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# Mathematical Method in Data Processing and Modeling

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**Original Research Article**

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**Abstract:** Modeling is a good way to solve the reality question. In order to describe the matter of the real system, many models were designed to make deep research. In many models, there is always an idea that characterizes the main line of mathematics. With the main line, the models were derived to rules or regulations complied with the real systems. By the rules, the data processing can be handled by all kinds of algorithms and software or platforms so that they can be processed like a assembly line. By the modeling, many real systems can be demonstrated with visual and vivid methods so that everyone can understand or use. Numerical simulation also a popular way to set up or verify the models complied with mathematical methods.

**Keywords:** mathematical method; data processing; algorithm; modeling; numerical simulation.

## INTRODUCTION

What is mathematical method? What role of the mathematical method is? How to use mathematical method? Every person studying mathematics has all kinds of questions even if he is now using mathematical method [1-5].

Mathematical methods use mathematical language to express the state, relationship, and process of things, and to derive, calculate, and analyze them to form methods for interpreting, judging, and prophesying questions. The so-called method refers to the operational rules or modes contained in the means, ways and behaviors that people adopt in order to achieve a certain purpose. Through long-term practice, people have discovered many means, routes or procedures using mathematical ideas.

The same means, gates, or procedures have been used many times and have achieved the intended purpose, becoming a mathematical method. The mathematical method is a method of scientific research using mathematics as a tool, that is, using mathematical language to express the state, relationship and process of things, and deriving, computing and analyzing to form methods of interpretation, judgment and prophecy [6-11].

Mathematical methods refer to the various ways, means, and approaches used in mathematically discovering, asking questions, analyzing problems, and solving problems (including internal and actual problems of mathematics), such as recursive mode, generalization, specialization, and so on. The mathematical thinking method is an essential understanding of mathematical knowledge, theorems, methods, laws, etc. It is a rational understanding of the regularity of the formation of mathematical knowledge and methods, and is the fundamental strategy for solving mathematical problems [12-15].

Mathematical knowledge is the carrier of mathematical thinking methods. Mathematical thinking is at a higher level than mathematical knowledge and mathematical methods. It comes from the basic knowledge of mathematics and commonly used mathematical methods. At the same time, when we use mathematics knowledge, method and skill to solve mathematics problems, mathematics thought method has a guiding position [16-18].

Learning mathematics is the ability of one's thinking. Its content is second. If you don't study hard, how do you know the fun of learning mathematics? What we learn in the process of learning is not just knowledge, but also learning. There is still a power to come. Learning math can do a lot of numerical calculations. Our life can be said to be inseparable from mathematics. Accounting, income, expenditure and other calculations are basic mathematical applications. Learning mathematics can exercise the brain's ability to think. Mathematics is a very rigorous science. To learn well, you must have good logical thinking skills. Learning mathematics is the foundation for learning other sciences, such as physical, chemical, and so on [16-20].

In the process of learning mathematics, we must not only learn the basic knowledge of mathematics, but also the mathematical thinking methods contained in mathematics, so that we can apply what we have learned and use it in the opposite direction.

## METHODS

The algorithm refers to an accurate and complete description of the solution to the problem. It is a series of clear instructions for solving the problem. The algorithm represents a systematic approach to describing the problem-solving strategy. That is to say, it is possible to obtain the required output in a limited time for a certain specification input. If an algorithm is flawed or not suitable for a problem, executing this algorithm will not solve the problem. Different algorithms may accomplish the same task with different time, space or efficiency. The pros and cons of an algorithm can be measured in terms of space complexity and time complexity [21-24].

Modeling is a process of building a system model. Modeling is an important means and prerequisite for researching systems. Any process that uses a model to describe the causal or interrelationship of a system is modeled. Because the relationships described vary, so are the means and methods to achieve this process. It can be modeled according to the mechanism of motion of the system itself, or by the processing of experimental or statistical data of the system, and according to the existing knowledge and experience of the system. You can also use several methods at the same time [25-30].

