ANSYS Function Builder

Example Problem

Displacement function of the form: **{X} + A*sin(omega*{TIME})** , where {X} is the nodal 'x' location; A is a 'constant'; sin() is the SINE function; 'omega' is a constant and {TIME} is the current ANSYS time value. The ANSYS input generated in the log file when importing the attached xansys.func file is shown below. We will decipher the listing below to understand how ANSYS interprets the function.

The example below is of a single equation and is hence a 2D table. If you have an equation which has different forms valid across various regimes the tabular representation of the function becomes a 3D table with each plane in the 3D table corresponding to different functions valid for that regime. The equation or the variable defined in the first plane will be used to calculate the regime variable and specify which plane will be used to calculate the function.

```
*DEL,_FNCNAME
*DEL,_FNCMTID
*DEL,_FNC_C1
*DEL,_FNC_C2
*DEL,_FNCCSYS
*SET,_FNCNAME,'example'
*DIM,_FNC_C1,,1
*DIM,_FNC_C2,,1
*SET,_FNC_C1(1),100
*SET,_FNC_C2(1),50
*SET,_FNCCSYS,0
! /INPUT,xansys.func,,,1
*DIM,%_FNCNAME%,TABLE,6,5,1,,,,%_FNCCSYS%
!
! Begin of equation: {X}+A*sin(omega*{TIME})
*SET,%_FNCNAME%(0,0,1), 0.0, -999
*SET,%_FNCNAME%(2,0,1), 0.0
*SET,%_FNCNAME%(3,0,1), %_FNC_C1(1)%
*SET,%_FNCNAME%(4,0,1), %_FNC_C2(1)%
*SET,%_FNCNAME%(5,0,1), 0.0
*SET,%_FNCNAME%(6,0,1), 0.0
*SET,%_FNCNAME%(0,1,1), 1.0, -1, 0, 1, 18, 3, 1
*SET,%_FNCNAME%(0,2,1), 0.0, -1, 9, 1, -1, 0, 0
*SET,%_FNCNAME%(0,3,1),   0, -2, 0, 1, 17, 3, -1
*SET,%_FNCNAME%(0,4,1), 0.0, -1, 0, 1, 2, 1, -2
*SET,%_FNCNAME%(0,5,1), 0.0, 99, 0, 1, -1, 0, 0
! End of equation: {X}+A*sin(omega*{TIME})
!-->
```

-999 represents function in table format
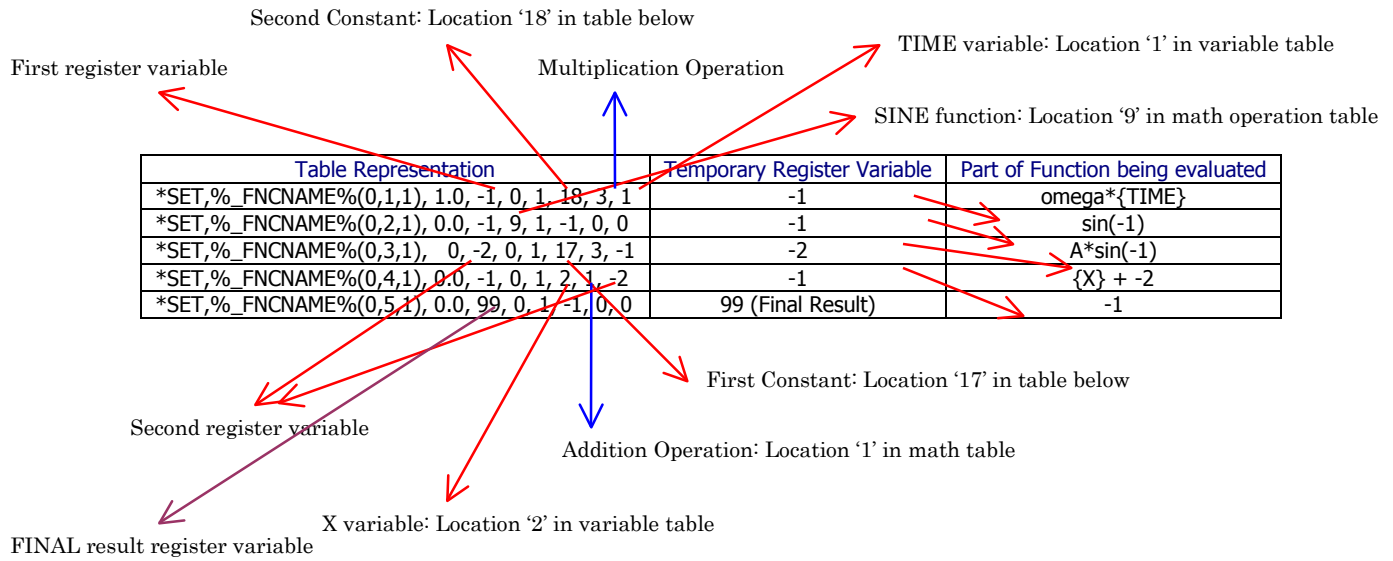
Scalar array for first constant specification
Scalar array for second constant specification

First Register variable for temporary storage

Function evaluation see below

The table evaluation is broken into steps using temporary register vairbales and combination of primary variables and math operations. The number representation of the math operations and primary variables is given in tables below.

