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FINDING WAYS AND MEANS OF OPTIMIZING ALGORITMS OF TRANSFORMATION NUMERICAL MATRICES

This article mentioned algorithm transformation numerical matrices by the reduction, which is described in more detail in previous publications. In the study of this algorithm was developed a number of modifications with unique operations on matrices of numbers. Each modification is subject to a certain set of rules, which in turn depend on criteria of matrix: size (number of rows and columns), content (the number of decimal numbers), the prospect of reduction (the presence of identical numbers in a single test within) allowable number of iterations. From the classification criteria of matrix depends the path of transformation and recovery matrix, so it set the goal of finding drugs that will carefully organize and facilitate these processes, but did not break the integrity of the algorithm.

Keywords: virtual operators, the transformation matrix, restoration matrix, reduction criteria, sample iterations, priorities system.

ПОШУК ШЛЯХІВ ТА ЗАСОБІВ ОПТИМІЗАЦІЇ АЛГОРИТМУ ТРАНСФОРМАЦІЇ ЧИСЛОВИХ МАТРИЦЬ

Згадано алгоритм трансформації числових матриць методом їх скорочення, котрий описано детальніше у попередніх публікаціях. Під час дослідження цього алгоритму було розроблено низку модифікацій із унікальними операціями над матрицями чисел. Кожна модифікація підпорядковується певному набору правил, що, своєю чергою, залежать від критеріїв матриці: розміру (кількість рядків та стовпців), вмісту (кількість знаків числа), перспективи скорочення (наявність однакових чисел в одному досліджуваному радіусі), допустимої кількості ітерацій. Від критеріїв класифікації матриці залежить шлях трансформації та відновлення матриці, тому метою було знаходження засобів, котрі зможуть ретельніше систематизувати та полегшити ці процеси, але при цьому не порушать цілісності самого алгоритму.

Ключові слова: віртуальні оператори, трансформація матриці, відновлення матриці, критерії скорочення, вибірка ітерацій.

Introduction

Working with the matrix begins with the study of its characteristics, the most important of which is the prospect of cuts. Matrix with a set of numbers that cannot be cut any time can be transformed, that is why it was developed a number of modifications to the basic algorithm to avoid such difficulties. In turn, these modifications depend on the size of the matrix. Accordingly, it was investigated four possible cases: even number columns and odd number lines, even number lines and odd number columns, not even number of columns and rows, even number of rows and columns. Preferably, enough of one to two applications of these modifications algorithm for the emergence of the possibility of transformation matrix.

Also, the study was discovered another problem in the algorithm, namely the reduction of excessive matrix. The emergence of this phenomenon depends on the size and content of the matrix. Matrix has the maximum number of allowable iterations reduction, so there may be difficulties with its reproduction. In some cases it is possible to transform the matrix so that the decline absolutely all its numbers and its value is zero. In this case, the recovery matrix to its original form would be impossible for the algorithm. But to address such problems was also found solutions. With the new modifications (units) algorithm intended to limit the reduction in number of components of the matrix. This modification methods something like balancing matrix intended for recovery prospects reduction.

In a detailed study of the transformation algorithm was found a few possible cases except the above mentioned basic, which may disrupt the correct operation of the algorithm, but each of them has developed subdivision algorithm designed to address them.

In the presence of a sufficiently large number of modifications of the algorithm is a problem with an even greater number of transactions carried out on matrices and also depend on a large number of characteristics of the matrix. Therefore, this article is about finding ways to organize algorithm and does not change and does not deny his actions, modifications, characteristics.

1. Priorities components of the algorithm transformation

For optimal ordering all components necessary algorithm of the transformation to assign a priority matrix characteristics. Accordingly, should give an example of a matrix of random numbers are small and carry a superficial analysis of its characteristics. This approach allows us to evaluate the importance of each characteristic matrix for the algorithm.

