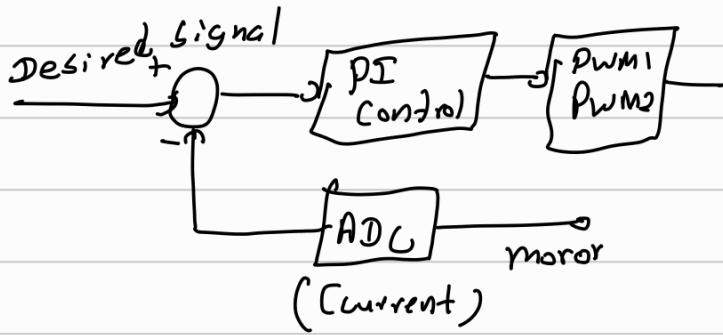


Torque → Current



max torque \rightarrow rotor flux - current MMF from stator 90° degrees

$$\text{Torque} = \frac{3P}{2\pi^2} [\lambda_{dr} I_{qs}]$$

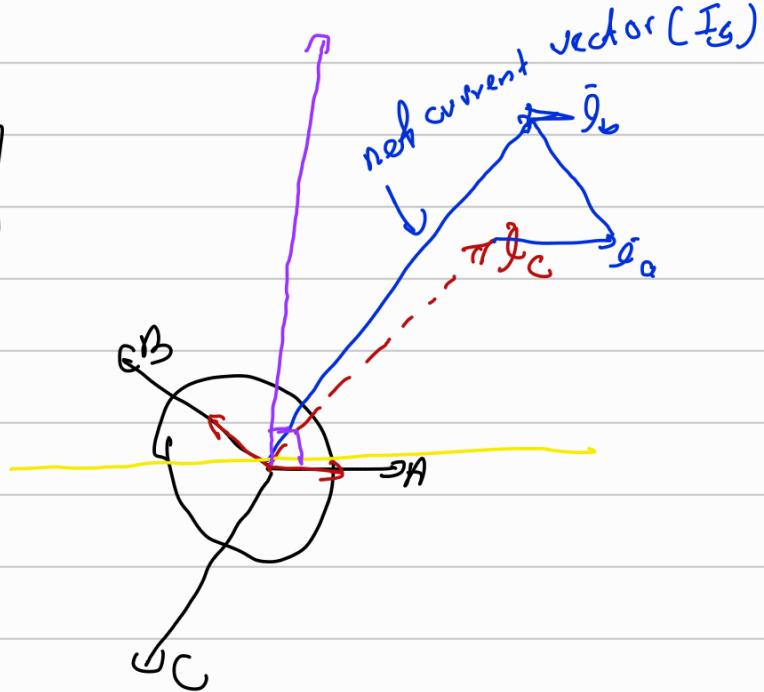
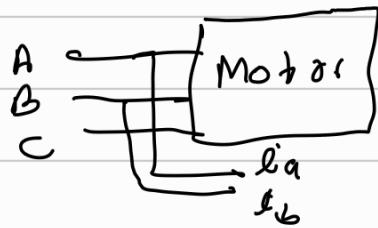
Interrupt

Measure rotor flux angle

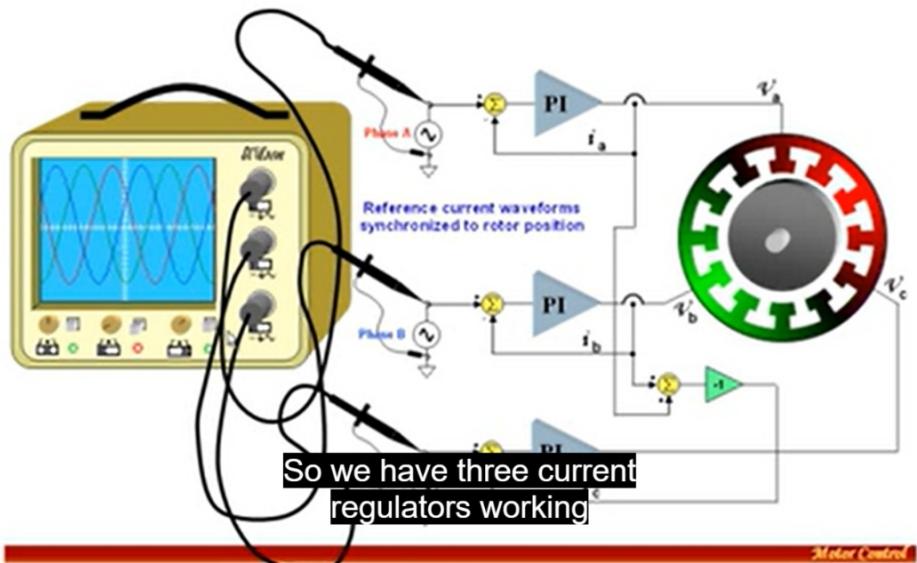
Regulate current vector to be 90° wrt rotor flux

