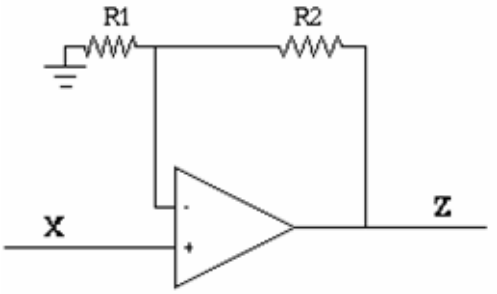
VAJE IZ ELEKTRONIKE (3) 18.10.2006

Primer uporabe: ojačevalec , neidealen OP-AMP



$$\frac{0-\eta}{R_1}+\frac{z-\eta}{R_2}+I_{bias}=0$$

$$A(x-\eta+Off)=z \Rightarrow \eta=-\frac{z}{A}+Off+x$$

$$\frac{(-x+\frac{z}{A}-Off)}{R_1}+\frac{(z+\frac{z}{A}-Off-x)}{R_2}+I_{bias}=0$$

$$z\left[\frac{1}{R_2}+\frac{1}{AR_1}+\frac{1}{AR_2}\right]-x\left[\frac{1}{R_1}+\frac{1}{R_2}\right]-Off\left[\frac{1}{R_1}+\frac{1}{R_2}\right]+I_{bias}=0$$

$$z=\frac{\left[\frac{1}{R_1}+\frac{1}{R_2}\right]}{\left[\frac{1}{AR_1}+\frac{1}{AR_2}+\frac{1}{R_2}\right]}x+Off\ \frac{\left[\frac{1}{R_1}+\frac{1}{R_2}\right]}{\left[\frac{1}{AR_1}+\frac{1}{AR_2}+\frac{1}{R_2}\right]}-\frac{I_{bias}}{\left[\frac{1}{AR_1}+\frac{1}{AR_2}+\frac{1}{R_2}\right]}$$

$$z=\frac{\frac{R_2}{R_1}+1}{1+\frac{1}{A}+\frac{R_2}{AR_1}}x+Off\ \frac{\frac{R_2}{R_1}+1}{1+\frac{1}{A}+\frac{R_2}{AR_1}}-I_{bias}R_2\frac{1}{1+\frac{1}{A}+\frac{R_2}{AR_1}}$$

PRIMERI

1.) $A \to \infty$

$$z=\left[\frac{R_2}{R_1}+1\right]x+Off\left[\frac{R_2}{R_1}+1\right]-R_2I_{bias}$$

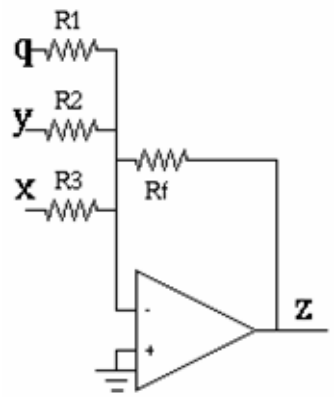
2.) $Off \to 0$, $Off \in [\mu V - mV]$

$$z=\left[\frac{R_2}{R_1}+1\right]x-R_2I_{bias}$$

3.) $I_{bias} \to 0$

$$z=\left[\frac{R_2}{R_1}+1\right]x$$

- Seštevalnik (DA konverter)



$A \rightarrow \infty$, $Off = 0$, $I_{bias} = 0$

$$\frac{q}{R_1} + \frac{y}{R_2} + \frac{x}{R_3} + \frac{z}{R_f} = 0$$

$$z = -R_f \left[\frac{q}{R_1} + \frac{y}{R_2} + \frac{x}{R_3} \right] = -\left[\frac{R_f}{R_1} q + \frac{R_f}{R_2} y + \frac{R_f}{R_3} x \right]$$

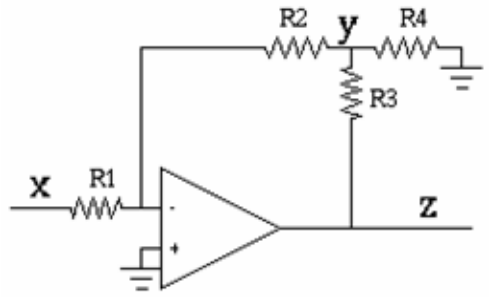
PRIMERI

1 .) $R_f = R_1 = R_2 = R_3 \rightarrow z = -(x + y + q)$

2 .) $\frac{R_f}{R_1} = 1$, $\frac{R_f}{R_2} = 2$, $\frac{R_f}{R_3} = 4$

V 2.) smo dobili 3 bitni DAC pretvornik, ki pa ni najboljša rešitev. To bomo spoznali kasneje.

- Kaj dela to vezje?



$$\frac{x}{R_1}+\frac{y}{R_2}+I_{bias}=0$$

$$\frac{z-y}{R_3}+\frac{-y}{R_4}+\frac{-y}{R_2}=0$$

$$\frac{z+\frac{R_2}{R_1}x+I_{bias}R_2}{R_3}+\frac{\frac{R_2}{R_1}x+I_{bias}R_2}{R_4}+\frac{\frac{R_2}{R_1}x+I_{bias}R_2}{R_2}=0$$

$$z\frac{1}{R_3}+x\left[\frac{R_2}{R_1R_3}+\frac{R_2}{R_1R_4}+\frac{R_2}{R_1R_2}\right]+I_{bias}\left[1+\frac{R_2}{R_4}+\frac{R_2}{R_3}\right]=0$$

$$z=-\left[\frac{R_2}{R_1}+\frac{R_2R_3}{R_1R_4}+\frac{R_3}{R_1}\right]x+R_3I_{bias}\left[1+\frac{R_2}{R_4}+\frac{R_2}{R_3}\right]$$