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Newton Raphson Technique

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Abstract: This summary is about for solving algebraic equations by reducing it through second degree polynomial equations and this is not for complex roots(i.e 2 or 3 order) but in modified Newton Raphson method technique is for fast model –adaptive identification. By the new method we can find out correlation speed measurement distance measurement and last one is tracking system. This technique is very much helpful in wide spread of several aspect from old one. This technique is of Genetic algorithim, simulated annealing which is applicable for fractal compression.

I. INTRODUCTION

As I already told you at this this technique is used solving algebraic non-linear equation and also fixed iteration by second degree. At first we have to know the word newton raphson come from –This word are derived from named after Issac Newton and Joseph raphson(which gives real value function). Basically this technique is for better approximation to the roots (zeroes)

$x_1=x_0-\frac{f(x)}{f'(x)}$

Occasionally this method fails but sometime you can make it work by changing the initial guess. This algorithm is first in the class of Householder's methods succeeded by Halley's method.

II. APPLICATION

A. Root finding.
B. Finding solution of a system of non-linear equation.[1]
C. Fastest converging method for initial value i.e convex near a root.
D. Optimal design of water distribution network.[2]
E. Used in solving differential equation.

III. THE NEWTON RAPHSON ITERATION

Let x0 be a estimate of r (r=x0+h) where h=r-x0. The number h measures how far x0 from the truth.

(1)	0	$f(x_0+h) \approx f(x_0) + f'(x_0)$
(2)	H	$\approx -f(x_0)/f'(x_0)$
(3)	R	$x_0 + h \approx x_0 - f(x_0)/f'(x_0)$
(4)	X_1	$X_1 - f(x_0)/f'(x_0)$
(5)	X_2	$X_1 - f(x_1)/f'(x_1)$
(6)	X_{n+1}	$X_n - f(x_n)/f'(x_n)$

Table No. (1.1)

IV. NEWTON- RAPHSON METHOD FOR ONE VARIABLE

Newton Raphson method converges faster than false position method and secant method.[3]
Let f(x) = 0 be the given equation
Let xk be an initial approximation to the root of the equation f(x) =0
Let Δ x be an increment in x such that xk +Δ x
Where f (x +Δ x) =0

$X_K + 1$	$X_K \Delta x$	$X_K + (-f(X_K) / f'(X_K)$	$X_K - f(X_K) / f'(X_K)$

K=0,1,2,3,4…….. Table No.(1.2)

V. NEWTON-RAPHSONMETHOD FOR TWO VARIABLE

It is that method which is mostly related to a quadratic function[4] .we can approximate function f at a given point x_k by a Taylor series.

A. *Newton-Raphson method for Single Variable*

In this method we can find more than one root of the given linear equation. Formula for this method is same as Newton Raphson method except there is one more term in this method[5]

Xn+1=X_n– [P]{F(X_n)/ F'(Xn)}

Or

X1=X0 – [P-1]{F'(X0)/ F''(X0) }

Here 'P' is the number of roots which we want to find. And this method is

F(x) =f(x_k) + f(x)(x – x_k) + ½ (x – x_k)t H* (x_k) (x – x_k)

X_{k+1} =x_k– [H * (x_k)f (x_k)]

only applicable when the given equation is a Linear equation.

B. *Newton-Raphson method for Multi variables*

This method is used to find roots of multi variable i.e. There are two different variables. Consider two non-linear equation having two variable 'x' and 'y'. P(x,y)=0

Q(x,y)=0[6].

Example; find the real root of the equation F(X)=2x2-3sin(x)-5=0 correct upto 3 decimal places, where initial X_0=1 using Newton-Raphson Method.

Solution

Let F(X)=	2x2-3sin(x)-5
F'(X)=	2x2-3sin(x)-5
F'(X)=	4x-3cos(x)
F''(X)=	4+sin(x)
F(X0)=	-5.524412 F''(X)= 4+sin(1)=6.5

Table No.(1.3)

It satisfies the condition F(X0). F''(X0)>0

Therefore we can use Newton Raphson Method by taking initial value as X_0=1

1) *1st Iteration*

F'(X)	4(1)-3cos(1)= 2.379093
X_1	X_0 - F(X0)/ F'(X_0)
X_1	3.322066

Table No. (1.4)

2) *2nd Iteration*

F(X_1)=2(3.322066)2-3sin(3.322066)-5 F(X_1) =17.610730

F'(X_1) =2(3.322066)-3cos(3.322066)

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VI. GRAPHIC REPRESENTATION

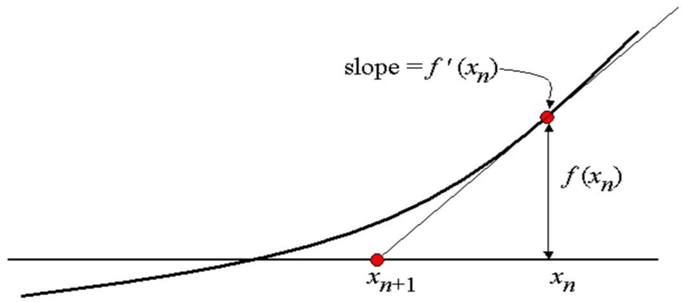

Figure (2.1)

We draw a tangent line to the graph of f(x)*f*(*x*) at the point x = x_n*x*=*xn*. This line has slope f'(x_n)*f*′(*xn*) and goes through the point \big(n,f(x$_n$)\big)(*xn*,*f*(*xn*)). Therefore it has the equation y = f'(x$_n$)(x – x$_n$ + f(x$_n$)*y*=*f*′(*xn*)(*x*−*xn*)+*f*(*xn*). Now, we find the root of this tangent line by setting *y*=0 and x=x_{n+1}*x*=*xn*+1 for our new approximation. Solving this equation gives us our approximation, which is x_{n+1} = x$_n$- \frac{f(x.n)}{f'(x.n)}*xn*+1=*xn*−*f*′(*xn*)*f*(*xn*).

