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AJANTA PRAKASHAN

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Mathematics Using Matlab: A New Way of Mathematizing

Momin Fasiyoddin Inayat

Department of Mathematics, Milliya Arts, Science and Management Science College, Beed.

Abstract

Knowledge of mathematics is at the core of all the sciences. Methods to gain the knowledge of mathematics had always influenced by the traditional tools and techniques. During past few decades the development of calculating tools and computing devices had influenced the development of mathematics. Computers caused an enormous growth in usability value of mathematics and provided better environment for simulation, visualization, programming complex models and solving various mathematics problems which are difficult to solve manually. This paper provides an overview of the MATLAB and its use in solving the mathematical problems.

Keyword: Matlab, Computation, Toolbox

1. Introduction

Mathematics is a key to all sciences and it reveals hidden patterns that help us to understand the world around us. Now days, mathematics is not limited to arithmetic and geometry, but it is a diverse discipline that deals with data, measurements and observations from science, with inference, deduction, and proof; and with mathematical models of natural phenomena, of human behavior, and of social systems [1].

A driving force behind the advancement of civilization has always been the desire to overcome problems of daily life with the help of technical aids [2]. Watching the history of mathematics you can recognize that calculation tools had always influenced the development of mathematics. The computer, a child of mathematical thinking, has changed the several roles of mathematics as well as the ways of teaching and learning mathematics.

The computer caused an enormous growth of the usability value of mathematics. The powerful calculation competence, the possibility of simulating, building complex models by programming, visualizing facilities are provided for effective learning of mathematics. This possibility has also changed the technology supported math education.

Mathematics is a language and like other languages it has its own grammar, syntax, vocabulary, word order, synonyms, and conventions [3]. This language is both a means of communication and an instrument of thought.

Computers have had a dramatic influence on almost every arena of scientific and technological development, and large tracts of mathematics have been developed to support such applications. Here applications of computers to mathematics, that is, the sense in which computers can help us acquire mathematical knowledge and understanding [4].

The new approach to mathematics the utilization of advanced computing technology in mathematical research is often called *experimental mathematics*. The computer provides the mathematician with a laboratory in which he or she can perform experiments: analyzing examples, testing out new ideas, or searching for patterns [5]. This paper tries to provide a basic idea of how to use MATLAB as a tool for mathematical modeling, interpretation, and visualization.

2. MATLAB overview

Matlab is a high-performance language for technical computing (Mathworks, 1998). MATLAB, which stands for **M**ATRIX **L**ABORATORY, is a state-of-the-art mathematical software package, which is used extensively in both academia and industry. It is an interactive program for *numerical* computation and data visualization, which along with its programming capabilities provides a very useful tool for almost all areas of science and engineering. Unlike other mathematical packages, such as MAPLE or MATHEMATICA, MATLAB cannot perform symbolic manipulations without the use of additional Toolboxes. It remains however, one of the leading software packages for *numerical* computation [6].

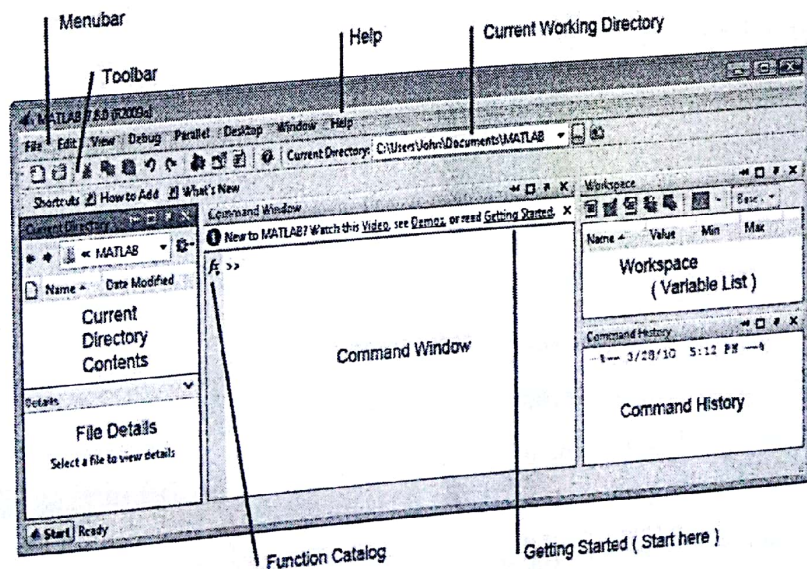


Figure: Matlab Work Environment

- **Polynomials and interpolation:** Matlab can be used as a programming language for solving various problems including polynomial interpolation and many more. We can design the scripts in Matlab which can be used to solve the problem of polynomial interpolation using some inbuilt functions and some additional processing.
- **Fourier analysis and filtering:** Matlab provides inbuilt functions for performing Fourier analysis (fft) and number of linear filters for various applications including image enhancement.
 - Data analysis and statistics
 - Optimization and numerical integration
 - Ordinary differential equations (ODEs)
 - Partial differential equations (PDEs)
 - Sparse matrix operations

4. Conclusion

This paper provides an overview of MATLAB as a tool for mathematics. MATLAB provides powerful environment to solve linear algebra problems, data analysis and statistics, differential equations, polynomials and many more. MATLAB also provide a language to design number of scripts to solve those problems for which inbuilt functions are not sufficient. It can also be used as an effective tool in teaching of mathematics as it provides visualization of the results for many problems like curve fitting, linear and nonlinear transforms, filtering etc.

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