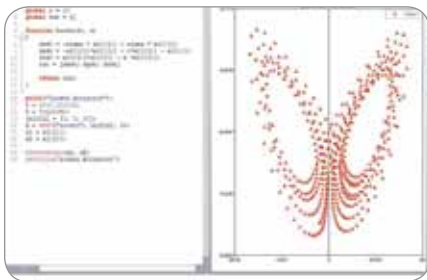
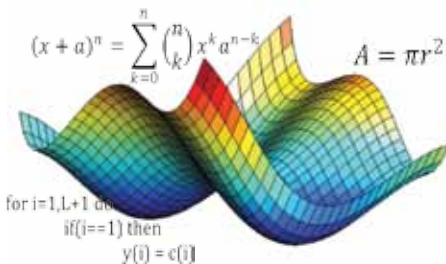


Altair® HyperMath™

Mathematical Modeling Environment



HyperMath Includes a Modern GUI-Based Development Environment

HyperMath™ is a general purpose numerical computing environment consisting of a high-level programming language, extensive math libraries and a comprehensive set of interactive development tools. This rich environment enables efficient custom math modeling compared with spreadsheets and traditional programming languages. In addition HyperMath's tight integration with HyperWorks™ allows for seamless pre and post processing of computer-aided engineering data.

Benefits

Rapid Code Development

- An easy-to-use and intuitive high-level scripting language designed for numerical code development.
- Interactive code debugging with Altair ScriptView enables visual identification of programming errors and speeds troubleshooting without the need to embed diagnostic code.
- Eliminates the need to develop standard functions by providing a wide collection of utilities enabling streamlined numerical programming.
- Includes string manipulations, file I/O, to meet a wide range of needs.
- Data plotting and graphing provide visual verification for any given HyperMath programming solution.

Comprehensive Mathematical Library

- Access to a comprehensive suite of mathematical libraries for both simple and advanced data analysis.

Easy CAE and Test-Data Access

- Built-in CAE and test-data readers give access to all popular FEA data formats for pre- and post-processing.

Enhancing Existing Processes

- A direct integration with the HyperWorks suite of products and HyperMath's open nature allow users to easily integrate HyperMath solutions within any CAE process.

Capabilities

Integrated Development Environment

An integrated set of GUI components (ScriptView) facilitates code development.

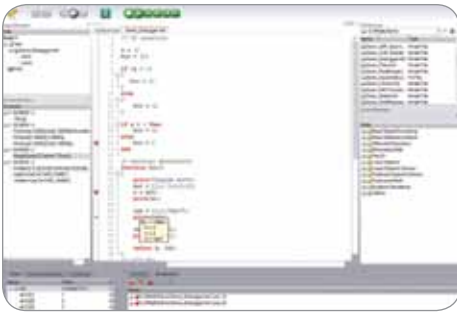
- Modern editor with syntax highlighting, code folding & searching capability.
- Organization of programming constructs (folders, files, subroutines, plots) for easily locating, editing, or reusing code.
- File browsing system allows direct access to existing program files on disk.
- Visual and interactive code inspections during runtime.
- A catalog of all built-in library items with search capability.

- HyperMath scripts & TCL macros for HyperMesh & HyperWorks Desktop can be created and debugged on real time.

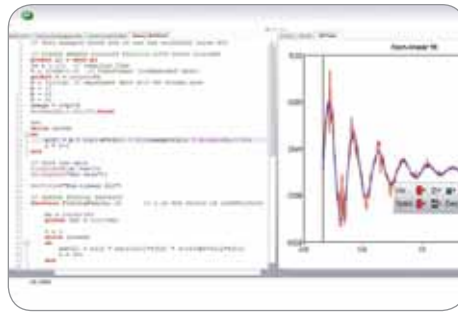
Powerful & Flexible Programming Language

A high-level language designed for numerical-code development that is easy to learn and intuitive relieves the user from the intricacies of code development encountered in traditional programming languages.

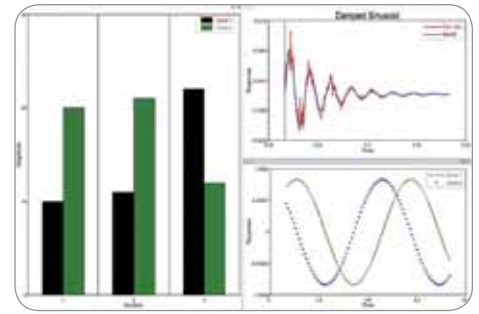
- Fully interpreted and dynamically typed language.
- Matrix-based data structure allows easy representations and manipulations of data.



Interactive Debugger Allows Code Inspection During Runtime



High-level Programming Language and Comprehensive Math Libraries Enable Rapid Code Development



Various Plotting Types Support Visual Verification of Solutions

Basic matrix operations like addition and inversion are done easily via operators, allowing the code to closely resemble the equivalent mathematical expression.

- Use of compact notation to index a range of elements in vectors and matrices eliminates the need to implement loops to carry out the same operations while providing faster code execution.
- All variables are type-less so that they can be reassigned to any data type throughout the code.
- Mixed-data-type-array support enables the creation of complex user-data structures for custom needs.
- Platform-independent language enables fast and easy reuse in any computing environment.
- Supports complex numerical data and arithmetic operations on complex data.

Comprehensive Math and Utility Libraries

A rich math and utility function library addresses a wide range of needs, such as initializing, querying, and performing relational operations on matrix contents and executing operations on strings. This helps eliminate the burden of implementing the same in code. The library includes:

- Elementary math
- Matrix math and algebra
- Signal processing
- Statistical analysis
- Differential equations

- Linear and nonlinear systems solver
- Plotting functions
- Operating system functions
- General utilities
- Optimization library

2D Plotting

HyperMath contains a data visualization module that enables users to quickly generate line, bar, and scatter plots. The plot properties and attributes can be easily modified interactively through the user interface or in an automated approach using one of HyperMath's plot utilities or functions.

Interfaces to Other HyperWorks Products

HyperMath can be executed from various other HyperWorks products in different ways. This allows HyperMath to participate in existing processes.

- Direct interface with Tempex allows access from HyperGraph®, HyperStudy® and HyperView®.
- Batch-mode execution of HyperMath allows access from applications like HyperStudy and Process Manager™.

Data Support

A large set of CAE data readers is provided. In addition, methods to query the data for content information are available. These allow searching for specific items in the data. Data can be exported to Altair Binary Format (ABF) or delimiter-separated text files with ease.

Data formats directly supported include:

- Altair® HyperMesh® (.res)
- Altair® OptiStruct®
- Altair H3D (limited)
- Altair binary format* (.abf)
- RADIOSS™
- LS-DYNA (time history files,d3plot, binout)
- ADAMS
- MADYMO
- PAM-CRASH
- NASTRAN pch complex results
- Ride data files
- RPC-3
- nCode (.dac)
- Excel* (.csv)
- Multi-column ASCII*
- xyDATA files
- UNV
- DIADEM
- ISO 13499
- HDF4
- Matlab binary*

* Formats can be imported and exported



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