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Review on Newton Raphson Method

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Abstract: The Newton's Raphson method is also known as Newton method. It is named after Isaac Newton and Joseph Raphson. This method is easy way to find an approximate to the roots of real value and also to solve the non-square and nonlinear problems. It also aims to represents a new approach of calculation of non-linear equation which is very similar to Newton Raphson method simple method and inverse Jacobian matrix will be used for further calculation and will also in some application. Self-derivative function in solving non-linear equation in scientific calculator, derivative Newton Raphson formula algorithm, uses and limitations of Newton Raphson method is been discussed below.

I. INTRODUCTION

Finding the solution of a set of no linear equation f(x) = (f1...fn)=0 is been a problem for past years. Newton Raphson method is to be considering an easy way to find the nonlinear equation solution. [2] Compare to other methods this method only requires one iteration and the derivative evaluation per iteration. Newton Raphson method is 7.678622465 times better than the bisection method and secant method is 1.389482397 times better Than Newton method[1]. This method is an easy way to find the roots of the nonlinear equation it provide good outcome with immediate convergence speed and matlab and C++ also adopted this method for finding the roots, scientific calculator is used for such calculation

II. NEWTONRAPHSON METHOD

Newton Raphson method is also known as Newton method, it is named after Issac Newton Joseph Raphson. This is a root finding algorithm which gives better approximations to the roots of real value[3]. It uses the idea that a continuous and differentiable function can be approximated by a straight line tangent to it. The idea is to start with a guess which is merely close to the true roots then a tangent line is drawn using calculus and where the it intersect the x axis. The point at which the x axis is intersected will be a better approximation to the original function root than the first guess and this method can be iterated.

Derivation of Newton method

X: f(x) =0

Given a function f defined over the real x and its derivative f, we begging with the first guess x0 for root of the function f then x1 is

X1 = x0-f(x0)/f'(x0)

IN graph tangent(x0.f(x0)) intersect (x1,0) at x axis.

Xn+1=f (Xn)/f' (Xn)

Iteration is continued till the accurate value is reached. [6]

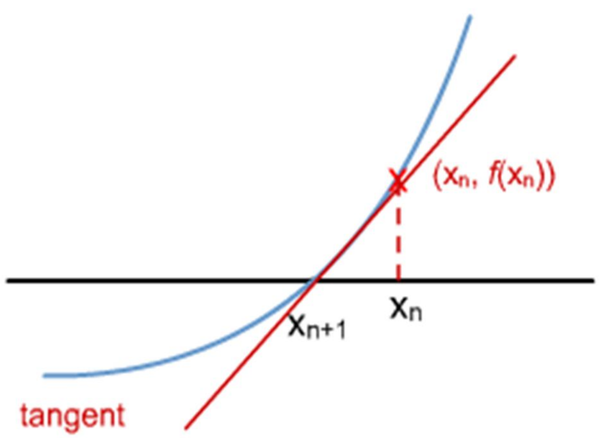

Fig 1.1 Graph illustrating root estimation usingNewtonRaphson method

1) Example

a) Find the real root of $2x^2$-3Sinx-6=0 correct upto 4 decimal places with initial value of x0=1 using Newton method

F(x)= $2x^2$-3Sinx-6

F'(x)= 4x-3cosx

1st Iteration

X0=1

X1=x0-f(x0)/f(X0)

F(x0) =-5.424413

F'(x0)=2.279093

X1= 1-(-5.424413)/2.279093

X1=3.120668

2nd iteration

X2= 2.327631

3rd iteration

X3= 1.491784

4th iteration

X4= 1.950426

5th iteration

X5= 1.950157

6th iteration

X6= 1.950157

Root of f(x) = 1.950157

Table 1.1

Number	Iteration
X1	3.120668
X2	2.327631
X3	1.491784
X4	1.950426
X5	1.950157
X6	1.950157

b) Find the example, if one wishes to find the square root of 602, this is equivalent to finding the solution to[4]

X^2 = 602

The function to use in Newton's method is then,

F(x) = x^2-602

With derivative,

f'(x)=2x

With the initial guess of 10, the sequence given by Newton's method is,

1st iteration

X1= x0-f(x0)/f(x1)

=10-10^2-602/2*10

=35.6

2nd iteration

X2=x1-f(x0)/f'(x1)

=35.6-35.6^2 -602/2*35.6

X2=26.385555671

3rd iteration

X3=24.890065489

4th iteration

X4=24.738965784
5th iteration
X5= 24.73896584
Root of f(x) is 24.73896584

Table 2

Number	Iteration
X1	35.6
X2	26.385555671
X3	24.890065489
X4	24.738965784
X5	24.73896584

III. ADVANTAGES

1) This method is one of the quicker method which to iterate root fastly.
2) Converges of the root quadratic.
3) Approximation gets double when we get near to roots.
4) Multiple dimensionsareeasy to convert. [5]

IV. LIMITATION

1) This method may not work if there is point's inflection, local maxima or minima around x0 or the root.
2) Bad starting point
3) Iteration point is stationary
4) Derivative issue

V. CONCLUSION

Compare to others method Newton Raphson method is more accurate and fast. If the x axis and the tangent are merely parallel to each other this method is not useful in this situation. This method is most used in small molecules of calculation for large molecules of calculation this method is not used. This method is easy to convert multiple dimensions .It has a bad starting point and iteration is stationary. We can also say that the Newton Raphson method can be very useful to determine the intrinsic value based on measured permittivity.

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