Numerical simulation, also known as numerical analysis, is a computer program to solve the approximate solution of a mathematical model, also known as computer simulation. Relying on electronic computers, combined with the concept of finite element or finite volume, through numerical calculation and image display methods, the purpose of researching engineering problems and physical problems and even various problems in nature is achieved. Numerical simulation is an art that combines mathematics, physics, engineering applications, and numerical analysis. The mathematics here mainly refers to partial differential equations, tensor analysis, functional analysis, etc.; these mathematical contents provide a language for describing various problems used for numerical simulation to analyze and solve, they can be used to describe a problem conveniently and accurately. Even to facilitate the resolution of these problems. Numerical analysis requires us to first find the problems to be analyzed and solved from the engineering application, and then we need to find out the decisive physical mechanisms or phenomena behind these problems, then describe these mechanisms and phenomena mathematically and finally select the appropriate numerical analysis method. The problem is solved [31-36].

## RESULTS AND DISCUSSION

Learning mathematics is a simple to complex mental exercise process. Many people think that mathematics knowledge is useless in the future. Indeed, if you don't do related academic work in the future, you will not use much mathematics knowledge; but On the one hand, people with good mathematics often have clear ideas, logical coherence and subjective initiative in many things. Many people use stupid ways to solve problems, they can often use their own thinking to see the nail. And there will be a variety of reverse thinking, transformative thinking [1-8].

In recent years, mathematics itself has undergone tremendous changes. On the one hand, mathematics neglects the close connection with real life because of its increasingly axiomized and formalized. On the other hand, due to the development of mathematics applications, mathematics has penetrated into almost every subject area and all aspects of people's lives. It is necessary to communicate the connection between mathematics in life and mathematics in textbooks, so that mathematics and life are integrated. Mathematics can help people make appropriate choices and judgments on a large number of complicated information in daily life, and provide a simple and effective means for people to exchange information in daily life. Mathematical ideas, methods, and techniques are people's practical problems [6, 10, 12-15].

The key to the successful use of mathematical methods in scientific research is to extract a suitable mathematical model for the problem to be studied. This model not only reflects the nature of the problem, but also simplifies the problem to facilitate the mathematical derivation. The establishment of mathematical models is a scientific abstract process for the specific analysis of problems, so it is necessary to be good at grasping the main contradictions, highlighting the main factors and relationships, and opening up those secondary factors and relationships [25-30].

The data can be in the form of numbers, text, images or sounds. The basic purpose of data processing is to extract relatively valuable and meaningful data from large, disorganized, and incomprehensible data. Data processing runs through all areas of social production and social life. Data management is the activity of people's classification, organization, coding, storage, query and maintenance of data, and is a key link in data processing. Its purpose is to give full play to the role of data [37-40].

Data processing is the process of extracting valuable information from a large amount of raw data,

that is, the process of converting data into information. It mainly processes and sorts all kinds of data input, and the process includes the evolution and derivation of data collection, storage, processing, classification, merging, calculation, sorting, conversion, retrieval and propagation. In data processing, the calculation is usually relatively simple, and the processing calculation in the data processing business is different depending on the business, and the application needs to be written according to the needs of the business to be solved [41-44].

Mathematical modeling algorithms can make a huge difference. For example, in people's production practices, they often encounter the problem of how to use existing resources to arrange production in order to achieve maximum economic benefits. Such problems constitute an important branch of operations research - mathematical planning, while linear programming is an important branch of mathematical planning [12, 22, 28].

As humans use numbers, various mathematical models are constantly being built to solve a variety of practical problems. For the daily activities of the majority of science and technology workers, a mathematical model can be established to establish an optimal solution. Building a mathematical model is an indispensable bridge between the practical problems in front of communication and the mathematical tools [25-30].

Mathematical modeling, in a broad sense, mathematical models include various concepts in mathematics, various formulas, and various theories. Because they are all abstracted from the prototype of the real world, in this sense, the whole mathematics can also be said to be a science about mathematical models. In a narrow sense, mathematical models refer only to mathematical relationships that reflect a particular problem or a particular system of specific things. In this sense, it can also be understood as a mathematical expression that relates the relationships between variables in a system. Mathematical modeling is a bridge between mathematics and practical problems. It is the medium for the wide application of mathematics in various disciplines. It is the main way to transform mathematics science and technology. The important role of mathematical modeling in the development of science and technology is increasingly influenced by the mathematics community. The engineering industry has paid great attention to it, and it has become one of the important capabilities necessary for modern science and technology workers [10-15, 25-28].

When the basis of the verification that cannot be done by laboratory experiments, the numerical simulation can realize the calculation and verification under various conditions and make up for the shortage of laboratory experiments.

