COMPAD, Blazing New Trial in the Learning of Computer System

This is what many professors often encounter when teaching computer system: students in the look of bafflement, and can’t seem to fully understand the lectures delivered. On the other hand of the spectrum, this is what Vincent W.L. TAM, professor at University of Hong Kong and the principle investigator of the MSRA funded project, An Innovative and Pen-Based COMPAD Platform to Enhance Education and Research in Computer Systems, encounters when teaching computer system: students getting abstract concept across and showing great enthusiasm toward the lessons. What differentiates the classes, provides effective teaching and receives positive feedback is the introduction to COMPAD.

An Innovative Learning Pad

COMPAD, the Learning Pad for Computers, is a simulator that aims to facilitate learning of computer systems, especially on the program execution. COMPAD simulator is important for it can greatly increase the understanding of the internal working on computer system for both computer and electronic engineering students because it provides flexible model for various computer system. Besides, the concept of IEEE learning objects was also integrated into COMPAD simulator, so each component in the computer system corresponds to some learning object. As a result, when COMPAD is used in teaching, the course instructor can flexibly reconfigure the computer system according to their preferences.

Easy and Fun-to-use

Getting COMPAD simulator is easy. First of all, the prototype is provided on the course website for students to download onto their notebook. After the installment, students can know different computer system configuration when executing the sample program on Microsoft.Net platform. In this way, students can understand clearly about the actual event occurring in program execution. What’s more, after students load in the configuration, they can make use of the touch-face pen-based screen to modify instruction and add in more components regarding configuration, thus increasing the interactivity and composing a more useable, advanced computer system.
Spawning the Idea from Students

The idea of developing COMPAD simulator stems from the consideration Prof. TAM showed toward his students when teaching year one Computer Architecture courses back in 2007. “I found whenever I explain about how the different registers and micro-processors work in terms of program execution, the concept is very abstract to the student; they always have lots of questions because they can’t really understand and visualize how the computer works.” Prof. TAM said in a recent MSRA interview. To cope with the problem, Prof. TAM came up with the idea of doing COMPAD simulator in hopes of helping them visualize the detailed event occurring at the micro-processor level, thus increasing the understanding of the internal working of computer system.

Positive Feedback beyond Expectation

The positive feedback from students and the survey result collected is beyond Prof. TAM’s expectation. After the first version of COMPAD simulator is launched and imposed in the tutorial classes in 2009, students praised it by telling Prof. TAM, “Dr. TAM, we really love COMPAD simulator, you should better introduce it earlier, so we can better understand mechanism.” What’s more, the survey result collected proves that COMPAD simulator is effective in terms of learning of computer system. The survey is conducted by the department of Electrical and Electronic Engineering in University of Hong Kong, and also in collaboration with Center for the Enhancement of Teaching and Learning (CETL), and the feedback proves to be very positive.

Students’ words

“COMPAD works quickly; we can change the timing like slowing it down or making it faster. We can take out the components we don’t need, and focus on the thing we want to understand. It makes the learning of computer system
“COMPAD can greatly help me in the understanding of computer system. By using diagrams on the interface, I can know each steps occurring during the program execution clearly. Also, it is easy to use, which is very beneficial for beginners. I would definitely recommend COMPAD simulator to students in similar subject areas.”-- Wang Jiao

**Future Research**

The flexible architecture built for COMPAD simulator can apply to various subject areas, not just to computer architecture. For example, electronic or computer related courses, engineering-related courses, even to digital image processing courses. Since the influence is unlimited, we can make the most out of it by implementing COMPAD, and using the simulation tools in explaining difficult or abstract concept in various subject areas.

**Comments and advice to Microsoft**

“Microsoft Research Asia may want to consider some more regular or periodic research meeting among all the researchers in similar areas, or across different areas, so as to increase the interaction and the exchange of research ideas. Other than that, I would also like to see some regular internal research publication, probably not just until the project is complete, but for some on-going projects as well. I’m very positive in essence that Microsoft Research Asia is doing the right job, but you can probably enhance the team even more by widening the reachability of the team and making it more regular and accessible to all the researchers.” – Prof. Vincent W.L. TAM