7	8	9	0	0
3	2	1	6	5
3	0	5	4	1
5	8	7	5	9
7	6	5	4	3

Fig. 1.1. The input matrix of random numbers

At first glance you can watch matrix 5x5 of positive integers with a sign, and there exists such characteristics as parity and odd numbers, but in this case it has no role, although they have some value in solving more complex examples. Before processing matrix verified emission prospect, according to this example can be seen three reductions in the first iteration. So it should be noted that this case is an opportunity at least once transform matrix, as one of a plurality of units do not have to apply the algorithm. After this iteration 6 of 25 numbers will be reduced matrix, then the matrix size will change and there will be new allowable cuts. Also seemingly reduction only six numbers is not critical, but we should not forget that after each iteration held in the matrix may be new prospects for further reductions. Therefore, the standard will be a step by step reduction to test the maximum number of iterations, as it will determine whether the number of iterations becomes critical.

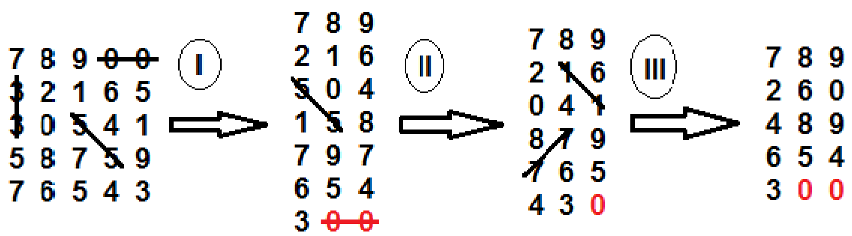

Fig. 1.2. All valid iterations reduction

As can be seen from the example in Figure maximum number of iterations is equal to three and the three iteration matrix becomes a 5x5 matrix 5h3, non-critical loss of numbers that excessive reductions are missing.

All steps in detail not commented since they have been described in previous articles. One thing should be recalled that demonstrated changes after each iteration matrix called displacement and highlighted in red zeros (that the recovery matrix overrides) are called matrix addition. These two steps further work will be used for development of software, in which they will be presented in the form of coefficients for transformation and renewal matrices larger and more complex examples.

As a result of all cuts of 25 numbers left matrix 15, and excluding the last two zeros in its recovery, while still only 13 numbers. You can judge that fell less than half of the matrix in three iterations. According to the number of iterations of the algorithm is directly proportional to the reduction in the number of iterations of recovery is to restore the matrix to its original appearance will be conducted as three iterations.

The result of this analysis is not an acceptable definition of critical or abbreviations instead matrix characteristics on which should primarily rely in its study. Accordingly, the analysis for the critical algorithm cases, they also have a hierarchy of importance and order of their discovery. According to the example given was in before he first tested the possibility of reduction (reduction perspective), which is directly dependent on the availability of the same matrix numbers in other sectors. So the first order priority will be assigned to such content as characteristic matrix is a set of numbers placed in it. Therefore, the second plan the matrix size (number of rows and columns) and it is assigned a priority second order.

2. Priorities for minor components of the algorithm transformation

Due to the wide range of possibilities of this algorithm and its modifications including dial, the user can transform a complex matrix types than indicated in the first chapter. Their complexity may depend not just on the set of numbers, and the type of numbers the most. Previously considered only positive integers that consist of only one mark.

One of the secondary characteristics will type numbers in the matrix are, in fact, this characteristic will have several subspecies.

The studies were observed matrix-valued numbers, which were assigned action similar to the previous example. Here is a simple example of such a matrix:

223	515	774
214	902	359
115	211	431

Fig. 2.1. Matrix-valued random number

We have a matrix size of 3x3, which has three digit numbers while all numbers have the same number of characters. Thanks to one of the versions we can divide this matrix into three separate matrix of numbers with a sign. The number of such matrices depends on the number of decimal numbers. Separation input matrix will look like this:

2 5 7	2 1 7	3 5 4
2 9 3	1 0 5	4 2 9
1 2 4	1 1 3	5 1 1

Fig. 2.2. The distribution matrix-valued numbers for certain matrix

As shown in this example all three digit numbers were divided into the number one sign, this separation was carried out in columns, as is the quickest and easiest of options. Each of the three new matrix has the ability to cut, they are transformed separately by one, and for example can be the same way and passed, in the case when the task is to encode the message, then each matrix separately recovered and then three restored matrices we form according to specified order original matrix three digit numbers. This modification reduces the problem of big numbers to the problem of the first chapter, which confirms the assignment of the highest priority content matrix.

