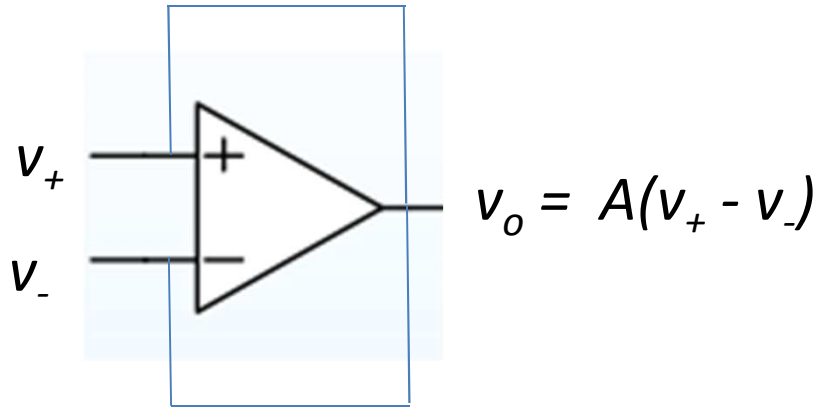
Lecture 2
Positive Feedback
Schmitt trigger



Recall simple comparator (Lab 1)

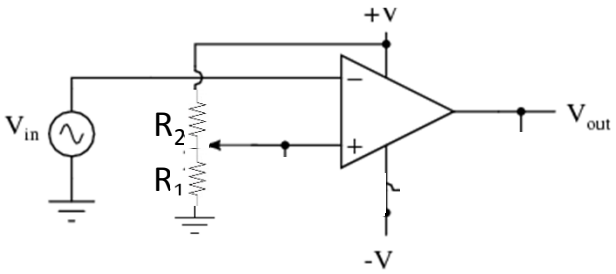


Fig 2: Simple comparator: R_1 R_2 set the threshold voltage for switching v_{out} between $+V_{max}$ and $-V_{max}$

what is v_+ ?: $$v_+ = \frac{R_1}{R_1 + R_2} V \equiv V_T$$

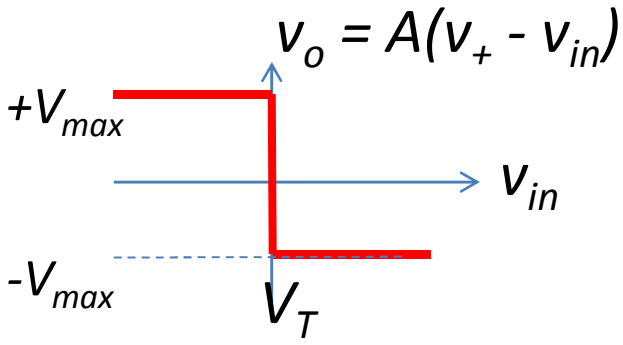
$$v_- = v_{in}$$

For $v_{in} < V_T \rightarrow V_{out} = +V_{max}$

For $v_{in} > V_T \rightarrow V_{out} = -V_{max}$

But for noisy v_{in} close to V_T,

V_{out} *swings crazily between* $+V_{max}$ & $-V_{max}$



Review of Lab 2
POSITIVE feedback is good

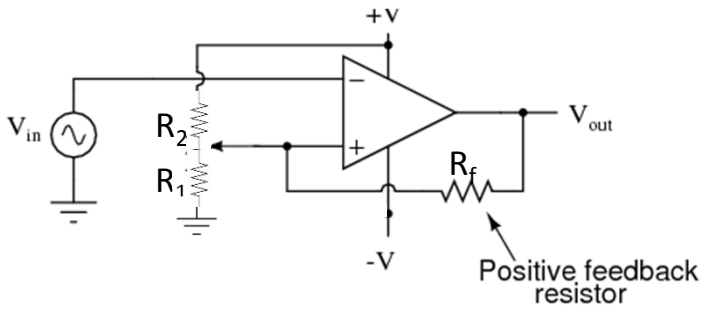


Fig 3: Positive feedback through R_f stabilizes the circuit response

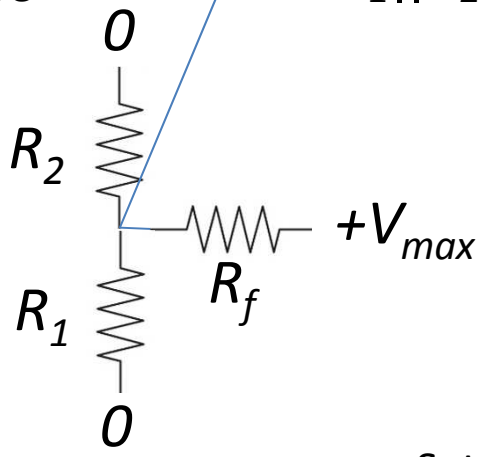
$v_+ = f(v_{out}\ R_1\ R_2\ R_f)$

v_{out} *has two values:* $+V_{max}$, $-V_{max}$

Apply superposition: V_T already set by R_1,R_2. R_f *sets* $+\delta v_+$ *and* $-\delta v_+$

