

Describe MATLAB Software and Its Application

Jingchao Liu

Xijing University, No.1 Xijing Road, Chang'an District, Xi'an City, Shaanxi Province, China

805444342@qq.com

Keywords: MATLAB; Signal Processing; Image Processing.

Abstract: With the rapid development of information technology, whether in People's Daily production practice or in scientific research, there will be a variety of problems about mathematical logic, data processing and so on. As a powerful functional calculation and data processing, analysis software MATLAB has brought great convenience for scientists. This paper introduces the development process of MATLAB and its influence, and focuses on the basic functions of MATLAB and the application process of big data development, as well as the application of MATLAB in its work.

Introduction

In the mid-1970s, Dr. Cleve and his colleagues developed a FORTRAN subroutine library that called EISPACK and LINPACK with funding from the national science foundation. EISPACK is a FORTRAN library for eigenvalue solutions, and LINPACK is a library for solving linear equations. At the time, these two libraries represented the highest level of matrix operations.

In 1984, Cleve and John formed Math Works with release 1 (Dos version 1.0) of MATLAB. Officially put MATLAB on the market. The first commercial version of MATLAB was the DOS version 3.0 released in the same year. And continue to conduct MATLAB research and development, and gradually develop it into a set of numerical processing, graphics processing, image processing, symbol calculation, word processing, mathematical modeling, real-time control, dynamic simulation, signal processing as one of the mathematical application software. After the appearance of MATLAB as a commodity, only a few years later, the closed software packages in the field of control (such as UMIST in Britain, LUND and SIMNON in Sweden, KEDDC in Germany) were eliminated one after another due to its good openness and reliability in operation. Instead, MATLAB was rebuilt on the platform of MATLAB.

In the early 1990s, among more than 30 mathematical science and technology applications in the world, MATLAB ranked first in numerical calculation, while Mathematic and Maple ranked first in symbolic calculation software. Math CAD is popular with middle school students because it provides a unified environment for computing, graphics, and word processing. MATLAB has become the internationally recognized standard computing software.

Mathcad simplifies documentation, which is critical to communicating and meeting business and quality assurance standards. By combining equations, text, and graphs into a worksheet, Mathcad makes it easier to keep track of the most complex calculations.

MATLAB Software Application in Electronic Circuit Analysis

MATLAB software through matrix and numerical calculation, its linear and nonlinear electronic circuit, digital electronic circuit and hybrid circuit analysis. At the same time, MATLAB software is open source and can be improved according to actual needs, which is of great help to teaching and scientific research. The existing MATLAB software has a number of toolkits, the use of MATLAB electronic circuit analysis, must solve the schematic topology information input, the establishment of schematic model, the corresponding equation solution, the establishment of model and other key technologies. Key technology, through MATLAB software circuit analysis, theory and practical effect is very good!

MATLAB software can be more efficient, intuitive analysis of the electronic circuit, help understand the characteristics of the circuit to illustrate the application of different types of circuit analysis.

Using MATLAB Software Carry Out Tolerance Analysis. The analysis in line tolerance is inseparable from the excitation source and component values, and a lot of calculation is needed to obtain the change data of each component. Through repeated calculation, the running state of electronic circuit and the response characteristics of the excitation source can be intuitively analyzed and expressed. However, in the actual operation, due to the difference in calculation weight, there is a considerable deviation between the calculated result and the measured value in actual operation. This error is not easy to be controlled and has a great contingency, which has become a difficult problem for the management of electronic circuit. Nowadays, with the widespread application of various precision electronic circuits, the reliability of tolerance analysis directly affects the operation of electrical equipment and the fault-tolerant performance and stability of electronic circuits.

Based on MATLAB, the fast monte-carlo analysis method is generally adopted to realize the tolerance analysis of electronic circuit. According to the general operation process, we generally start from the determination of the nominal value of the circuit, select the response function and matrix, and then determine the output nominal value. After the above steps, the tolerance parameters in the circuit are recorded and the matrix is derived. Next, the binary counter is used to generate tolerance parameter combination, and then the output result is calculated through the expression, and then the minimum and maximum tolerance is calculated. In the actual operation process, we need to use the tolerance matrix to calculate the combination of tolerance parameters. After obtaining the combination value, we use the binary calculator to obtain the corresponding relationship between the minimum tolerance and the maximum tolerance. In the process of analysis, a mathematical model is generally established to obtain the possible output results through the operation of combined values.

Electronic Circuit Signal System and Frequency Response Analysis. In the electronic circuit, the amplifier directly affects the frequency of the closed-loop circuit, the overall running smoothness and the performance of the electrical appliances. When analyzing the circuit frequency, we draw the frequency curve of the amplifier through MATLAB. In actual operation of the circuit, the open loop gain to a variety of factors, volatility, simply by recording data calculation, time consuming is very large, through the MATLAB software, we open loop gain can be expressed as the corresponding function, by setting real pole, usually expressed as a w , through the composite function, import the extreme value, the calculated gain. Frequency response analysis in order to more accurately, in practice, we have to closed loop between output and voltage operation, open loop gain values into mathematical function model, and calculated the dynamic variable function matrix, the law of changes in values, we use software to founder, it is concluded that the simulation diagram, intuitive display circuit frequency response of volatility.

Image smoothing refers to the processing method used to highlight the wide area, low-frequency component, main part of the image or to suppress the image noise and interfere with the high-frequency component, so as to reduce the abrupt gradient of the image and gradually smooth the brightness, so as to improve the image quality.

