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CREATING A SYSTEM OF EQUATIONS AND SOLVING PROBLEMS RELATED TO THEIR SOLUTION

Abstract. The article presents theoretical and experimental results on the use of error-free calculations for solving systems of linear algebraic equations. Solving systems of linear algebraic equations is one of the fundamental problems of mathematics. In particular, it arises when solving boundary value problems for differential and integral equations, to which real problems of technology, physics, economics, and mathematics are reduced.

Key words: calculations, system of linear algebraic equations, parallel calculations, computational complexity.

Many problems of theoretical and applied mathematics are brought to the solution of a system of linear equations of the first degree. For example, problems of interpolation with the n-order polynomial using the values of the function given at n points or approximation of the function using the method of mean squares are brought to the solution of the system of linear equations of the first order.

A system of linear algebraic equations.

The source of the formation of a system of linear equations of the first order is the approximation of continuous functional equations with finite difference equations. Solving the system of first-order linear equations is divided into two methods, i.e. exact and iterative methods.

An exact method means finding an exact solution to a problem as a result of the exact execution of a finite number of arithmetic operations.

In iterative methods, the solution of a system of linear equations is found as a limit of successive approximations**.**

System of linear equations and their solution. Many practical, including economic, problems lead to the concept of a system of linear equations.

DEFINITION 1: A system of m linear equations with n unknowns is a system of the following form:

Here, ai j and bi (i=1,2, …, m; j=1,2, …, n) are given and arbitrary fixed numbers, the numbers aij are the coefficients of the system (1), and bi are the free terms is called In this system, xj (j=1, 2, ... , n) are unknowns, and it is required to find their values.

Using the sum symbol, system (1) can be briefly written as follows:

Now we introduce the rectangular matrix A composed of the coefficients aij of the system of linear equations (1) or (2), the matrix X and V formed from the unknowns xj and free terms bi.

Then, using matrix multiplication, (1) the system can be written in the following matrix form, which is compact and convenient:

$$AX=V. \quad (4)$$

DEFINITION 2: The solution of the system of linear equations (1) or (2) is said to be such numbers x1=a1, x2=a2, …, xn=an that when they are put into the system of equations, each equation is satisfied, i.e. until 'grey becomes equal.

Solutions of the system if the column matrix is written in the form In this case, the column matrix X consisting of n numbers is one solution of the system.

For example, for a system of equations with n=3 unknowns and m=2 x1=1, x2= –2 and x3=5 or the numbers that make up the dominant matrix are the solution. Indeed, if we put these numbers into the equations of the given system (5), we will have correct equalities.

Checking for the existence of a solution to a system and, if it exists, finding it is called solving the system. There can be three cases when solving a system of linear equations.

Case 1. Sistema has a solution and this solution is unique. For example,

$$x1=2 \text{ and } x2=-5$$

are unique solutions for the system.

Case 2. The system has a solution, and this solution has more than one. For example, it is possible to directly check that x1= –5, x2=26 and x3=43 are also solutions for the system (5) above.

Case 3. The system has no solution. For example, the system has no solution because there are no numbers whose sum is both 1 and 0 at the same time.

We will consider the method of solving the system of linear equations by successive elimination of unknowns, that is, the Gaussian method.

This method has several calculation methods. One of them is Gaussian complex path.

Let this system be given Suppose that a11≠0 (the leading element), otherwise we change the places of the equations and move the equation with a non-zero coefficient in front of x1 to the first place.

All the coefficients of the first equation in the system are divided by a11,

$$x1 +b12(1)\ x2 +...+b1(n1)\ xn =b1(,1n)+1 \ (2)$$

we generate , here

$$a12 = b12(1), \ldots, aa111n =b1(n1), aa1,11n+1 =b1(,1n)+1\ a11$$

or briefly b1(1j) = aa111j (j ≥ 2). Using equation (2), it is possible to eliminate x1 in the remaining equations of system (1). For this, equation (2) is successively multiplied by a21, a31, ..., and the second, third, etc. of the system, respectively. subtract from Eqs. As a result, the following system is formed. where aij(1) are the coefficients

$$aij(1) =aij - ai1b1(1j)\ ,(i, j \geq 2)$$

is calculated using the formula.

Now we perform similar substitutions on system (3). To do this, divide all the coefficients of the first equation in system (3) by the leading element a22(1) ≠0,

$$x2 + b23(2)\ x3 + ... + b2(2n)\ xn = b2(,2n)+1\ (4)$$

we generate , here

(2) a

$$b2\ j = a22(1)\ (\ j \geq 3)$$

Using the equation (4) in the following equations of the system (3), we eliminate x2 as above, we come to the system, here

$$aij(2) = aij(1) - ai(21)b2(2j),\ (i, j \geq 2)$$

The process of eliminating unknowns is continued, and we assume that this process can be completed up to m-step, and at m-step we have the following system.

here

$$a\ (m)$$

$$(m)\ mj\ ,\ a(m)$$

bmj = amm(m) ij =aij(m−1) −aim(m−1)bmj(m) (i, j ≥ m +1) .

