Journal of Advanced Research in Power Electronics and Power Systems
Volume 10, Issue 1 - 2023, Pg. No. 20-23
Peer Reviewed Journal

Review Article

Exploring the Application of Power Electronics with Computer Simulation Software: A Research Perspective

Faramraz Mohammadi

Research Scholar, Electronics Department, Tehran University, Iran.

I N F O

E-mail Id:
faramrazmohammadi@gmail.com
Orcid Id:
https://orcid.org/0009-0001-8118-9911
How to cite this article:
Mohammadi F. Exploring the Application of Power Electronics with Computer Simulation Software: A Research Perspective. *J Adv Res Power Electro Power Sys* 2023; 10(1): 20-23.

Date of Submission: 2023-04-04
Date of Acceptance: 2023-05-10

A B S T R A C T

The use of computer simulation software has increased dramatically with the advancement and development of computers, particularly in the electronics and power sectors. This article primarily focuses on the study of computer simulation software technology's applications in the field of electrical power technology.

Keywords: Computer, Simulation Software, Power Electronics Technology, Application

Introduction

With the advancement of computer technology, electronic power technology is being employed in industry on an ever-increasing scale. At the same time, the nation is actively promoting the use of renewable energy sources and distributed power generation.Consequently, the importance of power electronics technology is becoming increasingly clear.

Computer

The computer, created by John von Neumann, has advanced to become one of our most significant scientific and technological achievements. It has significantly affected how people work and live, as a result, technology has advanced on a global scale. I think it will continue to improve because it is an essential instrument for social information and is always evolving.[1]

The Characteristics of the Computer

Computers are capable of carrying out logical and mathematical calculations as well as information storage tasks. It is an electronic device with intelligence that can carry out tasks according to a programme, greatly enhancing our lives. We cannot separate the computer's useful qualities from the reason why we can utilise it effectively. Its benefits include quick calculations, high calculation accuracy, sound reasoning judgement, autonomous control. The present computer system can calculate trillions of times per second and successfully handle more challenging scientific computing issues. Complex computing problems used to take weeks or even months to solve, sometimes much longer.

The use of Computers

The use of computers has been widely reflected in people's lives, such as routers, laptops, smart phones, etc. A router is a special network computer, which effectively provides convenience for our lives.

Power Electronics Eechnology

The rapid development of electronic technology makes it often used in life, the constant exploration of electronic technology has greatly improved our lives. Next, I will conduct a certain research on power technology.

Now that we have power required for our work, we cannot perform it efficiently without it. We must value the power we have now because without it, the world will become completely dark at night, which is not good for raising living standards. In order to increase the efficient growth of power electronics technology, professional talents for its direction must be trained. Power electronics technology has become an essential component of contemporary electrical engineering and automation. The first Thyristor created by General Electric in the US is widely regarded as the invention of power electronic technology. Power electronic technology has since advanced thanks to the emergence of gate-off Thyristors, power bipolar transistors, power field effect transistors.[3] Comprehensive development, up till now, the quick growth of power electronics technology has given power electronics a lot of room for development.

The Role of Power Electronics

Electricity is a ubiquitous part of our life. Through the use of power electronics, it is possible to efficiently transform one type of industrial electrical energy into another, maximising its usage and improving its efficiency, reasonability, affordability. Electromechanical equipment will be able to break out of the mould and move in the direction of high frequency thanks to the high-frequency processing of power electronic technology, which can increase productivity. In order for power electronic technology to operate quickly, the amount of linked electromechanical equipment can also be drastically decreased.

Computer Simulation Software

Computer simulation technology is continuously updated as science and technology advance, particularly the development of information and computer technology. People can come up with better ideas thanks to the efficient use of computers, the development of computer simulation software is even better. Enhance living quality and encourage life's efficient functioning.[4]

Definition of Simulation Technology

Simulation technology has evolved to analyse and synthesise a variety of systems, making it possible to do restricted study on massive systems. In order to attain the goal of efficient processing, the so-called simulation is the vividness of specific system attributes. Effective simulation must also address associated issues. Both relevant systemic difficulties and related demander-related problems must be addressed.