Gray contrast transformation is an important method of spatial enhancement. This method can change the dynamic range and contrast of image gray scale. The main principle is to modify the gray value of every pixel in the image point by point and pixel by pixel according to the rules. The contrast enhancement method can not only improve the image quality effectively, but also improve the image contrast problem of photo and electronic system under the influence of underexposure and non-linear.

The simple linear change often cannot satisfy the requirement, so we must carry on the nonlinear transformation. The common nonlinear transformations are logarithmic transformation and Gamma transformation.

Image filtering. Median filtering is a nonlinear smoothing technique, which sets the gray value

of each pixel to the median of all the gray values of the pixels in a neighborhood window.

The basic principle of median filtering is to replace the value of the point itself with the median value of the point in the field where the pixel in the digital image is located, so that the isolated noise points can be removed and the pixel value in the field is closer to the real pixel value.

The linear filtering operation multiplies each pixel in the domain with the corresponding coefficient, and then accumulates the result to the response at (x, y) . If the size of the domain is $M \times N$, a total of MN coefficients are required. These coefficients are arranged in a matrix, forming a template for linear filtering.

Image segmentation. Otsu method is a method that can automatically determine the threshold value by maximizing the variance between classes. The principle of the watershed algorithm is to convert an image into a topological topographic map, and treat its gray value as the topographic height, mountain corresponding to high gray value, valley corresponding to low gray value.

Morphological processing mainly includes two basic operations, expansion and corrosion, which are image extraction and recognition. Expansion and corrosion are dual operations, one is to increase the pixel of the target object, the other is to remove the pixel of the target object, the increase and removal of the pixel mainly depends on the actual shape and size of the structural elements in the image processing.

Open operation and closed operation are also important algorithms in morphological processing. The open operation can smooth the image contour by removing the burr sundries on the image contour. Although the closed operation is also the smoothing of the image contour, the result is quite opposite. It is mainly to remove the holes in the image area, fill in the gully and the contour gap. First corrosion and then expansion is open operation, first expansion and then corrosion is closed operation. Image boundary extraction is also based on expansion and corrosion algorithms.

The Application of MATLAB in Higher Mathematics Teaching

Mathematics is an important course in vocational education and the foundation of many science and engineering courses. Learning advanced mathematics well can pave the way for other courses and improve students' learning enthusiasm. Traditional teaching, the author of this paper, according to the current situation of students, use MATLAB software to do auxiliary in class, help students better understand some abstract content, improve the students' learning enthusiasm, improve the learning efficiency, so that the students in the limited class hours in a better understanding of higher mathematics, this course to learn a language at the same time.

MATLAB Application in Chemical Reaction Engineering

MATLAB built-in function can be used to simplify the calculation, drawing function can directly show the trend of data changes, easy for students to analyze, improve the ability of students to analyze complex problems. Through the analysis of specific engineering cases, students can improve their ability to deal with practical engineering problems and deepen their understanding of theoretical knowledge.

The Application of MATLAB in Signal and System Course Teaching

Signal and system is a very important basic course for electrical information majors. It mainly describes the analysis methods of signal in time domain and frequency domain, and the processing of signal by linear time-invariant system. Signal system or the majority of college telecommunications professional postgraduate examination written examination subjects. Therefore, learning this course well is very important for the development of students in this major. Signal and system courses are integrated with basic courses such as circuit analysis and advanced mathematics. This also makes the use of blackboard writing, PPT and other traditional teaching mode low efficiency. It is difficult to mobilize the enthusiasm of students. Especially for the students of application-oriented universities, it is more difficult to learn the signal and system courses well.

The MATLAB software is introduced into the signal and system course teaching, the use of numerical simulation and its powerful mapping function, let the students the concept of the abstract theory is implemented by means of computer simulation, not only can avoid the traditional experimental equipment is not easy to carry and operation cumbersome shortcomings, also to be able to liberate students learn from the theory of boring, to improve students' learning motivation.

Summary

With the rapid development of information technology, whether in People's Daily production practice or in scientific research, there will be a variety of problems about mathematical logic, data processing and so on. As a powerful functional calculation and data processing, analysis software MATLAB has brought great convenience for scientists. This paper introduces the development process of MATLAB and its influence, and focuses on the basic functions of MATLAB and the application process of big data development, as well as the application of MATLAB in its work.

References

- [1] Shuo Jiang. Application of MATLAB software in electronic circuit analysis [J]. Electronic technology and software engineering,2019(16):56-57.
- [2] Qi Duan. Application of MATLAB in higher mathematics teaching [J]. Think tank times,2019(36):186+195.
- [3] Qing-rui Zhang, liu kai, wang wei-wen. Application of MATLAB in chemical reaction engineering [J]. Education & teaching BBS,2019(30):189-190.
- [4] flying pigeon, n.syed, ZhaiShaoKang mei-xia li. The application of MATLAB in digital image processing [J/OL]. Computer technology and development, 2019 (10) : 1-6 [2019-10-25]. HTTP: // <http://kns.cnki.net/kcms/detail/61.1450.TP.20190626.0829.024.html>.
- [5] Tingting Bai. Application of MATLAB in mathematical analysis course [J]. Neijiang science and technology,2019,40(06):46-47.
- [6] Zhang Zhang, Luo Li. Application research of Matlab in remote sensing image processing [J]. Wind of science and technology,2019(17):91-92.
- [7] Qiang Wang. Application of Matlab in signal and system course teaching [J]. Education and teaching BBS,2019(23):257-258.