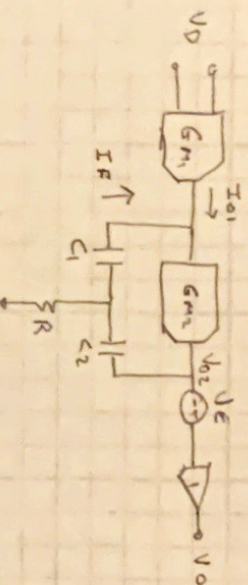


TPC

Circuit



Open Loop Gain:

$$I_F = V_{O2} \cdot \frac{R C_1 C_2 s^2}{R(C_1 + C_2)s + 1}$$

When $I_{OUT1} = I_F$,

$$V_D G_{M1} = I_F, \quad V_D = V_{O2},$$

$$A_{OL} = \frac{V_D}{V_D} = \frac{G_{M1} R (C_1 + C_2)s + 1}{s^2 R C_1 C_2}$$

Two poles + One zero

Error Correction: Assume V_E captures all O.P.S errors

$$I_F = V_E \cdot \frac{R C_1 C_2 s^2}{R(C_1 + C_2)s + 1}$$

$$V_D = \frac{I_F}{G_{M1}} = \frac{V_E}{G_{M1}} \cdot \frac{R C_1 C_2 s^2}{R(C_1 + C_2)s + 1}$$

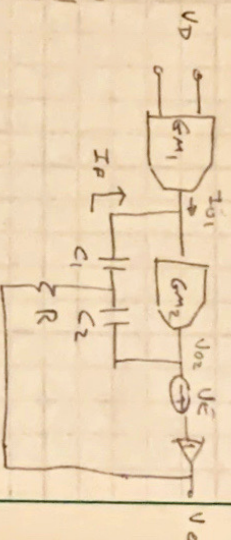
$$= \frac{V_E}{A_{OL}}$$

$$V_D = \frac{V_E}{A_{OL}} \cdot A_{CL}$$

, A_{CL} = closed loop gain

Distortion is attenuated by A_{OL} which is increased by TPC.

TMC



Assume $V_{O2} = V_D$,

$$I_F = V_D \cdot \frac{s C_1 \cdot (s R C_2 + 1)}{s R (C_1 + C_2) + 1}$$

When $I_{O1} = I_F$,

$$V_D G_{M1} = I_F,$$

$$A_{OL} = \frac{V_D}{V_D} = \frac{G_{M1}}{s C_1} \cdot \frac{s R (C_1 + C_2) + 1}{s R (C_1 + C_2) + 1}$$

Zero pole as it transitions from $G_{M1}/s C_1$ to $G_{M1}/s C_1 C_2$

In TMC, $V_D \approx 0$ for as long as $A_{OL} \gg 1$,

At freqs of interest, the comp network looks the same to V_E as in TPC and

$$I_F = V_E \cdot \frac{R C_1 C_2 s^2}{R(C_1 + C_2)s + 1}$$

$$V_D = V_D A_{CL} = \frac{I_F}{G_{M1}} A_{CL}$$

$$V_D = \frac{V_E}{G_{M1}} \cdot \frac{R C_1 C_2 s^2}{R(C_1 + C_2)s + 1}$$

just like in TPC.