Let m be the number of the last possible step. There can be two cases: m=n or m. If m=n is a triangular matrix and the system (1) is equivalent to the following

we will have a system. From the last system one can find xn, xn−1,..., x1 in sequence (6) finding the coefficients of the triangular system is called the straight walk of the Gaussian method, and finding the solution from the system (7) is called the inverse walk of the Gaussian method.

We have a system of linear equations in which the number of unknowns is equal to the number of equations we got acquainted with Cramer and matrix method of solving. This method is weak the downside is that there are too many when the number of unknowns is somewhat large calculations have to be done. For example, four lines with four unknowns for solving the system of equations by the Cramer method, five of the fourth order it is necessary to calculate the determinants. The fourth-order determinant is something when spreading over row or column elements, the distribution has four third orders determiner participates.

Methodology of teaching solving problems by forming equations.

The mathematics textbook is supposed to teach students to solve some problems by creating equations. To learn how to solve simple problems of adding, subtracting, multiplying and dividing unknown numbers by creating equations and solving text problems using equations together with examples strengthening the knowledge of students is an important task. The main goal is to create a foundation for the formation and development of logical thinking skills, to be able to express one's thoughts independently, to expand the students' thinking worldview, and to train their intelligence and the virtue of present-responsibility.

The mathematics textbook is intended to teach students to solve some problems by creating equations. In order for students to learn to solve problems with equations, they will need to separate the given and desired quantities in the problem. Solving simple problems using equations begins in second grade. In the second grade, simple problems on finding the unknown components of addition, subtraction, multiplication and division operations are solved by the method of creating equations.

Determine which equations they are when you start solving a system of equations. Methods for solving linear equations are well studied. Nonlinear equations are often unsolvable. There is only one special case, each of them is almost individual. Therefore, the study of solution techniques should begin with linear equations. Such equations can even be solved purely algorithmically.

If the system is specified with clear numerical coefficients, then the calculations will be less cumbersome. But the general solution allows us to consider that the denominators for the unknowns found are exactly the same.

And the figures show some patterns of their construction. If the size of the system of equations is greater than two, then the elimination method leads to very inconvenient calculations. Only algorithmic solutions have been developed to avoid them. The simplest of them is Kramer's algorithm (Kramer's formulas). To study them, you need to know what a system of general equations of n equations is.

References:

1. Даминова Б. Э. СРАВНИТЕЛЬНЫЙ АНАЛИЗ СОСТОЯНИЯ ОРГАНИЗАЦИИ МНОГОУРОВНЕВЫХ ОБРАЗОВАТЕЛЬНЫХ ПРОЦЕССОВ //Экономика и социум. – 2023. – №. 1-2 (104). – С. 611-614.

2. Тўраева Д., Даминова Б. ИНФОРМАЦИЯ-КОММУНИКАЦИЯ МЕТОДЫ ПРИМЕНЕНИЯ ТЕХНОЛОГИИ В БИОЛОГИЧЕСКИХ НАУКАХ //Science and innovation. – 2023. – Т. 2. – №. Special Issue 13. – С. 225-228.

3. Daminova B. E., Tolipova M. M., Axadilloyeva Z. N. CHIZIQLI ALGEBRAIK TENGLAMALAR SISTEMASINI GAUSS VA ITERATSION YECHISH USULLARI //MAVZUSIDAGI XALQARO ILMIY-AMALIY ANJUMAN. – 2023. – С. 662.

4. Рахимов Н., Эсановна Б., Примкулов О. АХБОРОТ ТИЗИМЛАРИДА МАНТИҚИЙ ХУЛОСАЛАШ САМАРАДОРЛИГИНИ ОШИРИШ ЁНДАШУВИ //International Scientific and Practical Conference on Algorithms and Current Problems of Programming. – 2023.

5. Якубов М., Даминова Б., Юсупова С. ФОРМИРОВАНИЕ И ПОВЫШЕНИЕ КАЧЕСТВА ОБРАЗОВАНИЯ С ПОМОЩЬЮ ОБРАЗОВАТЕЛЬНЫХ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ //International Scientific and Practical Conference on Algorithms and Current Problems of Programming. – 2023.

