

ELECTRONICS WORKBENCH THE ELECTRONICS LAB IN A COMPUTER

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Abstract

The electronics workbench is an electronics lab in a computer. This package provides students with the ability to study a circuit behavior and check the results as they are displayed on the multimeter, oscilloscope, Bode plotter, and logic analyzer. The analog, digital, and mixed-mode features make this package a practical tool that may be incorporated as part of the electronics laboratory assignments.

Introduction

Electronics, perhaps more than any other field of technology has enjoyed an explosive development in the last four decades. Electronics is a fascinating field because it provides the opportunity to be creative and at the same time solve problems.

In the electronics programs every effort has been made to have the students develop a good intuitive feel for circuit operation, while at the same time showing him or her how to analyze expected circuit performance using the appropriate mathematical relationship. This permits the students to systematically analyze, troubleshoot, or even design various circuits in an orderly and effective manner.

Most electronics courses taught these days are organized around what is called lecture-and-lab structure. This structure typically uses lectures on subject matter and is supplemented by laboratory experience. In addition to familiarizing the students with the type of equipment that he or she will use in industry, the experiments are also designed to verify or prove out the theoretical concepts discussed in the classroom. Very often this experimenting in the lab is the only hands-on experience the electronics students are likely to get. Students do not ordinarily build permanent, working prototype projects.

If the laboratory experiments are not generating the expected results, very often the whole experiment needs to be repeated. The unexpected results could be due to faulty components, incorrect design specifications, or improper connections. Nonetheless, implementing a circuit in the lab with undesired output might be time consuming. However, having an electronics simulator will enable the students as well as the instructor to analyze the performance of a circuit prior to implementing the actual hardware components.



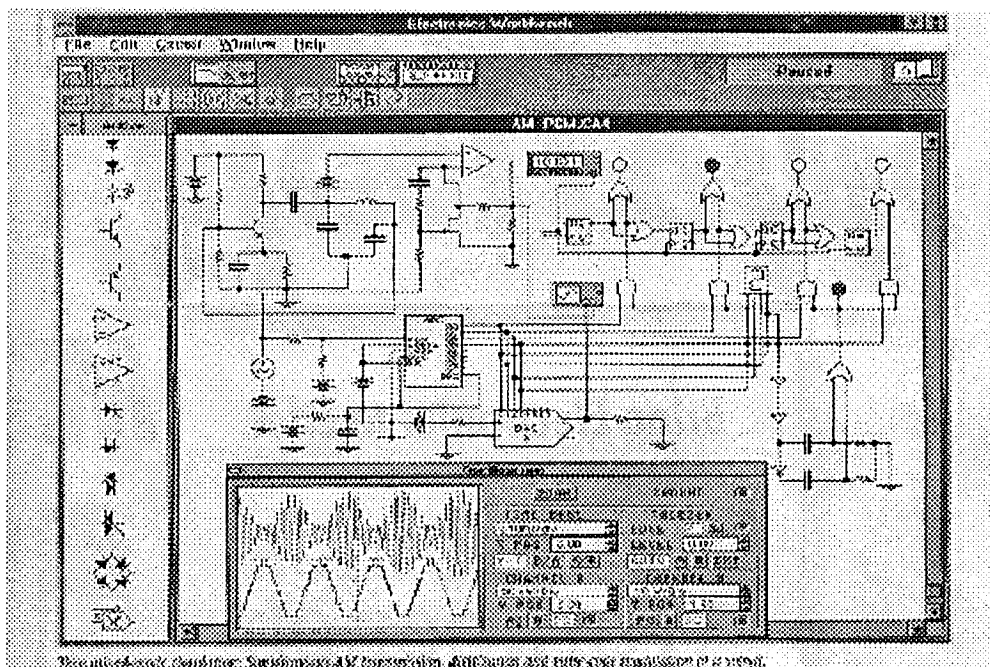
The Need for an Electronics Workbench in a Computer

In order to appreciate the arts of electronics and have an ideal learning environment, an electronics workbench in a computer (a simulator) is required where every student has access to working with plentiful components and indestructible equipment. Having such access will enable students to test their circuits and display the circuit-output waveforms directly on the screen instruments. An electronics simulator enables students to easily build an analog, digital, or a combination of analog-digital circuit schematic, attach desired instruments, and study the performance of the circuit by displaying the results on the oscilloscope, Bode plotter, logic analyzer, or whatever measuring instruments are attached to the circuit.

The package that I use in our electronics lab "Electronics Workbench Version 4" by Interactive Image Technologies LTD. is an excellent and practical tool for our students. This package offers analog, digital, and mixed-mode simulations. In addition to simulating working circuits, the Electronics Workbench simulates electrical faults such as open or short-circuit of any component, or enables individuals to specify the leakage to explore the trouble shooting techniques.

The analog module will provide both independent and controlled sources with linear components that include: resistors, capacitors, inductors, relays, and transformers, as well as nonlinear components that include: diodes, LEDs, Zener diodes, opamps, bipolar junction transistors, JFETs, and MOSFETS. The function generator can produce different waveforms and use of dual-signal oscilloscope as well as the Bode plotter make it possible to study the frequency response of a circuit.

The digital module with various gates, flip-flops, 555 timer, monostable multivibrator, encoder, decoder, multiplexer, etc. plus a word generator to drive a logic circuit as well as logic analyzer and logic converter make the learning environment of digital electronics a little more interesting. The mixed-mode simulation allows students to combine analog and digital schematic symbols and observe the traces displayed on the screen for the simulated circuits.



Conclusion

To make the electronics laboratory instruction more interesting and to create a more efficient learning environment there is a need for a simulator with large central workspace, various analog and digital components, as well as measuring and display equipment. The electronics workbench is a good tool to have and to be incorporated as part of the laboratory assignments. Students can build and test circuits entirely on the workspace using the mouse and menus. This paper suggest that the use of this simulator be incorporated as part of the electronic laboratory assignments.

Reference

Electronics Workbench The Electronics Lab in a Computer User's Guide. Interactive Image Technologies LTD., Toronto, Ontario Canada.

