Spectre captab Definition:

Printing the Node Capacitance Table

The Spectre simulator allows you to print node capacitance to an output file. This can help you in identifying possible causes of circuit performance problems due to capacitive loading.

The capacitance between nodes `x` and `y` is defined as

$$C_{xy} = -\frac{\partial q_x}{\partial v_y}$$

where q_x is the sum of all charges in the terminal connected to node `x`, and v_y is the voltage at node `y`.

The total capacitance at node *X* is defined as

$$C_{xx} = \frac{\partial q_x}{\partial v_x}$$

where charge q_x and voltage v_x are at the same node `x`.

Use the `captab` analysis to display the capacitance between the nodes in your circuit. This is an option in the `info` statement. Here is an example of the `info` settings you would set to perform a `captab` analysis:

Determine captab Value for Simple Combination of Fixed and Variable Capacitors

$$\frac{vin - vout}{RS} = C0\,\frac{dvout}{dt} + C1\,\frac{dvout}{dt} \quad [1]$$

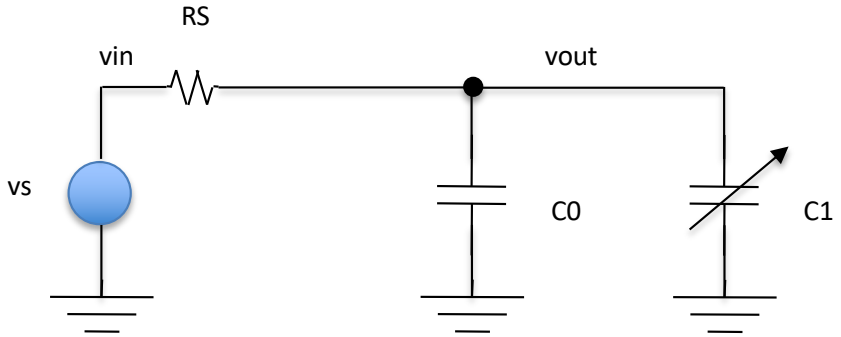
$$\frac{vin - vout}{RS} = (C0 + C1)\,\frac{dvout}{dt} \quad [2]$$

Consider homogenous solution: $$vout = -RS * (C0 + C1)\,\frac{dvout}{dt} \quad [3]$$

with solution: $$vout = V_o e^{-\frac{t}{\tau}} \quad where:\ \tau = RS * (C0 + C1),\ V_o \text{ is initial value of } vout \quad [4]$$

To find $\frac{\partial qout}{\partial vout}$ (captab definition): $$\frac{\partial qout}{\partial vout} = \left[\frac{\partial qout}{\partial t}\right] * \left[\frac{\partial t}{\partial vout}\right] = -\frac{V_o e^{-\frac{t}{\tau}}}{RS} * \left[\frac{-V_o}{\tau}\, e^{-\frac{t}{\tau}}\right]^{-1} \quad [5]$$

$$\frac{\partial qout}{\partial vout} = -\frac{V_o e^{-\frac{t}{\tau}}}{RS} * \left[\frac{-\tau}{V_o}\, e^{\frac{t}{\tau}}\right] = \frac{\tau}{RS} = (C0 + C1) \quad [6]$$



C0: fixed capacitor
C1: voltage dependent capacitor