Traditional Methods of Simulation Software

Traditional simulation software is an iterative process, abstracting a model, then inputting the experiment, the experimenter tells the experimental results, constantly changes the experimental model according to the judgment, until it thinks that this is the case. The model can serve the purpose of simulation of the objective system by the tester. This kind of simulation software is often used in simulators, etc., which effectively improves our quality of life.[5]

Simulation Software Application

People use simulation software frequently. Its quick progress has made life more convenient for everyone, as people have advanced, so has its effectiveness. I'll then conduct a specific study of these applications.

Saber Simulation Software Application

Power electronics, control, other types of mixed system simulation can be simulated using the Sabre simulation software, which can address a number of issues such circuit programme control, simulation system, detailed design verification. For instance: as demonstrated in Figure 1.

The graph of Saber2007, L6561 data manual circuit, End Time=20m, TimeStep=lu, shows that a particular model is formed by the input voltage and current tracking waveform in a cycle. Top-down system design and bottom-up specific design verification are supported by sabre simulation. It also offers a potent mixed-signal simulator that can replicate a real system.

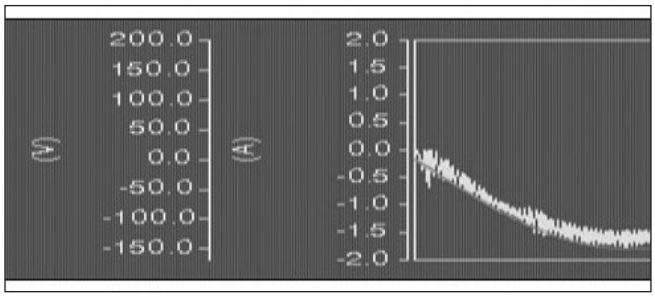

Figure 1.Data Circuit

PLECS simulation software

PLECS provides great convenience for its development, it often uses its functions to solve related problems in schools. Every time you do a problem, you will do the relevant PLECS simulation homework.

Simulator

Hydraulic presses, pneumatic presses, etc. will serve as the primary simulation equipment in some industries, but as those fields continue to expand, the simulation machine will also be utilised in them. Nowadays, both specialised and all-purpose simulators are frequently utilised, with digital computers acting as the host. Higher-level digital simulation simulators and intelligent simulators have evolved as a result of the ongoing advancement of technology, combining the benefits of integrated digital simulation and analogue simulation. This is a crucial stage in how humans simulate .[7]

Application of computer simulation software in power electronics technology

There are four main applications of computer simulation software in power electronics technology (as shown in Figure 2).

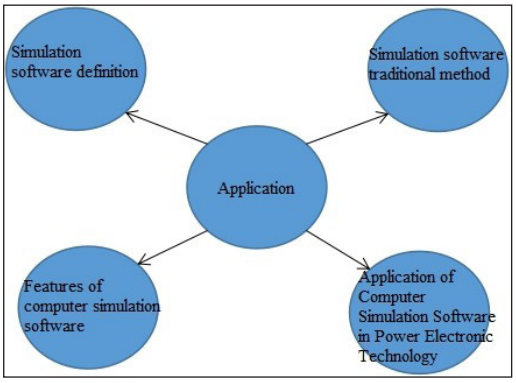

Figure 2. Application of computer simulation software in power electronics technology

An explanation of simulation software. Simulating system characteristics to a great extent is referred to as simulation. Simulator software can be used to solve a variety of system-related difficulties as well as problems that are based on the requests of the user.

Conventional simulation software techniques. The goal of system simulation is typically done by inputting experiments into abstract models to acquire test results, then iteratively improving the experimental models in response to the tester's judgements. The early simulation machine, which greatly contributes to enhancing people's quality of life, makes heavy use of simulation software.

