NUMERICAL PACKAGE IN COMPUTER SUPPORTED NUMERIC ANALYSIS TEACHING

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ABSTRACT

At universities in the faculties of Engineering, Sciences, Business and Economics together with higher education in Computing, it is stated that because of the difficulty, calculators and computers can be used in Numerical Analysis (NA). In this study, the learning computer supported NA will be discussed together with important usage of the calculator, computer and simulation programs will be emphasized and suggestions will be presented. In addition to the previously studied package programs using Visual Basic and C++, new solution based simulation programs have been developed.

Keywords: Numerical Analysis, Calculator, Simulation, Package Program, Solution Based, Numerical Methods, Teaching, Computer, Tutorial, Computer Supported, Program.

INTRODUCTION

Today there are fast developments in computer programming packages and projects that are being made on these packages. Regarding the fast development of technology this matter needs to be considered and used in order to get a benefit from that packages and projects rapidly.

The importance of teaching or education of technology supported mathematics is increasing day by day. Together with this, in order to enjoy teaching and learning mathematics you may use the computer and a calculator as a help tool (Ersoy, 2005). Currently, there are debates on whether calculators should be used or not in mathematic classes (Ersoy, 2003), but it can be said that this idea is totally invalid in NA. On the contrary, it may take a longer period in solving algorithmic problems. In NA teaching it's impossible to avoid using a calculator and computer. Together with this, currently in computer and technology supported mathematics; there are obstacles which need to be tackled (Ersoy, Baki, 2004). Software's simplicity, usefulness and its easiness to be learned are very important. Therefore, retraining the teachers continuously may prevent the well-informed teachers from having extra responsibility let upon them and may provide them with extra time.

If we were to mention the three properties of the calculator it would be: able to the mathematical calculations, easily accessible and cheap. In the development of today's technology almost all mobile phones have calculation functions and have also been put in Windows programs therefore, the idea of NA problems can easily be solved by a mobile phone which is not an imagination by entering only simple parameters. In this widespread situation, the most two important factors are: the understanding of the software and its effect on it being user friendly.

At the beginning of the 1990s, I can still recall, in the NA class, my tutor saying; "if you write down this code and run this program, you will find the answer". Even today, the codes we need to input on the computer programs (for example C++, Pascal, Matlab, Mathematica, Visual Basic etc.), some are compulsory some are elective and there are some that don't need to be given in some departments. Lets imagine that the computer program codes aren't needed for later purposes, it will be time consuming to input unnecessary codes and if some codes are put in, you may focus on non-related subjects.

PACKAGE PROGRAMS IN NUMERICAL ANALYSIS

We usually teach mathematics through examples, but often our students learn just the one example they study. They don't look deeper into the problem. They do not know why one set of parameters optimizes a solution and the other one does not. They may not be able to predict how a small change in parameter will affect the result (Kristin, etc., 1990). At this point, NA teaching simulation programs are important consequently, there would be an increase in the performance of the total learning experience in mathematics education which has been stated in detail the role of the computer (Aydın, 2005).

Before, simulated programs were written in Basic, Pascal and C languages, but now Mathcad, Matlab, Maple and Mathematica visuals have taken over. The usage of Mathcad is increasing day by day and this is especially preferred in the departments of Science and Engineering Faculties (Wlodkowski, 2006). Another of Mathcad's special feature is, it can edit words and calculate at the same time. Therefore, using a software calculator can easily be learnt which proves its importance.

In 2002, C++ was used in NA learning. This can be seen in the Turkish menu below (Figure 1.) as a developed visual package program (Yüncü, Aslan, 2002). In this package program numerical error analysis were made and samples are provided. Additionally, programs for: Bairstow root finding, Gauss elimination method, LU-Crout analysis, Cubicspline interpolation, Romberg integral and Runge-Kutta methods were used.

Again, Visual Basic being another visual program, another type of developed software calculator program in 2006, and a research paper encouraged the uses of computer programming methods for the execution of numerical iterations (Hassan,

etc., 2006). These are Newton Raphson, Euler, Improved Euler, Runge –Kutta and Lagrange's interpolation methods. Also, that program has the capacity to accept, run, perform, execute and give the final answers to numerical iteration method adopted. You can see this program below in details (Figure 2.):

