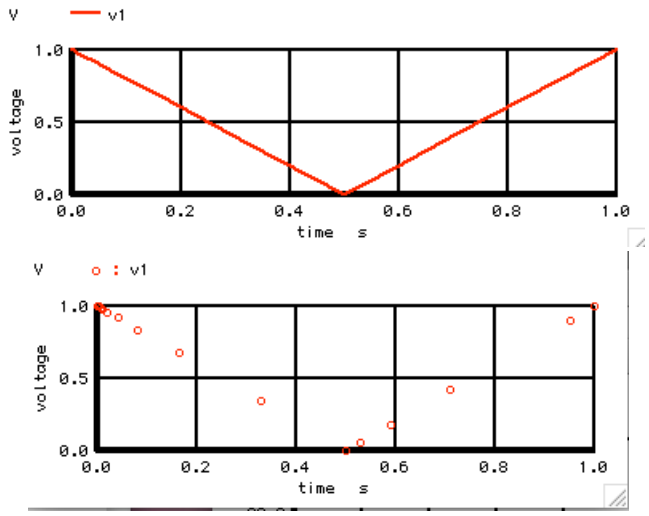
*=======Vector_Processing_Sort==========

There are some waveform processing functions that can same a lot of time and trouble. Most of them are intuitive. The sort function is powerful, but a little harder to visualize how it works.

```
*V_PWL#   NODE_P NODE_N DC      VALUE   PWL(    T1    V1    T2      V2    T3     V3      ...>)
V_PUL     V1     0      DC      0       PWL(    0     1     .5      0     1      1 )
*TRAN     TSTEP  TSTOP  TSTART  TMAX    ?UIC?
.tran     300m   1      0       300m
```

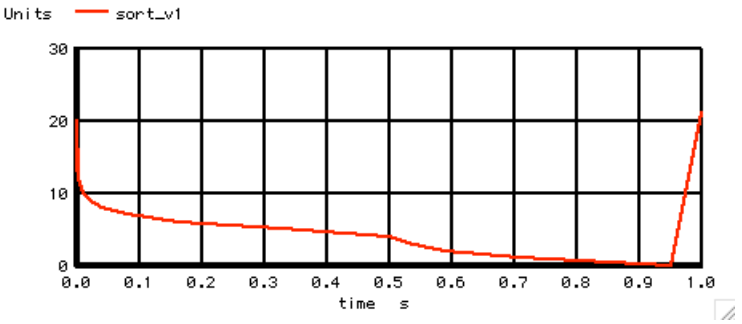
A triangle wave can show where the confusion comes from.

```
plot     v1
plot     v1     pointplot
```



When one sorts a waveform and plots the graph, what does the sort waveform mean?

```
let      sort_v1= sortorder(v1)
plot     sort_v1
```



One can make more sense by printing out the data.

```
print    v1 sort_v1

Circuit: Sort_Order

                                Sort_Order
Transient Analysis  Mon Jul 12 11:13:42  2010
```