The general trend of modern medicine is to move from qualitative research to quantitative research, that is, to be able to effectively explore the regularity of the relationship between quantity and quantity of substances in the field of medical science, and to promote the shackles of medical science to break through narrow experience, towards quantitative, precise, computable, Predictable and controllable direction, and gradually derived from the marginal disciplines of biomedical engineering, quantitative genetics, pharmacokinetics, metrology, metrology, quantitative physiology, and preventive medicine, basic medicine and Traditional disciplines such as clinical medicine are also trying to establish mathematical models and use mathematical theoretical methods to explore their quantitative laws. And all of this requires mathematical knowledge [2, 29, 45-48].

## CONCLUSION

With its instrumentality, practicality and strict reasoning, mathematics has become an important basic component of today's social culture. Without a person who understands mathematics, it is impossible to organize the disorder into order and to sublimate the experience into law, and insight into the inevitable connection within things [1-10].

Data processing is the basic part of system engineering and automatic control. Data processing runs through all areas of social production and social life. The development of data processing technology and the breadth and depth of its application have greatly affected the development of human society [37-40].

Mathematical modeling is for a specific object, for a specific purpose, according to its internal laws, to make the necessary simplifying assumptions, using appropriate mathematical tools, to obtain a mathematical structure. Its significance lies in mathematical solutions to practical problems [25-30].

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## REFERENCES

1. Polya, G. (2004). *How to solve it: A new aspect of mathematical method* (No. 246). Princeton university press.
2. Lucas-Tooth, H. J., & Price, B. J. (1961). A mathematical method for investigation of

inter-element effects in X-ray fluorescent analysis. *Metallurgia*, *64*(383), 149-161.
3. Hintikka, J. (1991). Kant on the mathematical method. In *Knowledge and the Known* (pp. 160-183). Springer, Dordrecht.
4. Schwartz, J. T. (2018). *Lectures on the mathematical method in analytical economics*. Courier Dover Publications.
5. Giguere, G. (1958). Warrants: a mathematical method of evaluation. *Financial Analysts Journal*, *14*(5), 17-25.
6. Burrough, P. A. (1989). Fuzzy mathematical methods for soil survey and land evaluation. *Journal of soil science*, *40*(3), 477-492.
7. Hilbert, D. (1955). *Methods of mathematical physics*. CUP Archive.
8. Possingham, H., Ball, I., & Andelman, S. (2000). Mathematical methods for identifying representative reserve networks. In *Quantitative methods for conservation biology* (pp. 291-306). Springer, New York, NY.
9. Pontryagin, L. S. (2018). *Mathematical theory of optimal processes*. Routledge.
10. Bender, C. M., & Orszag, S. A. (2013). *Advanced mathematical methods for scientists and engineers I: Asymptotic methods and perturbation theory*. Springer Science & Business Media.
11. Shoenfield, J. R. (2010). *Mathematical logic*. AK Peters/CRC Press.
12. Boaler, J. (2002). *Experiencing school mathematics: Traditional and reform approaches to teaching and their impact on student learning*. Routledge.
13. Pahl, G., & Beitz, W. (2013). *Engineering design: a systematic approach*. Springer Science & Business Media.
14. Treffers, A. (2012). *Three dimensions: A model of goal and theory description in mathematics instruction—The Wiskobas Project* (Vol. 3). Springer Science & Business Media.
15. Courant, R., Robbins, H., & Stewart, I. (1996). *What is Mathematics?: an elementary approach to ideas and methods*. Oxford University Press, USA.
16. Carpenter, T. P., Fennema, E., Peterson, P. L., Chiang, C. P., & Loef, M. (1989). Using knowledge of children's mathematics thinking in classroom teaching: An experimental study. *American educational research journal*, *26*(4), 499-531.
17. Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American educational research journal*, *42*(2), 371-406.
18. Henningsen, M., & Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for research in mathematics education*, 524-549.
19. Dubinsky, E. (2002). Reflective abstraction in advanced mathematical thinking. In *Advanced mathematical thinking*, 95-126. Springer, Dordrecht.
20. Hiebert, J., & Lefevre, P. (1986). Conceptual and procedural knowledge in mathematics: An introductory analysis. *Conceptual and procedural knowledge: The case of mathematics*, *2*, 1-27.
21. Coello, C. A. C., Lamont, G. B., & Van Veldhuizen, D. A. (2007). *Evolutionary algorithms for solving multi-objective problems* (5). New York: Springer.
22. Higham, N. J. (2002). *Accuracy and stability of numerical algorithms* (80). Siam.
23. Berg, M. D., Cheong, O., Kreveld, M. V., & Overmars, M. (2008). *Computational geometry: algorithms and applications*. Springer-Verlag TELOS.
24. De Berg, M., Van Kreveld, M., Overmars, M., & Schwarzkopf, O. (1997). Computational geometry. In *Computational geometry* (1-17). Springer, Berlin, Heidelberg.
25. Brown, M., & Harris, C. J. (1994). *Neurofuzzy adaptive modelling and control*. Prentice Hall.
26. Austin, T., Larson, E., & Ernst, D. (2002). SimpleScalar: An infrastructure for computer system modeling. *Computer*, *35*(2), 59-67.
27. Bandara, W., Gable, G. G., & Rosemann, M. (2005). Factors and measures of business process modelling: model building through a multiple case study. *European Journal of Information Systems*, *14*(4), 347-360.
28. Forrester, J. W. (1985). The" model versus a modeling "process. *System Dynamics Review*, *1*(1), 133-134.
29. Vennix, J. A., & Gubbels, J. W. (1992). Knowledge elicitation in conceptual model building: A case study in modeling a regional Dutch health care system.
30. Bentley, L. D., Dittman, K. C., & Whitten, J. L. (2000). *Systems analysis and design methods*. Irwin/McGraw Hill.
31. Bando, M., Hasebe, K., Nakayama, A., Shibata, A., & Sugiyama, Y. (1995). Dynamical model of traffic congestion and numerical simulation. *Physical review E*, *51*(2), 1035.
32. Privman, V. (1990). *Finite size scaling and numerical simulation of statistical systems* (p. 1). Singapore: World Scientific.
33. Higham, D. J. (2001). An algorithmic introduction to numerical simulation of stochastic differential equations. *SIAM review*, *43*(3), 525-546.
34. Hirsch, J. E. (1985). Two-dimensional

