Engineering and Scientific Applications: Using MatLab® for Data Processing and Visualization

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Abstract: MatLab® (MATrix LABoratory) is a numerical computation and simulation tool that is used by thousands Scientists and Engineers in many countries. MatLab does purely numerical calculations, which can be used as a glorified calculator or interpreter programming language; its real strength is in matrix manipulations. Computer algebra functionalities are achieved within the MatLab environment using "symbolic" toolbox. This feature is similar to computer algebra programs, provided by Maple or Mathematica to calculate with mathematical equations using symbolic operations.

MatLab in its interpreter programming language form (command interface) is similar with well known programming languages such as C/C++, support data structures and cell arrays to define classes in object oriented programming. As such, MatLab is equipped with most of the essential constructs of a higher programming language. MatLab is packaged with an editor and debugging functionality useful to perform analysis of large MatLab programs and find errors.

We believe there are many ways to approach real-world problems; prescribed methods to ensure foregoing solutions are incorporated in design and analysis of data processing and visualization can benefit engineers and scientist in gaining wider insight in actual implementation of their perspective experiments. This presentation will focus on data processing and visualizations aspects of engineering and scientific applications. Specifically, it will discuss methods and techniques to perform intermediate-level data processing covering engineering and scientific problems. MatLab programming techniques including reading various data files formats to produce customized publication-quality graphics, importing engineering and/or scientific data, organizing data in tabular format, exporting data to be used by other software programs such as Microsoft Excel, data presentation and visualization will be discussed.

The presentation will emphasize creating practical scripts (programs) that extend the basic features of MatLab Topics include

- Matrix and vector analysis and manipulations
- Mathematical functions
- Symbolic calculations & functions
- Import/export data files
- Program logic and flow control
- Writing function and passing parameters
- Test application programs