6. Кувандиков Ж. Т., Даминова Б. Э., Хафизадинов У. Н. АВТОМАТЛАШТИРИЛГАН ЭЛЕКТРОН ТАЪЛИМ ТИЗИМИНИ ЛОЙИҲАЛАШДА ЎҚУВ ЖАРАЁНИНИ МОДЕЛЛАШТИРИШ //MAVZUSIDAGI XALQARO ILMIY-AMALIY ANJUMAN. – 2023. – С. 656.

7. Daminova B. ALGORITHM OF EDUCATION QUALITY ASSESSMENT SYSTEM IN SECONDARY SPECIAL EDUCATION INSTITUTION (ON THE EXAMPLE OF GUZOR INDUSTRIAL TECHNICAL COLLEGE) //International Scientific and Practical Conference on Algorithms and Current Problems of Programming. – 2023.

8. Daminova B. et al. ELECTRONIC TEXTBOOK AS A BASIS FOR INNOVATIVE TEACHING //International Scientific and Practical Conference on Algorithms and Current Problems of Programming. – 2023.

9. Даминова Б. Э., Якубов М. С. Развития познавательной и творческой активности слущателей //Международная конференция “Актуальные проблемы развития инфокоммуникаций и информационного общества. – 2012. – С. 26-27.06.

10. Тошиев А. Э., Даминова Б. Э., Тошиев АЭ Д. Б. Э. Формирование самаркандской региональной транспортно-логистической системы //Перспективные информационные технологии (ПИТ 2017)[Электронный ресурс]: Междунар. науч.-техн. конф. – 2017. – С. 14-16.

11. Бозорова И. Ж. и др. ПРИНЦИП РАБОТЫ ЭЛЕКТРОКАРДИОГРАФА И ЕГО РОЛЬ В СОВРЕМЕННОЙ МЕДИЦИНЕ //НАУЧНЫЕ ДОСТИЖЕНИЯ СТУДЕНТОВ И УЧАЩИХСЯ. – 2020. – С. 25-27.

12. Ergash o’g’li Q. F., Jumanazarovna B. I. METHODS OF DISPLAYING MAIN MEMORY ON CACHE //Ответственный редактор. – 2020. – С. 6.

13. Bozorova I. FEATURES OF INFORMATION SYSTEMS OF ECONOMIC ACCOUNTING OF MATERIAL AND TECHNICAL ASSETS //Science and innovation. – 2023. – Т. 2. – №. A6. – С. 345-348.

14. Бозорова И. Ж. УЧЁТ МЕТОДОВ ОЦЕНКИ ТОВАРНО-МАТЕРИАЛЬНЫХ ЗАПАСОВ //INNOVATSION IQTISODIYOTNI SHAKLLANTIRISHDA AXBOROT KOMMUNIKATSIYA TEXNOLOGIYALARINING TUTGAN O ‘RNI. – 2023. – Т. 1. – №. 1.

15. Jumanazarovna B. I. The Use of Digital Technologies in the Process of Improving Economic Systems for Accounting for Inventory Items //Miasto Przyszłości. – 2023. – Т. 36. – С. 62-65.

16. Daminova B. et al. ELECTRONIC TEXTBOOK AS A BASIS FOR INNOVATIVE TEACHING //International Scientific and Practical Conference on Algorithms and Current Problems of Programming. – 2023.

17. Зохидов Ж. Б. и др. ОБЗОР ОПТИЧЕСКИХ ПЕРЕКЛЮЧАТЕЛЕЙ И ЕГО ВИДЫ //ИНТЕЛЛЕКТУАЛЬНЫЙ ПОТЕНЦИАЛ ОБЩЕСТВА КАК ДРАЙВЕР ИННОВАЦИОННОГО РАЗВИТИЯ НАУКИ. – 2019. – С. 24-26.

18. Bozorova I. J., Abdullayeva S. U. THE DEVELOPMENT AND ANALYSIS OF METHODS OF CREATING ELECTRONIC EDUCATIONAL RESOURCES FOR CHILDREN WITH DISABILITIES //Институты и механизмы инновационного развития: мировой опыт и российская практика. – 2017. – С. 11-13.

19. Бозорова И. Ж. и др. ТЕХНОЛОГИИ СОЗДАНИЯ ЭЛЕКТРОННЫХ БИБЛИОТЕК И ЭЛЕКТРОННЫХ МУЗЕЕВ //European Scientific Conference. – 2019. – С. 95-97.

20. Бозорова И. Ж. и др. ТЕХНОЛОГИИ СОЗДАНИЯ ЭЛЕКТРОННЫХ БИБЛИОТЕК И ЭЛЕКТРОННЫХ МУЗЕЕВ //European Scientific Conference. – 2019. – С. 95-97.