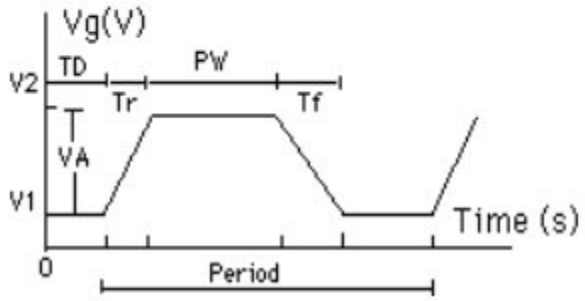
EC_simulate.m – The simulation consists in plotting the graphic of the potential difference between two nodes (**M** and **N**) of an electical circuit that contains only resistances, condensators and one single voltage source(**V** line).

Standard Input:

N, **M** → the two nodes
V line → parameters of the source (**N1 N2** → bornes)
R lines → give resistances positions and their values
C line → for condensators
TSTEP, **TSTOP** → plot graphic parameters

```
*N M
V N1 N2  PULSE(V1  V2 TD Tr Tf PW Period)
R  N1  N2  Value
C  N1  N2  Value
...
.TRAN TSTEP TSTOP
.PLOT TRAN V(i,j)
```



Equations (node potential method):

$$\begin{cases} \sum_{i=1, i\neq k, V(k)=0}^{n} \left(\sum_{j=1}^{n} G_{i,j} * V_j + \sum_{j=1}^{n} M_{i,j} * V'_j \right) = 0 \\ \dfrac{dV_i}{dt} = V'_i \\ V'_i(0) = 0 \end{cases}$$

Where $G_{i,j} = \begin{cases} \frac{1}{R_{i,j}}, R_{i,j} \neq 0, i = j \\ \frac{1}{R_{i,j}}, R_{i,j} \neq 0, i \neq j \\ 0, R_{i,j} = 0 \end{cases}$ and $M_{i,j} = \begin{cases} \sum_{k=1}^{n} C_{j,k}, i = j \\ -\sum_{k=1}^{n} C_{j,k}, i \neq j \end{cases}$

We obtain the differential system:

$$\begin{cases} \text{Mprim} * \text{V'(t)} + \text{M2} * \text{V(t)} + \text{M3} * \text{U(t)} + \text{M3prim} * \text{slopeU(t)} = 0 \\ \text{M2} * \text{V(0)} + \text{M3} * \text{U(0)} + \text{M3prim} * \text{slopeU(0)} = 0 \text{ (initial condition, unloaded condensators)} \\ \text{V'(0)} = 0 \end{cases}$$

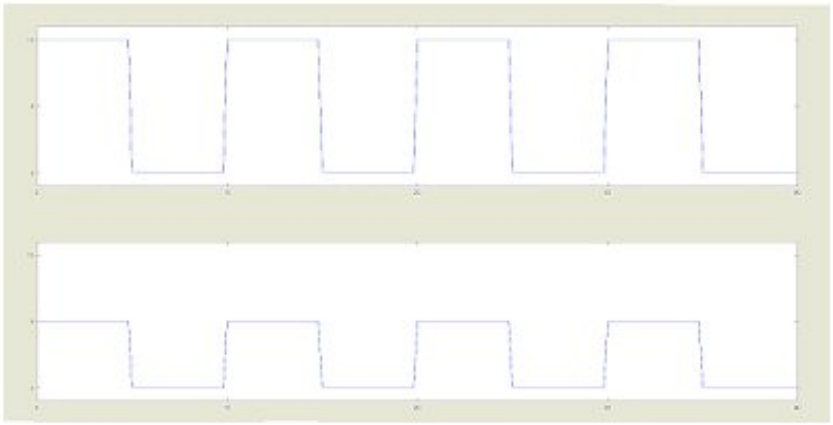
Where $V(t) = \begin{bmatrix} V_1(t) \\ . \\ V_n(t) \end{bmatrix}$, $V'(t) = \begin{bmatrix} V'_1(t) \\ . \\ V'_n(t) \end{bmatrix}$ and $U(t)$ voltage of the source(given by PULSE parameters)

Example :

Input:

```
*3 3
V  0  1  PULSE( 0 10 0 0 0 5 10)
R  1  2  10
R  2  0  10
.TRAN 0.2 40
.PLOT TRAN V(2,0)
```

Output:



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Other examples : 1.cir, 2.cir, 3.cir, 4.cir **Call : EC_simulate('1.cir')**

Tested with **Octave 3.0.3 for Windows**