Hubbard model: Numerical simulation study. *Physical Review B*, *31*(7), 4403.

35. Lüscher, M., & Wolff, U. (1990). How to calculate the elastic scattering matrix in two-dimensional quantum field theories by numerical simulation. *Nuclear Physics B*, *339*(1), 222-252.
36. Schmidt, J. D. (2010). Numerical simulation of optical wave propagation with examples in MATLAB. Bellingham, Washington, USA: SPIE.
37. Curtis, B., Kellner, M. I., & Over, J. (1992). Process modeling. *Communications of the ACM*, *35*(9), 75-90.
38. Yilmaz, Ö. (2001). *Seismic data analysis: Processing, inversion, and interpretation of seismic data*. Society of exploration geophysicists.
39. Farina, A., & Studer, F. A. (1986). Radar data processing. Volume 2-Advanced topics and applications. *NASA STI/Recon Technical Report A*, *86*.
40. Singleton Jr, R., Straits, B. C., Straits, M. M., & McAllister, R. J. (1988). *Approaches to social research*. Oxford University Press.
41. Claerbout, J. F. (1985). *Fundamentals of geophysical data processing*, 194-207). London et al.: Blackwell.
42. Macfarlane, R., Muir, D. W., Boicourt, R. M., Kahler III, A. C., & Conlin, J. L. (2017). *The NJOY Nuclear Data Processing System, Version 2016* (No. LA-UR-17-20093). Los Alamos National Lab. (LANL), Los Alamos, NM (United States).
43. Manogaran, G., Vijayakumar, V., Varatharajan, R., Kumar, P. M., Sundarasekar, R., & Hsu, C. H. (2018). Machine learning based big data processing framework for cancer diagnosis using hidden Markov model and GM clustering. *Wireless personal communications*, *102*(3), 2099-2116.
44. Resnitzky, U., & Naaman, N. (2017). *U.S. Patent No. 9,544,297*. Washington, DC: U.S. Patent and Trademark Office.
45. Lindlof, T. R., & Taylor, B. C. (2017). *Qualitative communication research methods*. Sage publications.
46. Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
47. Murphy, E. (2017). *Qualitative methods and health policy research*. Routledge.
48. Stevens, R. (2017). *Medical practice in modern England: the impact of specialization and state medicine*. Routledge.