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VS Table Tool

Overview of VS Table Tool

The vs_table_tool utility provides a way for users to create VS Table header and binary files. VS Table files provide binary table data to the VS Solver; which is useful in situations where the table data is large or it is impractical to add the table using the GUI.

VS Table Tool Installation

The vs_table_tool utility is part of the VS_SDK package, and when unzipped, can be found in the `VS_SDK\Utilities\TableTool\Linux` or `VS_SDK\Utilities\TableTool\Windows` directory depending which operating system applies. Running the executable with the `-help parameter` to get a list of parameters and options for the utility.

```
PS D:\> .\vs_table_tool.exe -help
 -help                      Prints this help message.

Required Parameters:
 -file [file]               Input CSV file used to create the binary table
                            (vsb) output file.
 -type [type]               Specify the interpolation and extrapolation method.
 -xlabel [label]            Label for the x axis of the table.
 -xunits [unit]             Unit for the x axis of the table.
 -flabel [label]            Label for the table data.
 -funits [unit]             Unit for the table data.

Optional Parameters:
 -title [name]              Specify the title of the table.
 -ylabel [label]            Label for the y axis of the table.
 -yunits [unit]             Unit for the y axis of the table.
 -colname [name]            Adds a column to the table with the specified
                            name. This parameter can be repeated for each
                            named column in the table. If colname is omitted
                            then default names will be auto generated.
 -firstrowcolvalue          Specifies that the first row of the input CSV
                            file will be used as y values for each column.

EXAMPLE:
vs_table_tool -file FILE.CSV -title "Table Example"
              -type 2D_LINEAR -xlabel Station -xunits m -ylabel Lateral -yunits m
              -flabel Elevation -funits mm -colname XLabel -colname Col1
              -colname Col2 -colname Col3 -firstrowcolvalue
```

Figure 1: Executing the -help parameter with vs_table_tool.exe

Creating a VS Table

The VS Table Tool writes the data from a comma separated file into a binary table and header file which can be read by the VS Solver. Tables written this way can be used in place of Configurable Function data that is entered via the GUI. The VS Table Tools supports many of the interpolation and extrapolation options used by the VS Solver, however not all configurable functions support all interpolation and extrapolation types. The GUI is one of the best places to verify that the selected table type is supported for a given function.

Required Parameters

The following parameters are required to generate the VS Table binary and header files:

-file *filename*

Name of an input file with comma separated values that contain the table data. The first row in the file will indicate to the vs_table_tool how many columns are present in the table. The rest of the file must match the number of columns in the first row.

-type *table type*

The table type refers to the interpolation and extrapolation method used by the solver. The value must be one of the accepted keywords used by the solver for table interpolation. The currently supported types are:

- `2D_FROM_ZERO` – Two-dimensional carpet function based on absolute slip. Only used by the tire model.
- `2D_LINEAR` – Linear interpolation and extrapolation used with a two-dimensional carpet.
- `2D_SPLINE` – Spline interpolation and extrapolation used with a two-dimensional carpet.
- `2D_STEP` – Step interpolation with flat-line extrapolation used with a two-dimensional carpet.
- `LINEAR` – Linear interpolation and extrapolation.
- `LINEAR_FLAT` – Linear interpolation with flat-line extrapolation.
- `LINEAR_LOOP` – Linear interpolation with looping.
- `SPLINE` – Spline interpolation and extrapolation.
- `SPLINE_FLAT` – Spline interpolation with flat-line extrapolation.
- `SPLINE_LOOP` – Spline interpolation with looping.
- `STEP` – Step interpolation with flat-line extrapolation.
- `VAR_WIDTH` – Linear interpolation with flat-line extrapolation. Used only with variable width roads.
- `VAR_WIDTH_STEP` – Step interpolation with flat-line extrapolation. Used only with variable width roads.

Not all the configurable function types supported by the solver in the list above are currently in use in the VS Browser for a particular product. (For example, SuspensionSim does not have any built-in configurable functions that currently support the 2D_FROM_ZERO type. These types are still available for use with user-defined configurable functions.

-xlabel *label*

Label for the X axis of the table. This parameter is required as all tables must have at least one column, which is designated as the x axis.

-xunits *units*

The unit for the X axis. Valid inputs include all units accepted by the VS Solver, including user defined units.

-flabel *label*

The label for the function output of the table.

-funits *units*

The unit for the function output of the table. Valid inputs include all units accepted by the VS Solver, including user defined units.

Optional Parameters

The following parameters are optional and are not required for all tables. These optional parameters are used most often when creating a two-dimensional table.

-title *table name*

Specify a display name for the table.

-ylabel *label*

Label for the Y axis of the table. This parameter is optional and only required if the data is a 2D table.

-yunits *units*

The unit for the Y axis. Valid inputs include all units accepted by the VS Solver, including user defined units.

-colname *name*

This will assign a column name to each column in the table. This parameter can be repeated as many times as desired to name each of the columns a unique label. If the parameter is omitted, then columns are assigned names automatically.

-firstrowcolvalue

This parameter is a flag that will indicate that the first row of the input CSV file (specified by -file) is used for identifying the second independent variable associated with the output data. For example, an engine torque map is a function of both the engine speed and the load signal sent to the engine (either by the ECU, or by setting the throttle position). In CarSim, TruckSim, and BikeSim, the engine torque map uses the engine speed as the first independent variable (one row for each speed) and the throttle position or load signal as the second independent variable (one column for each load setting).

Example Usage

Here is an example usage of the vs_table_tool with a three column CSV input file:

```
vs_table_tool -file FILE.CSV -title "Table Example" -type 2D_LINEAR -xlabel Station -xunits m -ylabel Lateral -yunits m -flabel Elevation -funits mm -colname XLabel -colname Col1 -colname Col2 -colname Col3 -firstrowcolvalue
```

If there is a formatting error in the CVS file, the vs_table_tool utility will report the line and column it encountered the error. If no errors occur, the output will be a `vsb` and `vstb` file with the same name as the value given to the -file parameter.

For an example of how to integrate an vsb table with the solver, examine the built in CarSim and TruckSim example **{ Loaded Tables } Rough Road 02 - 92 (loaded) #1** in the **Generic > Generic VS Command** library. These datasets are part of the **{ Road Networks: 3D Geometry and Terrain } Baseline (loaded road profile)** sample run.