The research allowed to develop of the algorithm modification to work with more complex cases valued numbers. For example, consider a matrix-valued numbers, where all numbers have a different number of characters:

1	22	3
444	9	17
5	357	21

Fig. 2.3. The matrix of numbers with different numbers of characters

This matrix at first glance it is impossible to split into three separate, but if we apply the method, which is similar to the addition of the matrix, in which used zero that the recovery could ignore, then just as we can change the number of digits of each number for the desired result. The matrix has the maximum number of three characters, respectively rest, we also transform in three digit numbers.

001	022	003
444	009	017
005	357	021

Fig. 2.4. Matrix additional signs of numbers

Now all components of the matrix is a three digit number, which similarly split between three separate matrices. Each of the smaller numbers were supplemented by one or two zeros (depending on the number of characters the greatest number) that the recovery can be ignored because they are part of the original matrix, but most likely they can be reduced in the process of the basic algorithm. These zero does not change the value of each number, as they are at the numbers.

A similar approach can be used in the matrix Fractional because to some extent they also can be considered meaningful, except that we distinguish fractional number less than one or more / equal to unity.

Fractional numbers that are lower per unit can be more effectively reduced demonstrate choose the matrix with numbers:

0.0091	0.0182	0.0004
0.0342	0.0008	0.0031
0.0038	0.0083	0.0284

Fig. 2.5. Matrix fractional numbers

In this case, we do not count the maximum number of supplement and not the number of zeros, but on the contrary, as all numbers less than one, because all the signs before the comma (dot) is zero by default, so they can be immediately discarded. Then we figure out the minimum number of zeros after the decimal point (dot) according to example after each point is one of the smallest number of zero. If you count the number of decimal zero, then we will remain three marks in each well.

091	182	004
342	008	031
038	083	284

Fig. 2.6. Matrix fractional numbers with a reduced number of characters

Then use the same method as for valued numbers, a matrix divide into three separate, but except for the fact that after the zero point does not disappear, but does not take place in the divided matrix. This is because even if to form a fourth matrix of zeros alone, it is fully reduced and fully reduced matrix is zero, so instead of fourth matrix transmitted only one zero. Restoring these three matrices will know that when received zero for some matrix of numbers, it means zero after a point shot number.

3. Actual methods for optimizing algorithm

The main components of the algorithm and minor components are several acceptable ways to organize them. For example a set of actions for different occasions (modification algorithm) can completely differ among themselves, some of which overlap, while others are valid for multiple types of tasks. Performance, features, modifying of the algorithm can overlap one with problems because some of the ways their organization is Petri nets and building graphs. Using these methods you can build a model around and pick up of the algorithm model for each type of task.

Another way could be the construction of flowcharts to describe of the algorithm and development on the basis of a certain type of binary trees that may not coincide with already developed types of trees and algorithms.

These dividers ways to better describe the algorithm and its features, but at the functional level they do not optimize because during the study were asked to use virtual operators for matrices.

Virtual operators will create a system of sorted and ordered operations and performance matrix that will be used for transformation and renewal matrices. To these operators do not violate the course of the algorithm, they are recorded as numbers, but these numbers be placed in the matrix according to strict rules, depending on its content and other characteristics according to their priorities. These virtual operators will not decline and will not be transmitted together with coded matrix. So our task is reduced to the description of virtual operators in a closed system, which in the future will take the form of a software user interface available. The system will contain all the components algorithm for all types of matrices and applications.

Conclusion

This article described the major and minor components of numerical algorithm transformation matrices, but not considered components of lower orders. This study allowed to identify and propose a way to implement optimization algorithm without deviation from its essence and purpose. The technique of applying virtual matrix operators will streamline prioritize all the components of the matrix will be built under a kind of hierarchy algorithm, based on which will be developed further mathematical, software and methodological software.

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