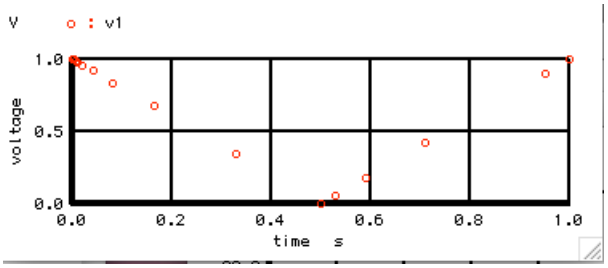
Index	time	v1	sort_v1
0	0.00000e+00	1.00000e+00	1.60000e+01
1	2.00000e-05	9.99960e-01	1.70000e+01
2	4.00000e-05	9.99920e-01	1.80000e+01
3	8.00000e-05	9.99840e-01	1.50000e+01
4	1.60000e-04	9.99680e-01	1.90000e+01
5	3.20000e-04	9.99360e-01	1.40000e+01
6	6.40000e-04	9.98720e-01	1.30000e+01
7	1.28000e-03	9.97440e-01	2.00000e+01
8	2.56000e-03	9.94880e-01	1.20000e+01
9	5.12000e-03	9.89760e-01	1.10000e+01
10	1.02400e-02	9.79520e-01	1.00000e+01
11	2.04800e-02	9.59040e-01	9.00000e+00
12	4.09600e-02	9.18080e-01	8.00000e+00
13	8.19200e-02	8.36160e-01	7.00000e+00
14	1.63840e-01	6.72320e-01	6.00000e+00
15	3.27680e-01	3.44640e-01	5.00000e+00
16	5.00000e-01	0.00000e+00	4.00000e+00
17	5.30000e-01	6.00000e-02	3.00000e+00
18	5.90000e-01	1.80000e-01	2.00000e+00
19	7.10000e-01	4.20000e-01	1.00000e+00
20	9.50000e-01	9.00000e-01	0.00000e+00
21	1.00000e+00	1.00000e+00	2.10000e+01

MacSpice 7 ->

==========

Since timing is inconsistent, the lowest value for v1 happens at time period 0.5, but at the index value of 16. The first value of the sorted data will be 16. The highest values of v1 are at an index of 0 and 21. So the last values of the sorted data are those two numbers.

==========



So the sort function give index values which can be used to find voltage values or points in time where a waveform is minimum or maximum. Using it can be much faster than looping arrays.

One can also find the 6th value with the following code.

==========

```
let     nthvalue = sort_v1[5]
print   v1[nthvalue]
```

Sort_Order
Transient Analysis Mon Jul 19 10:28:18 2010

Index	time	v1	sort_v1
0	0.00000e+00	1.00000e+00	1.60000e+01
1	2.00000e-05	9.99960e-01	1.70000e+01
2	4.00000e-05	9.99920e-01	1.80000e+01
3	8.00000e-05	9.99840e-01	1.50000e+01
4	1.60000e-04	9.99680e-01	1.90000e+01
5	3.20000e-04	9.99360e-01	1.40000e+01
6	6.40000e-04	9.98720e-01	1.30000e+01
7	1.28000e-03	9.97440e-01	2.00000e+01
8	2.56000e-03	9.94880e-01	1.20000e+01
9	5.12000e-03	9.89760e-01	1.10000e+01
10	1.02400e-02	9.79520e-01	1.00000e+01
11	2.04800e-02	9.59040e-01	9.00000e+00
12	4.09600e-02	9.18080e-01	8.00000e+00

```
13          8.19200e-02    8.36160e-01    7.00000e+00
14          1.63840e-01    6.72320e-01    6.00000e+00
15          3.27680e-01    3.44640e-01    5.00000e+00
16          5.00000e-01    0.00000e+00    4.00000e+00
17          5.30000e-01    6.00000e-02    3.00000e+00
18          5.90000e-01    1.80000e-01    2.00000e+00
19          7.10000e-01    4.20000e-01    1.00000e+00
20          9.50000e-01    9.00000e-01    0.00000e+00
21          1.00000e+00    1.00000e+00    2.10000e+01
v1[nthvalue] =  6.72320e-01
```

==========Full_Netlist_For_Copy_Paste==========

```
Sort_Order
.Option srcsteps = 1 set Gmin = 1.0000E-02
*=======Circuit_Netlist=========================
V_PUL   V1    0     DC     0    PWL( 0  1 .5 0 1 1 )

*TRAN   TSTEP TSTOP TSTART TMAX ?UIC?
.tran   300m  1     0      300m
.control
run
set     pensize = 2

plot    v1
plot    v1    pointplot
let     sort_v1= sortorder(v1)
plot    sort_v1
print   v1 sort_v1

*======find_6th_largest_Value=======
let     nthvalue = sort_v1[5]
print   v1[nthvalue]

.endc
.end
```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dsauersanjose@aol.com
Don Sauer
http://www.idea2ic.com/