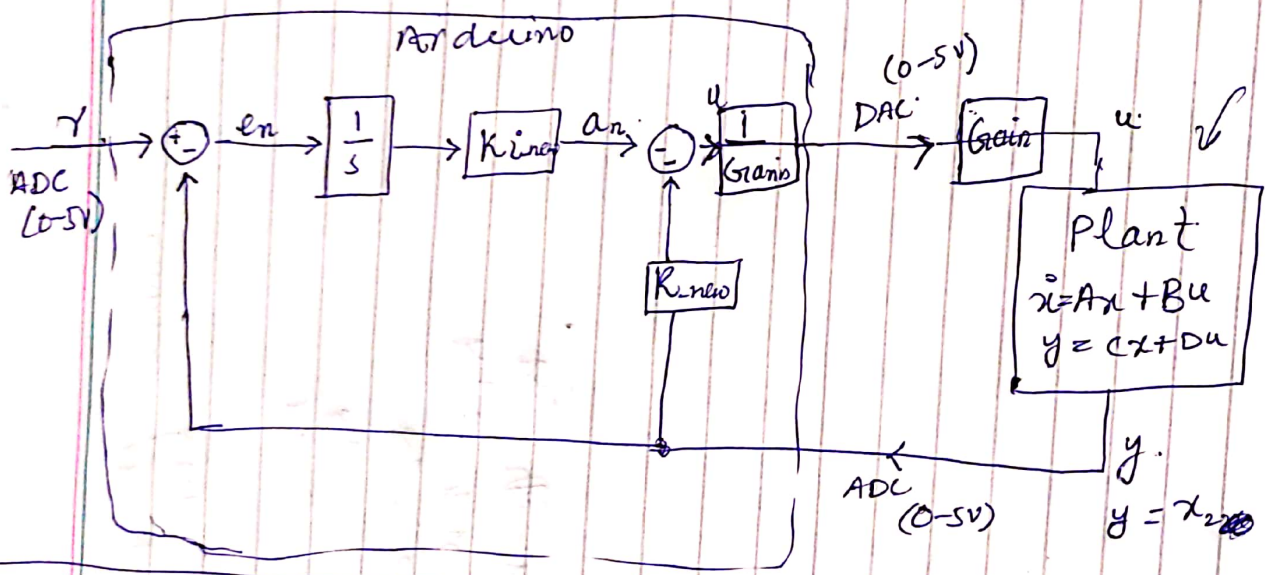
Process Implimentation



Plant through Op Amps ✓

$U_L = (0 \to 30)V$

As arduino (DAC) & (ADC) can only give (0-5)

So, we reduce U to (0 → 5V) and then amplify it to (0 → 30V)

Gain = 6.

$\Rightarrow 5 \times \text{Gain} = 30$

Eqns:

$e_n = r_n - y_n$

$a_n = K_i \frac{1}{s} \cdot e_n$

$x_{2n} = y_n$

$u_n = -(K_{new} x_{2n} + a_n)$.

As a_n contains integrals so we use $c \to z$ transformation

Continuous → z-transform → Difference Eqns

$$a_n = K_i \frac{e_n}{\textcircled{z}} \times \left(\frac{0.005 + z^{-1} 0.005}{1 - z^{-1}} \right) \quad \left(T = \frac{1}{100} \text{ sec} = 10 \text{ msec} \right)$$

$$\Rightarrow a_n - a_{n-1} = K_i (e_{n-1} + 0.005 e_n + 0.005 e_{n-1})$$

$$a_n = K_i (0.005 e_{n-1} + 0.005 e_n) + a_{n-1}$$

Code is in Arduino