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Comparisons for Determinants of Special Matrices by Algorithm Proposed

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Abstract. This paper presents the results of an early which compared the new algorithm to special matrices, purpose to calculate the value of determinant. Matrices which are numerically reliable techniques are used for this purpose. This technique permits for accuracy in the sense that it breaks down the new determinant for comparison to improve the existing numerical algorithms and to calculate the determinant of matrix.

Keywords: comparisons for determinants, determinants of special matrices, special matrices for determinants

1. Introduction

There are more algorithms than determinants of matrices. Several algorithms for the determinant of matrices have been recognized [2, 4, 5]. Elimination algorithm is not successful that it produces fractions. This is called naive the technique, because it does not avoid the problem of dividing by zero. This point has to be taken into account when implementing this technique on computers. A method for improving the above elimination algorithm was already known to elimination algorithm with Partial Pivot and complete pivot. This algorithm increase the operation of flop point. The algorithm of permutation obtains the determinant of matrices from its definition by generating all the permutations and copying the entries according to each permutation. The algorithm of permutation produces the determinant of matrices without additional fractions. But it is not easy to get all the permutations from the set of integers. The generating of permutations is actually one of the complete problems. To improve the permutation of algorithm for determinant, we must bring new algorithm for generating the permutations. Khanit (2007) found an algorithm for generating permutation and he used it in algorithm for determinant of any matrix, but he didn't presented comparisons to the test the new algorithm. Dong (2002) has presented a new algorithm for the generation of permutation and used this algorithm to find algorithm for determinant. However the empirical tests proved that algorithm gave the same operation flop point of permutation algorithm for determinant is ($n.n!$). He didn't write program for this algorithm for doing comparisons with other existing algorithms. We present a new algorithm for generating of permutation and use this algorithm to find a new algorithm for determinant. We present many comparisons with other existing algorithms by using special matrices in computer.

2. Construction of New Algorithm

As described in the previous section, there are different algorithms for the calculation of the determinant of matrices, but here we present a new algorithm for calculating the determinant of matrices by using permutation. This algorithm is based on a new algorithm for generating permutations, which gives the determinant of an n-by-n matrix.

To calculate the determinant of matrices, let A be a matrix of $n\times n$ where n is the size of the matrix. Then the steps that lead to the computation of the new algorithms are as follows:

1. Input the matrix A which you want for computation algorithm for determinant of matrices and find the number of all permutations by using the factorial rule as the follow: $n!=n\times(n-1)\times(n-2)\times(n-3)\times.....\times 1!$

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2. Construction algorithm generating of permutation : Generating all the permutations by using the new algorithm for generating of permutation by three steps first, fixing one element then find the number permutations by $(n-1)!$, second, delete the equivalents' permutations by $(n-1)!/2$, three find all permutations by cycle the reminder permutations, for example $n = 4$, the permutations generating in the following:

Step1		Step2		Step 3
1 2 3 4				
1 2 4 3	→	1 2 3 4	→	1 2 3 4, 2 3 4 1, 3 4 1 2, 4 1 2 3
1 3 2 4		1 2 4 3		1 2 4 3, 2 4 3 1, 4 3 1 2, 3 1 2 4
1 3 4 2	→	1 4 2 3	→	1 4 2 3, 4 2 3 1, 2 3 1 4, 3 1 4 2
1 4 2 3				
1 4 3 2				

3. Generate a matrix depending on the new permutation.
4. Find the sign permutation and sign inverse permutation.

The sign for permutation

$$sign\ (1\ 2\ 3\ 4\ \ldots .\ n) = (-1)^{*\text{number of inversion permutation}} = (-1)^{*0} = 1 = +1$$

and sign for inverse permutation

$$sign\ (n\ \ldots\ldots 4\ 3\ 2\ 1) = (-1)^{*\text{number of inversion inverse permutation}} = (-1)^{*(n-(n-1)+n(n-2)+..\ +2-1)} = \begin{cases} 1 & if\ n\ is\ even \\ -1 & if\ n\ odd \end{cases}.$$

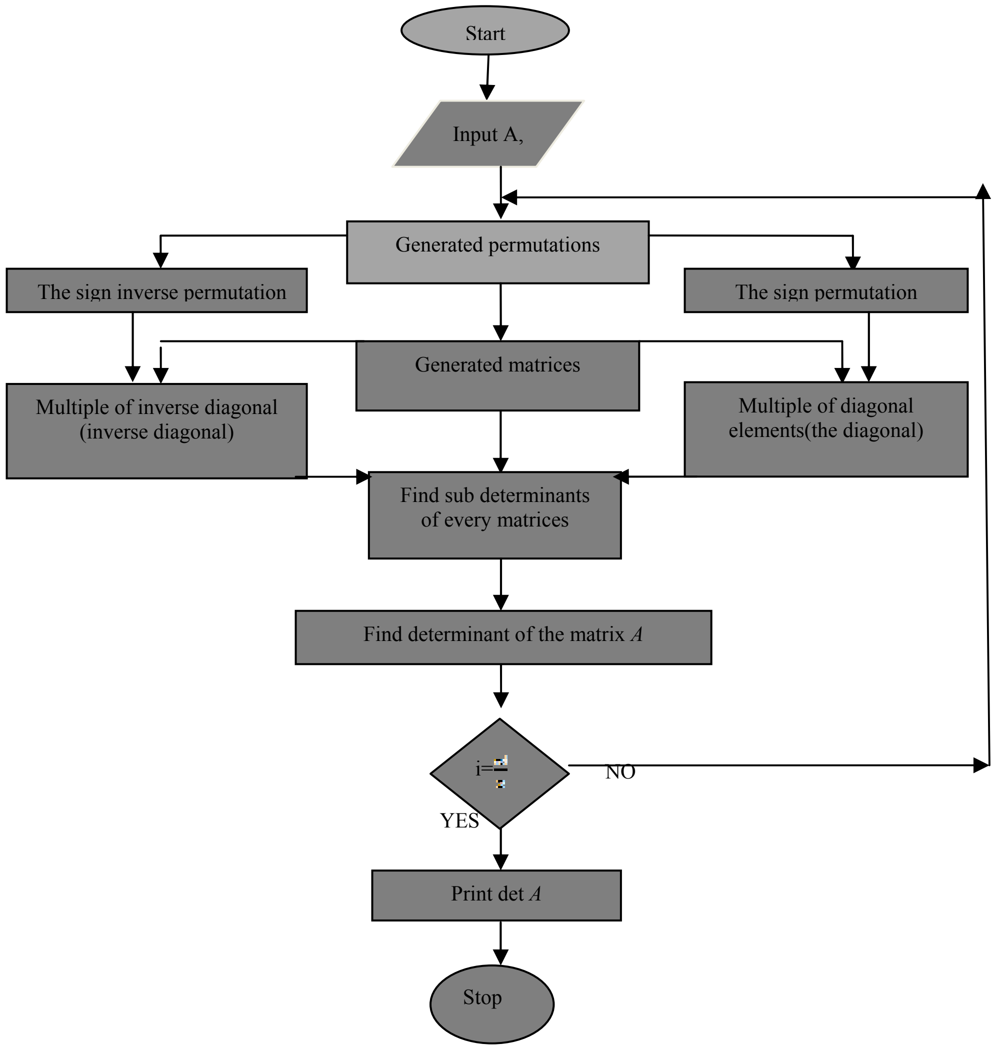

Fig.1: Flow Chart for New Algorithm