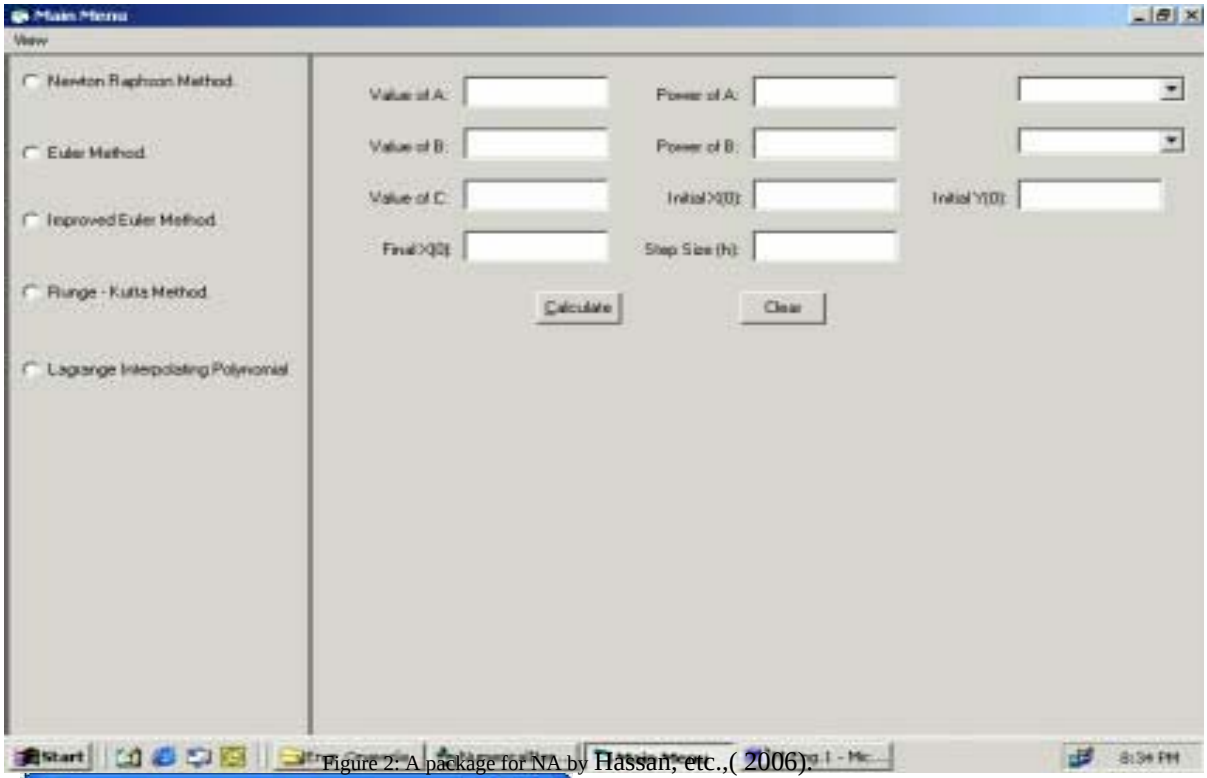


Figure 2: A package for NA by Hassan, etc.,(2006).

Figure 1: A package for NA by Yüncü, Aslan, (2002).

In addition to the above characteristics, in this study it's an be found depending on the method of solution. Here, Mathews (198 e methods in producing results in the Visual Basic developed packag on Raphson, limitations are only made for these non-linear functions a program are degrees of the function, coefficients and necessary initia unctions and parameters in order to make sure that the students understa tor is needed for appropriate parameters. It mustn't be forgotten that eac points). The details can be seen in Figure 3, Figure 4, Figure 5 and Figu

