The False-Position Method

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FALSE POSITION METHOD

طريقة الموقع الخاطئ

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Introduction

The poor convergence of the bisection method as well as its poor adaptability to higher dimensions motivate the use of better techniques. One such method is the *Method of False Position*.

طريقة الموقع الخطأ إحدى وسائل التحليل العددي، الغرض منها الحصول على الجذر الحقيقي للمعادلة $f(x)=0$.[1]

هي من أقدم الطرق الحسابية، وتشبه طريقة التنصيف مباشرة لكن معدل التقارب في طريقة الوضع الخاطئ أسرع من طريقة التنصيف.

This method attempts to solve an equation of the form f(x)=0. (This is very common in most numerical analysis applications.) Any equation can be
written in this form.
The algorithm requires a function f(x) and two points a and b for which f(x) is positive for one of the values and negative for the other. We can write
this condition as f(a)×f(b)<0.
If the function f(x) is continuous on the interval [a,b] with f(a)×f(b)<0, the algorithm will eventually converge to a solution.
The idea for the False position method is to connect the points (a,f(a)) and
(b,f(b)) with a straight line.
Since linear equations are the simplest equations to solve for find the regulafalsi
point (C) which is the solution to the linear equation connecting the endpoints.
Look at the sign of f(C):
If sign (f(C)) = 0 then end algorithm
else If sign(f(C)) = sign(f(a)) then set a = C
else set b = C

Note

The False-Position and Bisection algorithms are quite similar. The only difference is the formula used to calculate the new estimate of the root x

Estimate the root, c_r of the equation $f(x)=0$ as

$$c_r = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

Now check the following

If $f(a)f(c)<0$, then the root lies between a and c; then $a = a$ and $b = c$.

If $f(a)f(c)>0$, then the root lies between c and b; then $a = c$ and $b = b$.

If $f(a)f(c)=0$, then the root is . Stop the algorithm.

Find the new estimate of the root

$$c_r = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

باستخدام طريقة الوضع الخاطئ بدقة تصل إلى 0.0002 اوجد جذر المعادلة,

$x^3-2x-5= 0$ في الفترة $[2,3]$

الحل:

$f(x)= x^3-2x-5$

$f(2)= 2^3-2(2)-5=-1<0$

$f(3)= 3^3-2(3)-5=16>0$

$$C_r = \frac{a f(b) - b f(a)}{f(b) - f(a)}$$

$$C_1 = \frac{2(16)-3(-1)}{16-(-1)} = 35/17 = 2.0588$$

$f(2.0588)=-0.3908 <0$

$C_1=a$

The root lies between [2.0588,3]

$$C_2 = \frac{2.0588(16)-3(-\ 0.3908)}{16-(-0.3908} = 2.0813$$

$|C_2 \_ C_1| \leq 0.0002$

$|2.0813 \_ 2.0588| \leq 0.0002$

$|0.0225| \leq 0.0002$

$f(C_2) = (2.0813)^3 - 2(2.0813) - 5$ **= -0.14680**

$C_2 = a$

وبتكرار هذه العملية نحصل على

$c_3=2.0862$, $c_4=2.0915$

$c_5=2.0934$, $c_6=2.0941$, $c_7=2.0943$

وبالتالي الجذر هو 2.094 صحيح ل ثلاث خانات عشرية .


Thank you