

Cuando el interruptor está abierto:

$V^- = V^+$  por CCV; y  $V^+ = \frac{V_I}{2}$  por el divisor de tensión.

luego  $I = \frac{V_I - V_I/2}{2R} = \frac{V_I/2}{2R} = \frac{V_I}{4R}$  y  $i_C = I = \frac{V_I}{4R}$

Cuando el interruptor está cerrado:

$$V^- = V^+ = \frac{V_I}{2} \text{ y } I = \frac{V_I}{4R}; \text{ pero } i_C = I - I' = \frac{V_I}{4R} - \frac{V^-}{R} = \frac{V_I}{4R} - \frac{V_I/2}{R} = V_I \left( \frac{-1}{4R} \right) = -\frac{V_I}{4R}$$

con lo que el capacitor se carga y descarga a corriente constante y la tensión en sus terminales crece de forma lineal.

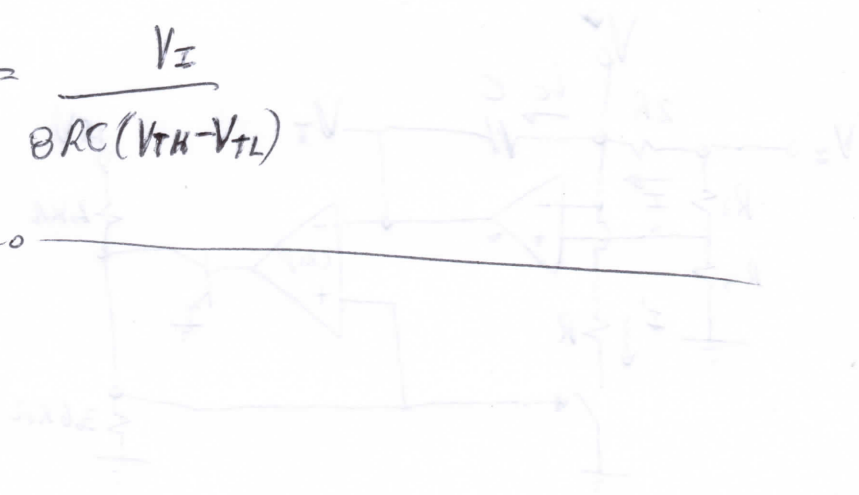
el comparador de histeresis trabaja digamos a  $V_{TH}$  y  $V_{TL}$  con  $V_{TL} \approx 0$ ;

así cuando  $V_T \approx V_{TL}$  el comparador conmuta y abre el interruptor;

con lo que el capacitor carga con corriente  $\frac{V_I}{4R}$ ; luego  $\Delta t = \frac{C \Delta V}{i}$

$\Rightarrow \Delta t = \frac{C(V_{TH} - V_{TL})}{V_I/4R}$ ; cuando  $V_T$  alcanza  $V_{TH}$ ; la corriente cambia a  $-\frac{V_I}{4R}$  y el  $\Delta t$  es el mismo luego se tiene:

$$f = \frac{1}{2\Delta t} = \frac{1}{\frac{2C \cdot 4R(V_{TH} - V_{TL})}{V_I}} = \frac{V_I}{8RC(V_{TH} - V_{TL})}$$



Change of integrator output  
 $V_o = V_i$  for CCR,  $V_o = \frac{V_i}{2}$  for divider of tension.

$$\text{Input } I = \frac{V_i - V_o}{R} = \frac{V_i - \frac{V_i}{2}}{R} = \frac{V_i}{2R} \quad I = \frac{V_i}{2R}$$

Change of integrator output

$$V_o = V_i - \frac{V_i}{2} = \frac{V_i}{2} \quad I = \frac{V_i - V_o}{R} = \frac{V_i - \frac{V_i}{2}}{R} = \frac{V_i}{2R}$$

$$= V_i - \frac{V_i}{2} = \frac{V_i}{2}$$

For the op-amp, the output is constant and the input is constant. The output is constant and the input is constant.

For the op-amp, the output is constant and the input is constant. The output is constant and the input is constant.

For the op-amp, the output is constant and the input is constant. The output is constant and the input is constant.

$$\text{For the op-amp, the output is constant and the input is constant. The output is constant and the input is constant. } V_o = \frac{V_i}{2}$$

$$\Delta t = \frac{C(V_{TH} - V_{TL})}{I} = \frac{C(V_{TH} - V_{TL})}{\frac{V_I}{2R}} = \frac{2RC(V_{TH} - V_{TL})}{V_I}$$

For the op-amp, the output is constant and the input is constant. The output is constant and the input is constant.