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Interpolation Concept in Numerical Computations

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Abstract: In this paper we studied the different types of method used for interpolation. We concluded that all methods used for interpolation depends on certain conditions.

I. INTRODUCTION

"Interpolation is the process of deriving simple function or data from the discrete data .it can be used to estimate the data of given points. As science and engineering has to deal or work with the discrete data. Interpolation helps to deal with discrete data as it simplify the given complicated discrete data into simple functions. Polynomials are simpler to evaluate, differentiate, integrate, hence they are used for this method and they are called as polynomial interpolation. [3]

It can be proven that given n+1 data points it is always possible to find a polynomial of order/degree n to pass through/reproduce the n+ 1 point

II. METHODS CAN BE USED FOR INTERPOLATION

A. Forward Difference Operator.

It is techniques of finding our estimating the value of given function or table from any value. Extrapolation is the process of computing value outside the range.

The differences x1 – x0, x2 – x1, x3 – x2, ……, xn – xn–1 when denoted by ey0, ey1, ey2, ……, eyn–1 are respectively, called the first forward differences. {2}

B. Backwards Difference Operator.

This interpolating technique is used to find the value of the function g = f (x) near the end of table of values, and to extrapolate value of the function a short distance forward from g n , Newton's backward interpolation.[2]

1) Numericals Based on Above Methods.

Q1.calculate forward difference & prepare Forward difference table for following data.

X	1	11	21	31	41	51	61
y	19.96	39.65	58.81	77.21	94.61	114.67	125.31

X	Y	Δy	Δ^2y	Δ^3y	Δ^4y	Δ^5y	Δ^6y
1	19.96						
		19.69					
11	39.65		-0.53				
		19.16		-0.23			
21	58.81		-0.76		-0.01		
		18.4		-0.24		3.91	
31	77.21		-1.00		3.90		-23.55
		17.4		3.66		-19.6	
41	94.61		2.66		-15.74		
		20.06		-12.08			
51	114.67		-9.42				
		10.64					
61	125.31						

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Table 1.1
Δy0 =19.69
Δ^2y0= -0.53
Δ^3y0= -0.23
Δ^4y0= -0.01
Δ^5y0= 3.91
Δ^6y0= -23.55
Conclusion:- by using forward method we have calculated simple data or function from discrete data

Q2.Obtain the backward Difference value & prepare backward Difference table for following data.

X	1	2	3	4	5
Y	3	3.90	6	10	15.65

Solutions

X	Y	▼Yn	▼^2Yn	▼^3Yn	▼^4Yn
1	3				
		0.9			
2	3.90		1.2		
		2.1		0.7	
3	6		1.9		0.95
		4		-0.25	
4	10		1.65		
		5.65			
5	15.65				

Table 2.2
$▼y_{n=0.9}$
$▼^2y_{n=1.2}$
$▼^3y_{n=0.7}$
$▼^4y_{n=0.95}$
Conclusion:- by using forward method we have calculated simple data or function from discrete data

C. Important Note
When the values of X are evenly spaced the forward and backward difference can be used. But if value of X are not spaced evenly. In such case backward difference andforward difference is not applicable.

III. COMPARISON AND ACCURACY
Both the methods are approximate and accurate but some errors can be present.

IV. CONCLUSION
In this paper we have conclude that forward and backward method are accurate and approximate but the use of methods or applying them have to be decided on the basis of some circumstances.

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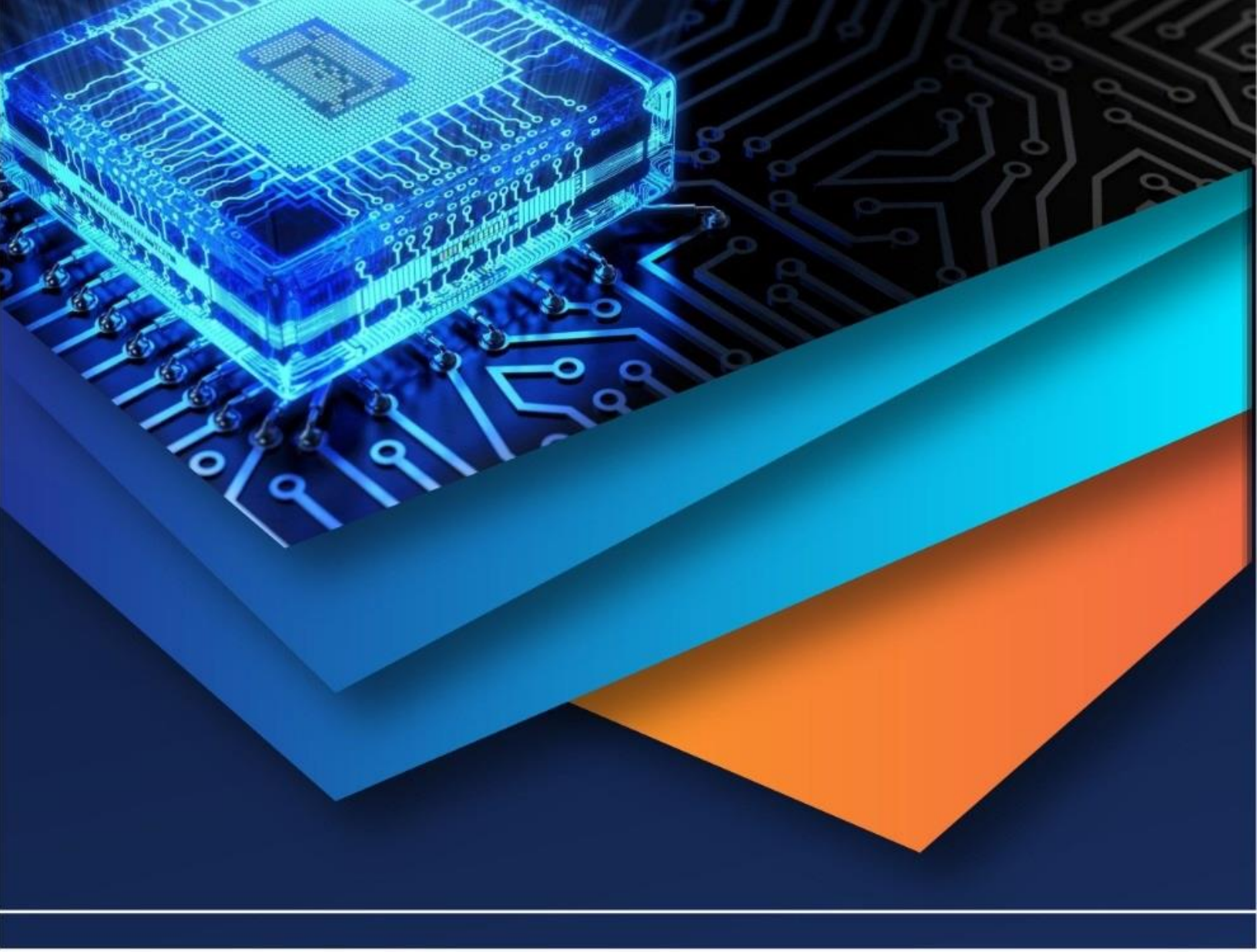

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