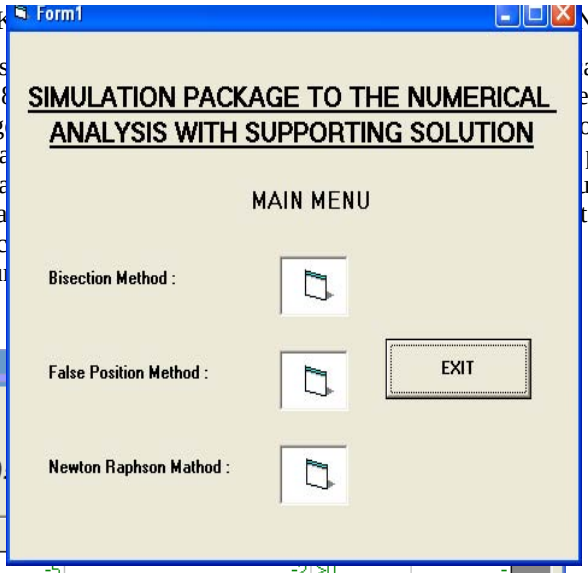
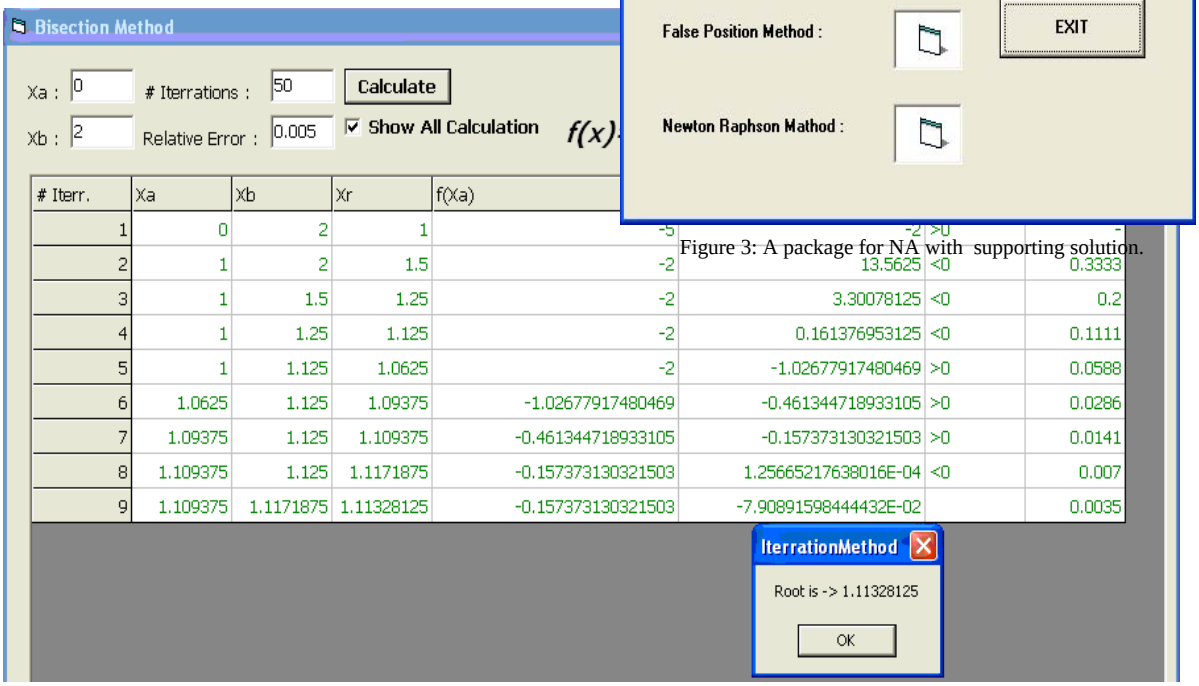


Figure 3: A package for NA with supporting solution.



# Iterr.	Xa	Xb	Xr	f(Xa)			
1	0	2	1	-5	-2	>0	-
2	1	2	1.5	-2	13.5625	<0	0.3333
3	1	1.5	1.25	-2	3.30078125	<0	0.2
4	1	1.25	1.125	-2	0.161376953125	<0	0.1111
5	1	1.125	1.0625	-2	-1.02677917480469	>0	0.0588
6	1.0625	1.125	1.09375	-1.02677917480469	-0.461344718933105	>0	0.0286
7	1.09375	1.125	1.109375	-0.461344718933105	-0.157373130321503	>0	0.0141
8	1.109375	1.125	1.1171875	-0.157373130321503	1.25665217638016E-04	<0	0.007
9	1.109375	1.1171875	1.11328125	-0.157373130321503	-7.90891598444432E-02		0.0035

Figure 4: Bisection Method.

