

Topic:

APPLICATION OF NUMERICAL COMPUTING

Abstract:

The main aim of this paper is to understand the information to numerical computing. In this paper we solve some examples of numerical computing. The numerical computational techniques are the technique by which mathematical problems are formulated and they can be solved with arithmetic operations. Those techniques are basically numerical methods. Numerical method supports the solution of almost every type of problem. The numerical methods are classified depending upon the type of the problem.

Numerical Computing Introduction:

Numerical computing is an approach for solving complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical model's physical situations that can be solved with arithmetic operations. It requires development, analysis and use of algorithms. Numerical computations invariably involve a large number of arithmetic calculations and, therefore, require fast and efficient computing devices. The microelectronic revolution and the subsequent development of high, low-cost personal computers have had a profound impact on the application of numerical computing methods to solve scientific problems.

NC are Basically Depending upon the Type of Problem:

Direct methods lead us to the exact solution in a finite number of steps. For example, **Gauss elimination** is used to find the roots of the linear simultaneous equations immediately. On the contrary, **iterative methods** are most commonly used and are not expected to finish off in a certain number of steps. These are approximate methods starting from an initial guess and converging to an exact solution. **Gauss- Jacobi** and **Gauss- Seidel** are iterative methods used to solve a system of equations with a larger number of unknowns.

Characteristics of Numerical Computing:

1. **Accuracy:** Every method of numerical computing introduces errors. They may be either due to using an appropriate in pace of an exact mathematical procedure or due to inexact representation and manipulation of numbers in the computer. These errors affect the accuracy of the results.
2. **Efficiency:** One more consideration in choosing a numerical method for solution of a mathematical model is efficiency. It means the amount of effort required by both human and computer to implement the method.
3. **Numerical Stability:** Another problem introduced by some numerical computing method is that of numerical instability. Errors introduced into a computation, from whatever source, propagate in different ways. In some cases, these errors tend to grow exponentially, with disastrous computational results.

Error

Whenever any mathematical calculation is performed it is not always possible to use exact and accurate values i.e., approximate values are used. Because of approximation the result is not accurate and we can say that error is introduced in the calculations.

Types of Error

Absolute Error:

It is defined as the magnitude of error. Which we considered as the true value. It is denoted by E_a . The absolute error depends upon the magnitude of actual and approximate value. Hence only absolute error does not provide complete information related to error.

Relative Error:

When the absolute error is normalized with respect to actual value then it is called relative error.

Applications in Computing:

In an infinite series (e.g., log) is approximated by a finite sum, the omitted term represents approximation error. Here, we need to estimate this error (or a bound for it) theoretically. Usually, this error depends on some parameter: e.g., n =number of terms in the finite series in numerical differentiation integration in an interactive procedure we need to be able to test whether the process has converged.

Some real-life application of numerical computing mentioned below:

- ***Making forecasts for the weather.***
- ***Enhancement of car safety.***

- *It is possible to learn from machine learning.*
- *Dynamics of spacecraft.*
- *The price estimation of airline companies.*

Analog Computing:

Analog refers to the principle of solving a problem by using a tool which operates in way analogues to the problem. Many real-life measurable quantities are analog in nature: time, temperature, pressure, and speed, for instance.

Digital Computing:

A digital computer is a computing device that operates on inputs which are discrete in nature. The input data are numbers that may represents numeral, letters, or other special symbols. Digital computers are more accurate than analog computers. Digital computers are widely used for many different applications and are often called general purpose computer.

Conclusion:

Numerical analysis is the branch of modern computation that finds applications in the field of engineering, life sciences and even arts. It has a remarkable ability to predict the world around us. Clearly, numerical analysis has proved itself as a boon to humankind, from ancient times all the way to today, and they will surely help us move forward into the future.

Reference:

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