Second Constant: Location '18' in table below

First register variable

Multiplication Operation

TIME variable: Location '1' in variable table

SINE function: Location '9' in math operation table

Table Representation	Temporary Register Variable	Part of Function being evaluated
*SET,%_FNCNAME%(0,1,1), 1.0, -1, 0, 1, 18, 3, 1	-1	omega*{TIME}
*SET,%_FNCNAME%(0,2,1), 0.0, -1, 9, 1, -1, 0, 0	-1	sin(-1)
*SET,%_FNCNAME%(0,3,1), 0, -2, 0, 1, 17, 3, -1	-2	A*sin(-1)
*SET,%_FNCNAME%(0,4,1), 0.0, -1, 0, 1, 2, 1, -2	-1	{X} + -2
*SET,%_FNCNAME%(0,5,1), 0.0, 99, 0, 1, -1, 0, 0	99 (Final Result)	-1

First Constant: Location '17' in table below

Second register variable

Addition Operation: Location '1' in math table

X variable: Location '2' in variable table

FINAL result register variable

Function representation using table format

table(0,0,1) = R-L , -999, Mat, C1, C2, C3, C4, C5, C6, C7, C8, C9, C10
table(0,1,1) = Mult, Reg, Op1, Con, V1, Op2, V2
table(1,2,1) =   Reg, Op1, Con, V1, Op2, V2

R-L ==> Regime Upper Limit
Mat ==> Material Id
Reg ==> Register
Op1 ==> Operator 1 (Unary operators)
Con ==> Constant
V1 ==> Parameter 1
Op2 ==> Operator 2 (Binary operators)
V2 ==> Parameter 2

Reference to "Operation Number" and "Variable Number" used in the above table format
Rows marked in RED are used in this example

Operation Number	Operation
1	ADD
2	SUBTRACT
3	MULTIPLY
4	DIVIDE
5	LOG
6	LOG10
7	POWERE
8	POWER10
9	SIN
10	COS
11	TAN
12	ASIN
13	ACOS
14	ATAN
15	ABS
16	SQRT
17	POWER
18	ATAN2
19	MIN
20	MAX
21	INVPOWER

Variable Number	Primary Variable
1	ParTabNames(1)(1:8) = 'TIME '
2	ParTabNames(2)(1:8) = 'X '
3	ParTabNames(3)(1:8) = 'Y '
4	ParTabNames(4)(1:8) = 'Z '
5	ParTabNames(5)(1:8) = 'TEMP '
6	ParTabNames(6)(1:8) = 'VELOCITY'
7	ParTabNames(7)(1:8) = 'PRESSURE'
8	ParTabNames(8)(1:8) = 'TSURF '
9	ParTabNames(9)(1:8) = 'DENS '
10	ParTabNames(10)(1:8)= 'SPHT '
11	ParTabNames(11)(1:8)= 'KXX '
12	ParTabNames(12)(1:8)= 'KYY '
13	ParTabNames(13)(1:8)= 'KZZ '
14	ParTabNames(14)(1:8)= 'VISC '
15	ParTabNames(15)(1:8)= 'EMIS '
16	ParTabNames(16)(1:8)= 'MAT '
17	ParTabNames(17)(1:8)= 'CONST1 '
18	ParTabNames(18)(1:8)= 'CONST2 '
19	ParTabNames(19)(1:8)= 'CONST3 '
20	ParTabNames(20)(1:8)= 'CONST4 '
21	ParTabNames(21)(1:8)= 'CONST5 '
22	ParTabNames(22)(1:8)= 'CONST6 '
23	ParTabNames(23)(1:8)= 'CONST7 '
24	ParTabNames(24)(1:8)= 'CONST8 '
25	ParTabNames(25)(1:8)= 'CONST9 '
26	ParTabNames(26)(1:8)= 'SECTOR '
27	ParTabNames(27)(1:8)= 'Xr '
28	ParTabNames(28)(1:8)= 'Yr '
29	ParTabNames(29)(1:8)= 'Zr '
30	ParTabNames(30)(1:8)= 'GAP '
31	ParTabNames(31)(1:8)= 'OMEGS '
32	ParTabNames(32)(1:8)= 'OMEGF '
33	ParTabNames(33)(1:8)= 'SLIP '