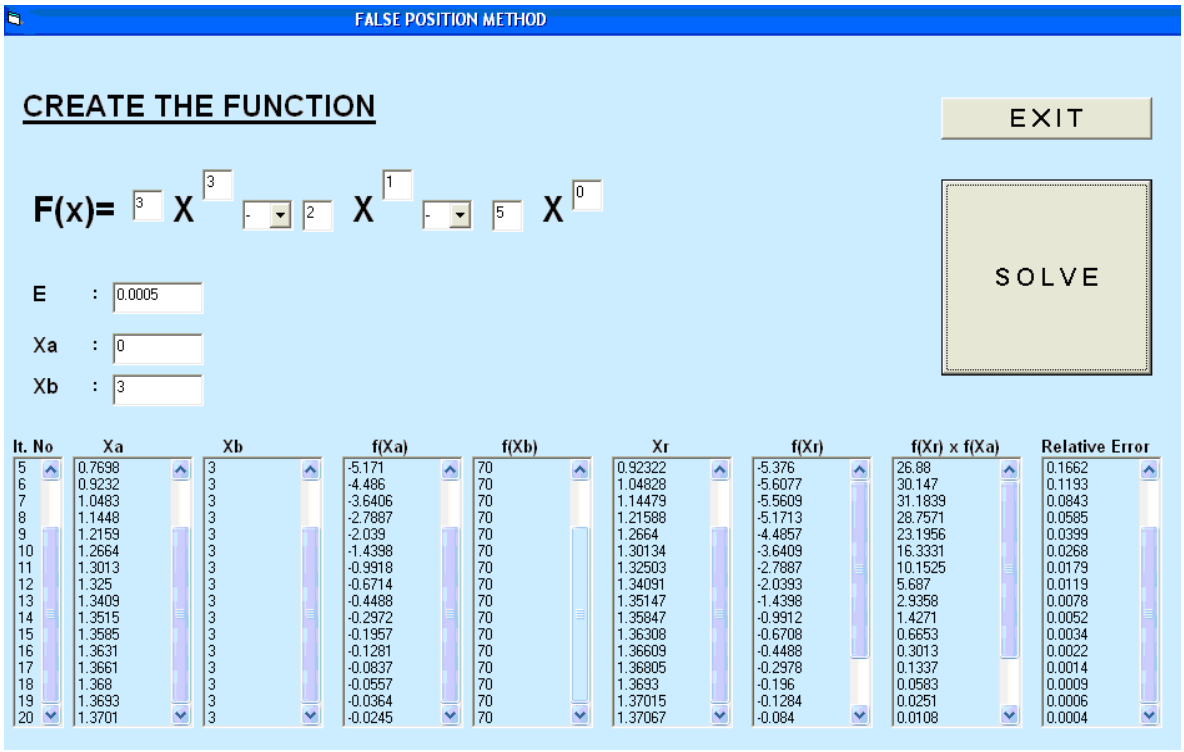


Figure 5: False Position Method.

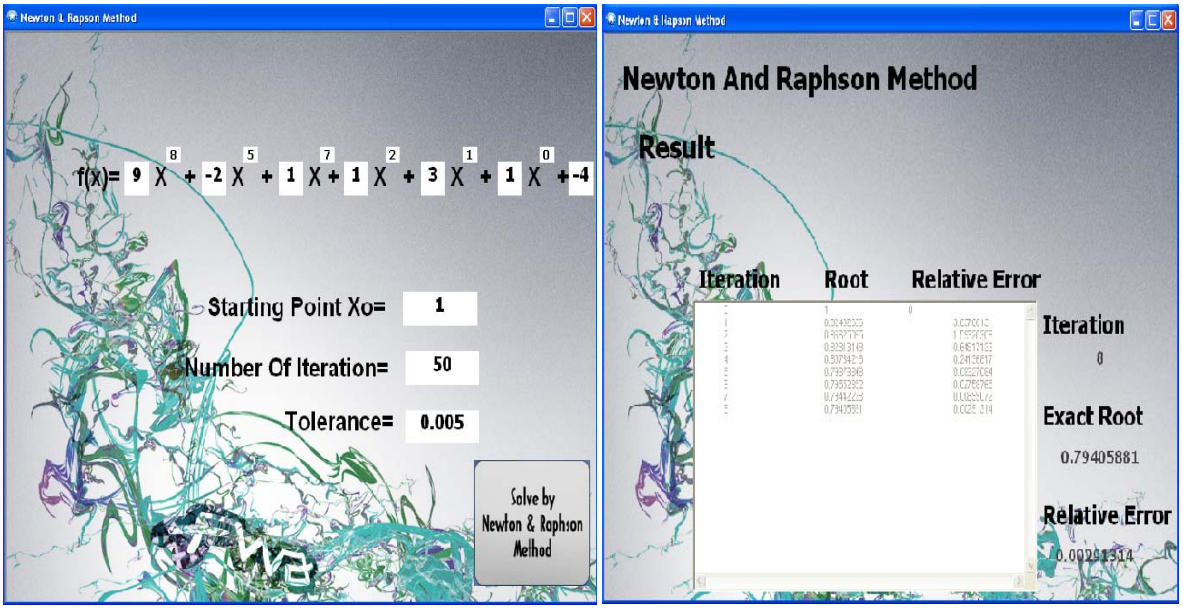


Figure 6: Newton Raphson Method.

CONCLUSION

In order to find the root of the non-linear function in this developed program package, there is no need for programming information instead, you can run the program by using Windows. It can also be used in NA teaching as a course supportive and a software calculator.

Even though the function capacity is limited in this package program, it produces the students sufficient amount of functions which helps them understand the lesson. Changes in the programming code can give a range of different functions. For this, Visual Basic information is a necessity. In addition, the program is based on the method of solution therefore, you can use an overhead projector for the presentation of the methods mentioned above to make the topic more clear or it can be put on a web-page as a course supportive tool.

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