial feedback from students about their PDC knowledge. Ninety students responded to the survey where 16% were freshmen, 38% sophomores, 38% juniors and 9% seniors. The majority of students indicated no previous knowledge of PDC! However, almost all students expressed their desire to learn about this topic. And some did not mind pursuing a career that may require some PDC background. A lot of the students though, were not sure how PDC can be related to their major field of study.

By the end of this semester, we plan to have assessment data and feedback from both students and faculty members which will guide us develop a more comprehensive plan to integrate PDC topics into Digital Computer Principle class for the coming semesters.