VII. HOW DOES IT WORK

Suppose you need to find the root of a continuous, differentiable function f(x)*f*(*x*), and you know the root you are looking for is near the point x = x_0*x*=*x*0. Then Newton's method tells us that a better approximation for the root isx_1 = x_0 - \frac{f(x_0)}{f'(x_0)}.*x*1=*x*0−*f*′(*x*0)*f*(*x*0).This process may be repeated as many times as necessary to get the desired accuracy. In general, for any x*x*-value $_{xnxn}$, the next value is given byx$_{n+1}$} = x_n - \frac{f(x$_n$)}{f'(x$_n$)}.*xn*+1=*xn*−*f*′(*xn*)*f*(*xn*).[7]

Note: the term "near" is used loosely because it does not need a precise definition in this context. However, x_0*x*0 should be closer to the root you need than to any other root (if the function has multiple roots).

VIII. CONCLUSION

By this method we solved many algebraic equation (i.e non-linear).This method is fast as compared with other method. This makes reduce in time complexity for solving non-linear equation.withthe help of this the

Convergence rate of bisection method is very slow and it's difficult to extend such kind of system equation. This method have very fast converging rate.

This method can be continuously applied to generate an iterative scheme with arbitiary specified order of convergence.

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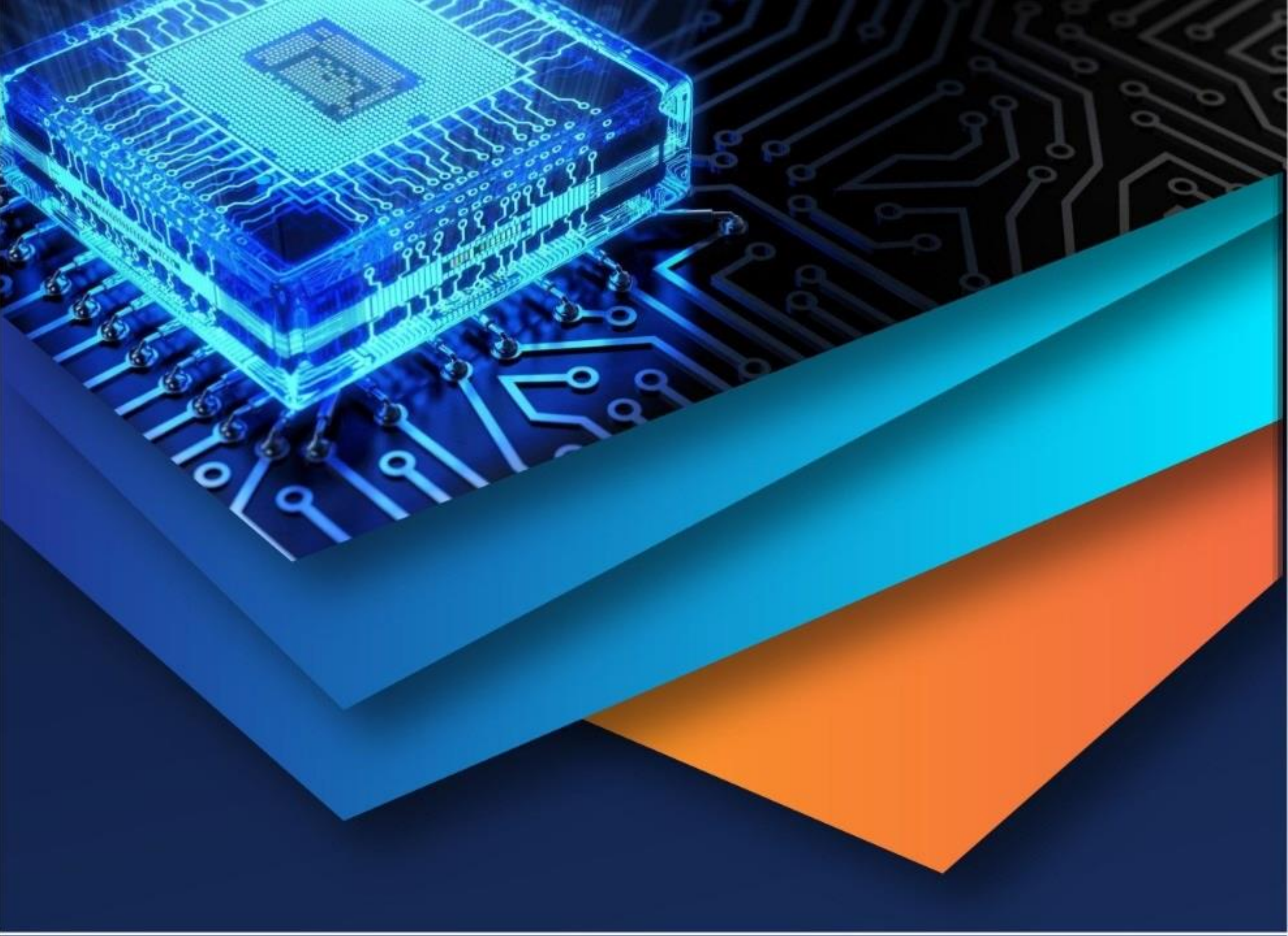

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