Paper Title: **Newton's forward interpolation: representation of numerical data by a polynomial curve**

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What: This paper contains Newton's forward interpolation formula, Representation of numerical data by a polynomial curve, and an Example of application of the formula.

Newton's forward difference formula is a finite difference identity giving an interpolated value between tabulated points in terms of the first value and the powers of the forward difference.

Why: There are a variety of interpolation formulas available. When using existing formulae for interpolation, the value of the dependent variable corresponding to each value of the independent variable must be computed from start using the utilized formula and the value of the independent variable. That is, if a suitable existing interpolation formula is to be used to interpolate the values of the dependent variable corresponding to a number of values of the independent variable, the formula must be applied for each value separately, and the numerical computation of the value of the dependent variable based on the given data must be performed in each case. To avoid repeating these numerical computations from the given data, consider a method that involves representing the numerical data with an appropriate polynomial and then computing the value of the dependent variable from the polynomial corresponding to any given value of the independent variable. However, in order to represent a particular set of numerical data on a pair of variables by an appropriate polynomial, a method/formula is required.

How: Let's solution a problem using newton's forward interpolation formula.

x	1891	1901	1911	1921	1931
f(x) in (M)	46	66	81	93	101

Solution:

Newton's forward difference table is:

x	f(x)	Δy_0	$\Delta^2 y_0$	$\Delta^3 y_0$	$\Delta^4 y_0$
1891	46				
		20			
1901	66		-5		
		15		2	
1911	81		-3		-3
		12		-1	
1921	93		-4		
		8			
1931	101				

Now we have to find $x = 1895$ at $f(1895) = ?$

here, $h = x_1 - x_0 = 1901 - 1891 = 10$

and $u = \frac{x - x_0}{h} = \frac{1895 - 1891}{10} = 0.4$

Newton's forward difference interpolation formula

is,

$$y(x) = y_0 + u\Delta y_0 + \frac{u(u-1)}{2!}\Delta^2 y_0 + \frac{u(u-1)(u-2)}{3!}\Delta^3 y_0 + \dots + \frac{u(u-1)(u-2)\dots(u-n+1)}{n!}\Delta^n y_0$$

Here,

~~y(1895)=~~

$$y(x) = y_0 + u\Delta y_0 + \frac{u(u-1)}{2!}\Delta^2 y_0 + \frac{u(u-1)(u-2)}{3!}\Delta^3 y_0 + \frac{u(u-1)(u-2)(u-3)}{4!}\Delta^4 y_0$$

$$y(1895) = 46 + 0.4 \times 20 + \frac{0.4(0.4-1)}{2!} \times (-5) + \frac{0.4(0.4-1)(0.4-2)}{3!} \times 2 + \frac{0.4(0.4-1)(0.4-2)(0.4-3)}{4!} \times (-3)$$

$$y(1895) = 46 + 8 + 0.6 + 0.128 + 0.1248$$

$\therefore y(1895) = 54.8528$

$\therefore$ Solution of newton's forward interpolation method $y(1895) = 54.8528$

That’s the way of doing newton’s forward interpolation method.

Limitation: No limitation found.

Future Work: