

Requirements for Table Lookup Modeling with VHDL-AMS

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1. The scalar table lookup functions interpolate the behavior between sample data points.

Explanation

The user should provide a set of sample behavior points $(x_{i1}, x_{i2}, \dots, x_{iN}, y_i)$. Then, the table lookup function f should interpolate these data. That means, $y_i = f(x_{i1}, x_{i2}, \dots, x_{iN})$. N is the number of independent variables. There is only one dependent variable. It must be checked whether more than one dependent variable should be supported.

2. The elements of the sample data points are of type REAL.

Explanation

The table lookup functions should only interpolate between real-valued data points. It delivers a REAL scalar value.

3. The sample data points are described by static expressions.

Explanation

The behavior of table lookup functions is fixed in the evaluation phase. The sample data points cannot be changed during the simulation.

4. The sample data points can be described by elements of objects of composite types.

Explanation

The data points should be described for instance by real valued arrays or an array of records. The choice of the data representation should be done w.r.t. the implementation.

5. The sample data points can be described by a sequence of numbers in each row of a file in text format.

Explanation

It should be possible to describe the data points by their elements that are saved in a text file. The values must be available as STRING representations of REAL values. It should be possible to limit the maximum number of data points in file.

6. If the data point information is read from a file it should be possible to choose the separator of the elements.

Explanation

Spaces, tabs, and different characters, for instance comma, should be possible as separators.

7. If the data point information is read from a file it should be possible to select the position of the dependent variable.

Explanation

It should be possible to select the position of the dependent variable. That means the elements of the data points must not be saved in a special order where for example the dependent value is the first or last value of the sequence of numbers. The position of the dependent variable must be the same in all rows of the data file.

8. If the data point information is read from a file it should be possible to add comments to the file.

Explanation

It should be possible to add comments in a separate line or after a sequence of numbers in a row that represent a data point.

9. There should not exist constraints on the regularity of data points.

Explanation

A special order of the data points is not required. Data points can be defined by a nonuniform grid. It should be possible to evaluate data points that are not defined at all points of a grid.

10. There should be a special solution for equally-spaced arguments.

Explanation

It should be possible to define the data points in short way if they are defined on a uniform grid.

11. The number of independent variables should be limited.**Explanation**

The number N of independent variable should be limited (compare 1.). N should not be less than 4.

12. It should be possible to select the interpolation method.**Explanation**

Different interpolation methods should be supported, for instance “nearest”, “linear” (piece-wise linear), and “spline”.

13. It should be possible to select the extrapolation method.**Explanation**

It should be possible to select the extrapolation method if the argument of the table lookup function is outside the area of the given data points, for instance “error”, “flat”, and “linear”.

14. It must be possible to assign a value by a table lookup function to each real valued scalar constant.**Explanation**

This includes constants that are declared with the constant keyword in VHDL-AMS and generic constants that are passed in as parameters to a VHDL-AMS model.

15. It must be possible to assign a value by a table lookup function to each real valued scalar quantity and signal.**Explanation**

It must be possible to use the table look up functions to assign values to quantities and signals. An argument of a call of a table lookup function can also be the time that is made available by the function `NOW`.

16. The implementation should allow to convert representations that are used in other modelling environments, especially Verilog-AMS.**Explanation**

It should be at least possible to use the same files with data point information that can be evaluated in a Verilog-AMS description.

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