TCPF EARLY ADOPTER: INTRODUCING PARALLEL AND DISTRIBUTED COMPUTING TO MINORITY UNDERGRADUATES

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OVERVIEW: PRAIRIE VIEW A&M UNIVERSITY

Prairie View A&M University (PVAMU) is the second oldest public institution of higher learning in Texas, and is one of Historical Black College and Universities (HBCU). With an established reputation for producing engineers, nurses, and educators, PVAMU offers baccalaureate degrees in 50 academic majors, 37 master degrees and four doctoral degree programs through nine colleges and schools. The university is accredited by the Southern Association of Colleges and Schools as a comprehensive public institution of higher education. The total Fall 2009 enrollment was 8,577 students with 90% of the student population consisting of African-Americans. The university has established a reputation as one of the nation’s top 10 producers of African-American engineers. The College of Engineering (CoE) at PVAMU consists of six departments and seven programs accredited by the Accreditation Board for Engineering and Technology (ABET).

PARALLEL AND DISTRIBUTED COMPUTING TEACHING STATUS

In Spring 2012, we have revised syllabi of Computer Science II (COMP 1224), Algorithm Analysis (COMP 3053), and Operating System (COMP 3063) by integrating TCPP concepts. TCPP lectures have been integrated into the related chapters in the three courses. We have collected the student survey data to evaluate the student’s feedback. The new course “Introduction to Parallel Computing” has been submitted to the curriculum committee and the teaching materials are under development.

Computer Science II

“Computer Science II” (COMP 1224) is a 4 credit hours class with 3 hours for teaching and 1 hour for computer laboratory. There are 26 students in Spring 2012. TCPP Integration:
- Threads
- Data sharing
- Synchronizations
- Speedup
- OpenMP Programming
- Think in parallel

Feedback:
- A good idea to introduce the parallel computing concepts at the early stage
- Students have shown enthusiasm in studying parallel programming skills
- Demonstrate the benefits of parallel program in performance.
- OpenMP is much easier to understand
- Multithreading is confusing to most of them

Algorithm Analysis

“Algorithm Analysis” (COMP 3053) This course is a very popular course in computer science curriculum. Students in this class found the interests of programming and developed problem solving skills. There are 16 students in Spring 2012. TCPP Integration:
- Multicore
- Parallel algorithms
- Synchronizations
- Speedup
- OpenMP programming skills
- Design parallel algorithms

Feedback:
- Get used to sequential programs.
- Like the comparison of sequential and parallel algorithms
- More practices of using multithreading and MPI are needed.
- Synchronizations are hard

Operating System

“Operating System” (COMP 3063) is one of core courses in Computer Science. There are 10 students in Spring 2012. TCPP Integration:
- Multicore architectures
- Multithreading concepts
- Synchronizations
- Threads scheduling
- Load balancing
- Speedup
- OpenMP programming skills

Feedback:
- The introduction of thread scheduling and load balancing help students understand better how OS manage tasks.
- Distributed computing needs to be introduced.
- A class project for thread scheduling will help students understand better the modern architectures and load balancing strategies.

Future Plan

New Course Plan:
- Work on the plan to introduce a new course “Introduction to Parallel and Distributed Computing” in the curriculum of Computer Science.
- 3 credit hours course offered to junior and senior undergraduates.
- Include: the parallel architectures, the concepts of parallelism and applications, the parallel programming models, and parallel programming practices.
- OpenMP programming, debugging and performance tuning skills.
- To get students better prepared in studying Computer Science in MSCS and MSCIS programs.

Other Courses Integration:
- Embed TCPP to the computer programming related core courses in the current CS curriculum.
- Include: CS I & II, data structure, algorithm analysis, operating system, programming languages, computer architectures, and network.
- Continue to conduct surveys to get feedback from the students to understand the difficulties and adjust them accordingly.
- Share the teaching materials and experimental platforms.

Conclusion

Based on our experience in the Spring 2012, the TCPP introduction to undergraduates is not only feasible, but also is promising. We have observed the interests of students in learning the new concepts and found out the difficulties of teaching them. The experience is very useful and we will continue to integrate the knowledge to other classes. We are also sharing the teaching materials to other faculty members.

Acknowledgment

We gratefully thank to the NSF/TCPP Core Curriculum Early Adopter Group to support the curriculum changes at PVAMU, and provide the traveling funds to present our work at the EduPar-12 conference.