



Dynamic activities for fixing concepts of Computer Architecture and Organization undergraduate classes.

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Abstract

The Computer Organization and Architecture classes are usually offered in undergraduate courses in Computer Science in the first semesters. The aim of this project is to give to the professors a well-documented set of activities, which could support the concepts discussed in the discipline and consequently promote means to improve the performance of students who present difficulties in understanding the concepts addressed in the discipline.

Key words:

Organization and Architecture, Learning support, Education.

Introduction

The Computer Organization and Architecture subject is usually present in the Information Systems, Systems Analysis and Development, and in Telecommunication Engineering courses. The subject goal is to approach the concepts of the internal organization of a computer, its components, and the relationship between them.

The students that apply to the course in the first semesters have major difficulties in learning some concepts presented in class. A research realized by Omid Mirmotahari, Christian Holmboe and Jens Kaasboll (2003) at the University of Oslo [2] verified that the greatest difficulty to the students is related to Boolean algebra and assembler programming. The main reason involved to this is the less time of dedication to study outside the classroom.

To assist the learning process, some professors decide to use software simulators that cover all topics of the subject to improve the learning process by the students.

Results and Discussion

For the achievement of this study, we did a literature review in the following bibliographic bases: IEEE Xplore Digital Library and ACM Digital Library. We use the following keywords related to Computer Organization and Architecture subject to filter and find papers on the theme Simulators, Computer Architecture, Computer Organization, Education, Logic Simulator, Boolean Algebra, Assembler, and Logic Circuits

The software suggested by the papers we searched for were Boolean Algebra Calculator, Cedar Logic Simulator, CPU-8E, K-map, Logic Friday, Logic.ly, Logic Works, LogiSIM, LogiSIM Computer Assembler, Multimedia Logic, and SPIM. After installing them in computers with Windows and Linux operational systems, we made tests regarding criteria such as software language, if the software is intuitive, if they provide access to tutorials, if the download and installation are easy tasks, what operating systems it runs, what are the dependencies on other software, and if they are free or licensed software.

We create a table to compare this software. After that, we prepared a set of practical activities with resolutions. All activities and their solutions are in a website available to everyone.

Conclusions

From the analysis, we concluded that the choice of the ideal software to support the subject Computer Organization and Architecture depends on several factors. For Brazilian students, it is important that the software is in Portuguese or be so intuitive that the student would be able to use it regardless the language it uses.

We established these to determine positive and negative features in each software, to make a comparison between them and, thus, to assist the choice for the best option depending on the requisites of each class or student.

The practical activities that we proposed are in different levels of difficulty, which ensure that teachers and students have access to a set of activities that satisfy their necessities.

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² MIRMOTAHARI, O.; HOLMBOE, C.; KAASBØLL, J. "Difficulties learning computer architecture" ACM SIGCSE Bull., vol. 35, no. 3, p. 247, Set. 2003.

³ ASSOCIATION FOR COMPUTING MACHINERY, "ACM Digital Library" Available at <<http://dl.acm.org/>> Access in: October 10 2015.

⁴ INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, "IEEE Xplore Digital Library". Available at <<http://ieeexplore.ieee.org/Xplore/home.jsp>> Access in: October 2015.