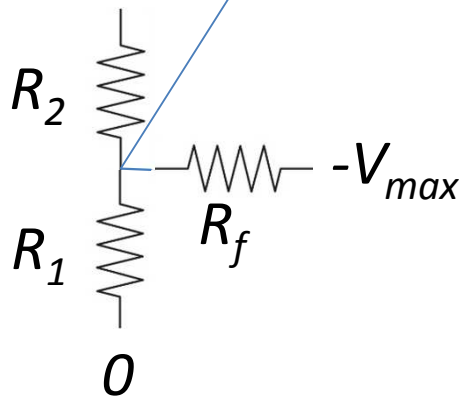
V_{TU}

$$+\delta v_+ = \frac{R_1||R_2}{R_1||R_2 + R_f}(+V_{max})$$



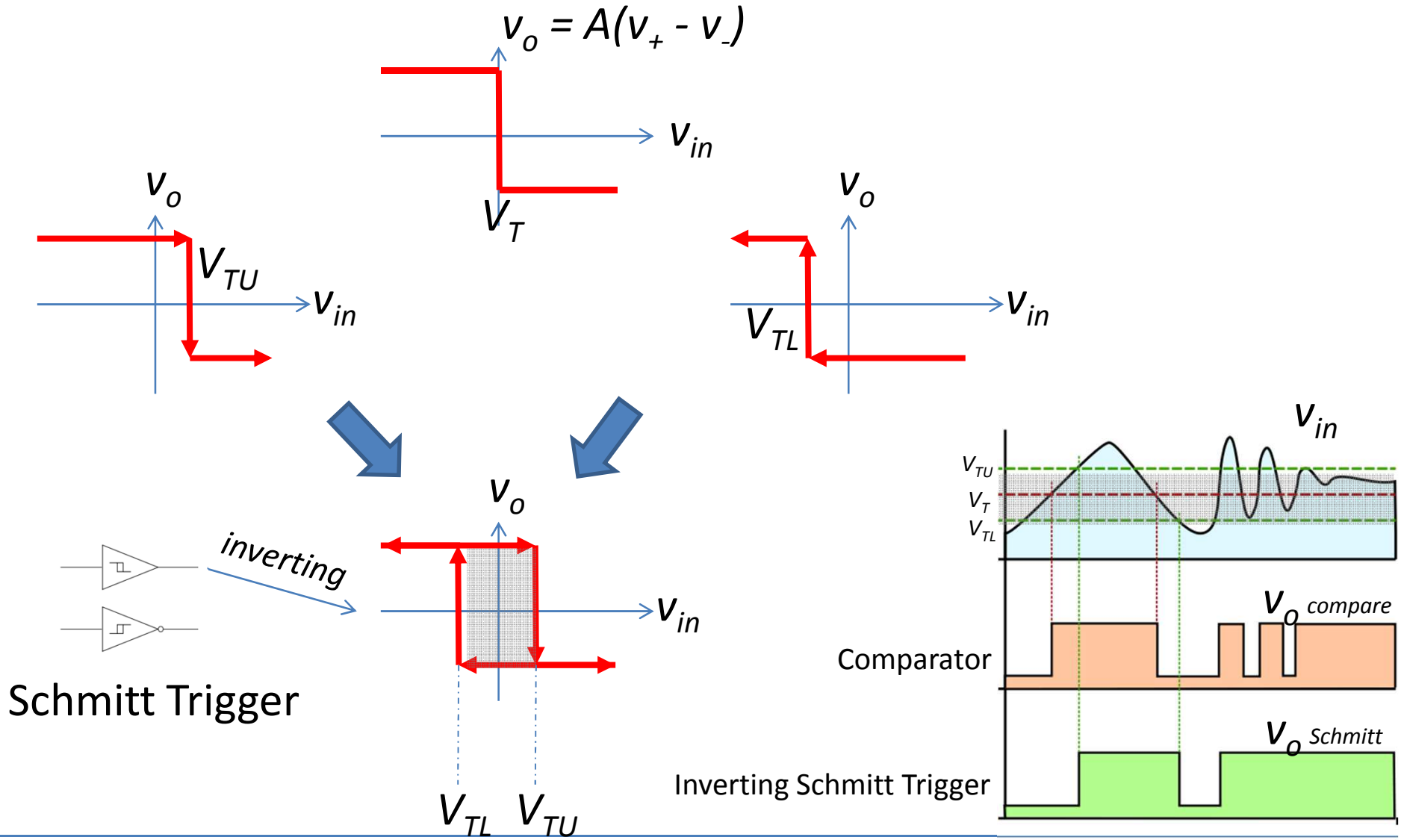
V_{TL}

$$-\delta v_+ = \frac{R_1||R_2}{R_1||R_2 + R_f}(-V_{max})$$



Set <u>*independent*</u> sources to zero $V, v_{in} \rightarrow 0$

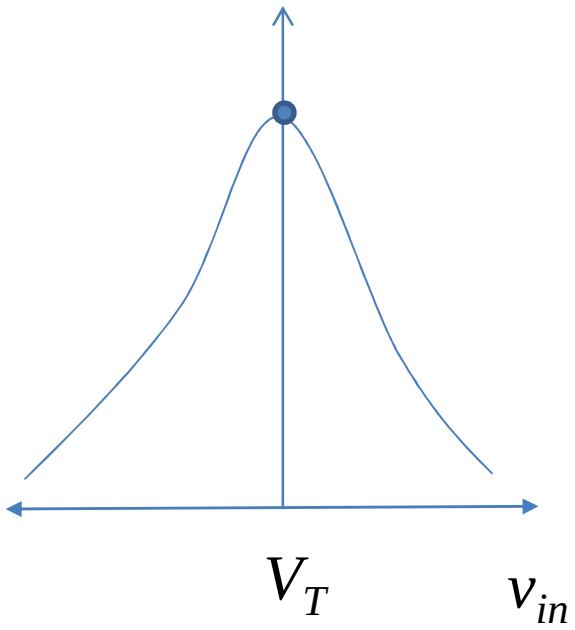
Threshold splits in two



Summary

In a figurative sense…

Simple comparator



Schmitt trigger
(positive feedback)