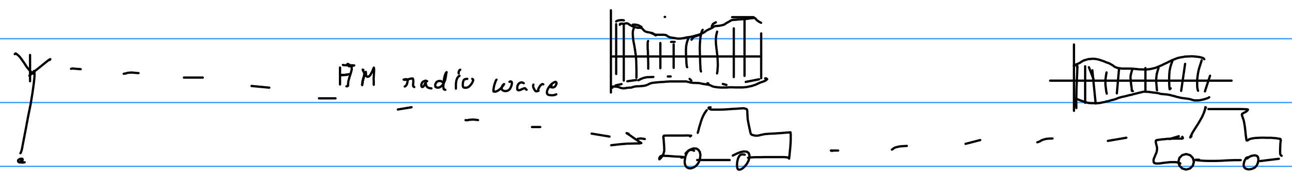
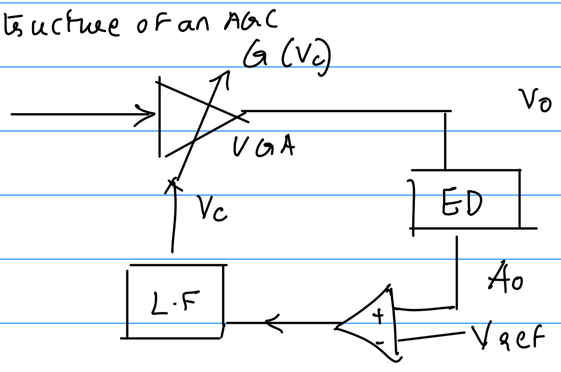
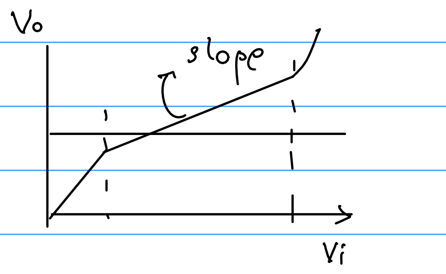
Automatic Gain control (AGC)



Basic structure of an AGC

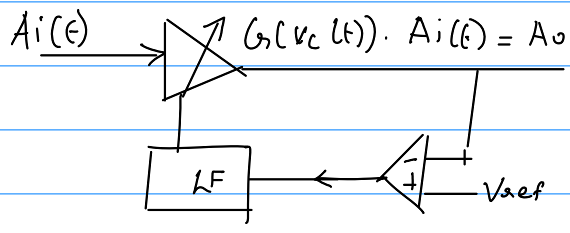


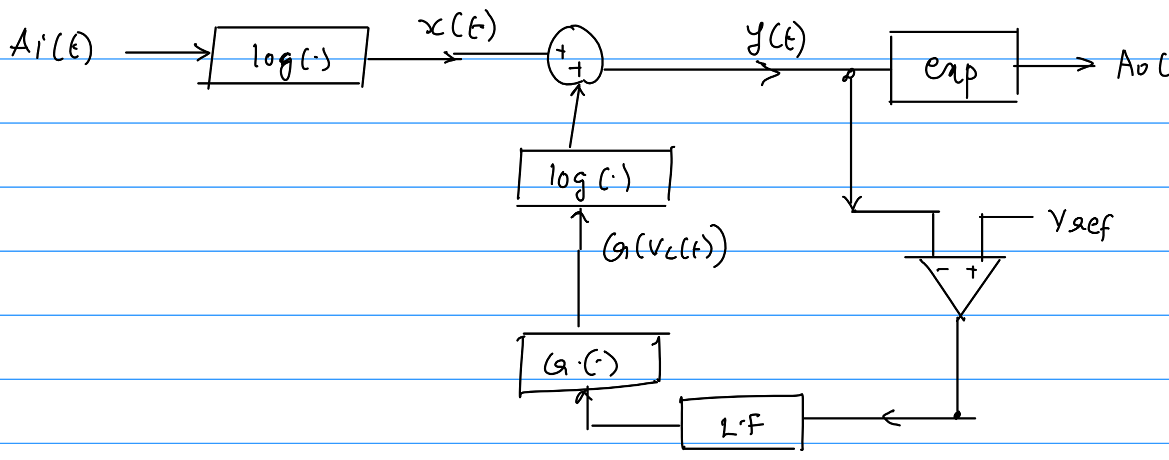


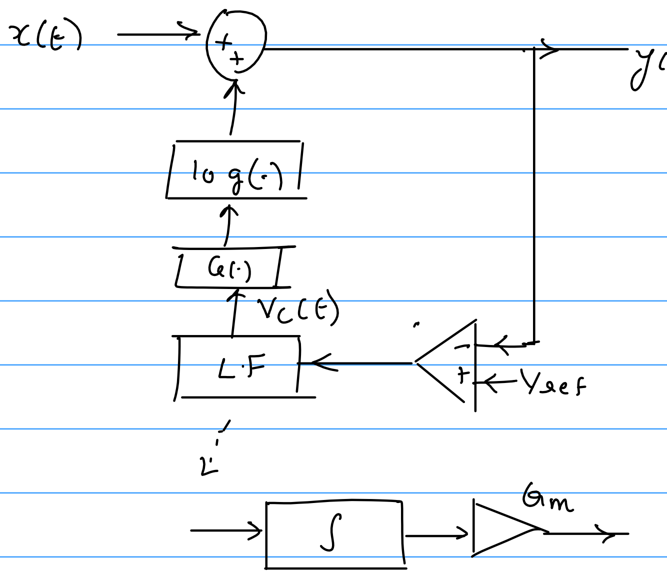
comp. ratio of AGC = 1/slope

$A_i(t)\cos(\phi(t)) = V_i(t)$

$A_o(t)\cos(\phi(t)+\theta) = V_o(t)$







$x(t) + \log(G(V_c(t))) = y(t)$

$V_c(t) = G_m \int_0^t (y(u) - V_{ref})\,du$

$\frac{dy(t)}{dt} = \frac{dx(t)}{dt} + \frac{G'(v_c(t))}{G(v_c(t))}\cdot\frac{dv_c(t)}{dt}$

$\frac{dv_c(t)}{dt} = -G_m(y(t) - V_{ref})$

$$\frac{dy(t)}{dt} = \frac{dx(t)}{dt} + \frac{G'(V_c(t))}{G(V_c(t))}\cdot G_m(V_{ref} - y(t)),$$

$$\frac{dy(t)}{dt} + \frac{G_m\cdot G'(V_c(t))}{G(V_c(t))}\cdot y(t) = \frac{dx(t)}{dt} + \frac{G_m G'(V_c(t))}{G(V_c(t))}\cdot V_{ref}$$

$$G(V_c(t)) = e^{aV_c(t)}$$

$$\frac{dy(t)}{dt} + aG_m\cdot y(t) = \frac{dx(t)}{dt} + aG_m\cdot V_{ref}$$

$$\tilde{y}(t) + V_{ref} = y(t)$$

$$\frac{d\tilde{y}(t)}{dt} + aG_m\tilde{y}(t) = \frac{dx(t)}{dt}$$

$$\tilde{Y}(s)\,(s + aG_m) = sX(s)$$

$$\tilde{Y}(s) = \frac{sX(s)}{s + aG_m}$$

$X(s) = \Delta x/s.$

how would $\tilde{y}(t)$ behave?

$$\tilde{y}(t) = \Delta x\, e^{-aG_m t}$$

$$y(t) = V_{ref} + \Delta x\, e^{-aG_m t}$$

$y(t) \rightarrow V_{ref}.$

$A_o \rightarrow \exp(V_{ref})$