Features of Computer Simulation Software

The software upgrade is not too complicated. Upgrades to the computer simulation programme can be made rapidly and with little difficulty. The quick advancement of new energy has aided in the creation of computer simulation software and, to some extent, boosted the number of models. Additionally, user needs are growing, necessitating an increase in the demand for computer simulation software upgrades.[8]

1. The graphical user interface is simple to use. The mouse can be used to control the computer simulation software, usage is rather straightforward. Power electronic technology and computer simulation software are closely related, operating users just need to meet minimal requirements. The graphical user interface of computer simulation software can be used by anyone who is familiar with power electronics theory and basic computer operation.
2. Minimise equipment loss. Components are frequently measured and tested before being used in a circuit. Utilising computer simulation software can streamline the component measuring process, significantly reduce test time, reduce component loss. It should be mentioned that the computer simulation software should simulate the real model as closely as feasible.

Application of computer simulation software in power electronics technology

1. The process of using computer simulation software in the simulation of power electronics. Whether or not there is an error in the test data and the size of the error are strongly correlated with the consistency of the test parameters. Only a tiny quantity of data can be measured using a simple tool measuring method since not only is the precision low, but also the number of measurements is constrained. The data measurement inaccuracy can be decreased by using computer simulation software to observe the parameters in more detail. After employing computer simulation software, it is additionally not essential to constantly replace test components and is feasible to precisely observe several curves in a little amount of time and identify the various circuit alterations.[9]
2. The use of computer simulation software in the power electronics technology schematic diagram. The schematic diagram of power electronics technology can be used to apply computer simulation software to effectively increase worker productivity, decrease worker intensity, enhance the scientific nature of analysis and design, reasonably control schematic diagram errors. The use of computer simulation software can help cut down on needless component loss and save money. The extraction of the circuit, the transfer module device, the building of the system model are the three basic components of the simulation design of the circuit.[10] The precise algorithm has an impact on how much the simulation parameter changes. The waveform diagram may show both the positive load and the negative load, two complex conditions that affect the voltage.

Conclusion

In conclusion, the use of computer simulation software has greatly facilitated the advancement of electronic power technology. Its use can significantly contribute to the best possible resource allocation. It enables electric energy to enhance its contribution to the growth of human society.

References

1. Ding Xinping, Ma Leolin. Application Research of SABER Simulation Software in the Teaching of "Power Electronics Technology" [J].China Electric Power Education, 2014:59- 60+62.
2. Dong Zhongjiang. Research on Application of Computer Technology in Power System Automation [J]. Electronic

Technology and Software Engineering, 2015:198.
3. Guo Lei. Application Research of Power Electronics Technology Based on Computer Simulation Software [J].Science and Technology Innovation and Application, 2018
4. Hu Yaoyao. Application Research of Power Electronics Technology Based on Computer Simulation Software [J].Computer Products and Circulation, 2018:77.
5. LI Dan. Application Research of Simulation Technology in the Course of Computer Circuit Basis [J]. Computer Knowledge and Technology, 2016:152-153.
6. Rong Jun, Ding Yuestuan, Zhang Min, Chen Xi.Application of computer simulation software in the teaching of "power electronic technology" [J]. China Electric Power Education, 2011:179-180.
7. Shubin Wang, Xinhua Wu.Application of computer simulation software in analog electronic technology teaching [J]. Software Guide, 2008:133-134.
8. Tao Yumei, Jia Jingpu.Analysis of the application of computer simulation software in power electronics technology [J]. Communications World, 2017
9. Wu Delin. Application Research of Multisim Simulation Software in Teaching of Computer Electronic Circuit Technology [J].Computer Knowledge and Technology, 2009:153-154.
10. XU Suheng. Discussion on the Application of Computer Simulation Software in Power Electronics Technology [J]. Electronic Technology and Software Engineering, 2016:73.