Exit ISR

3 Pha's



3-Phase Stationary Frame Current Regulators



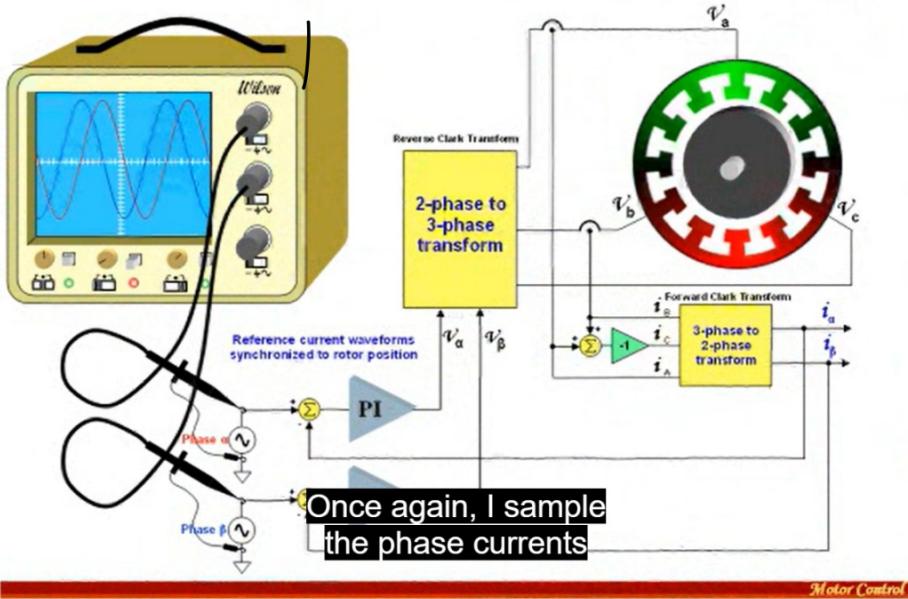
I_a is I_c calculated now

Output will take shape of sine waves

generate error signals

Convert the three phase current vectors into two orthogonal vectors

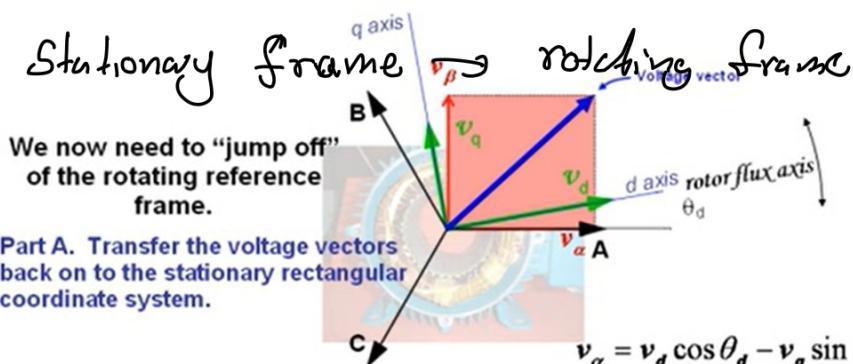
2-Phase Stationary Frame Current Regulators



dark transformation \rightarrow 3phase

There is even simpler way

4. Modulate the correction voltages onto the motor terminals.



And once again, we can use a lookup table,

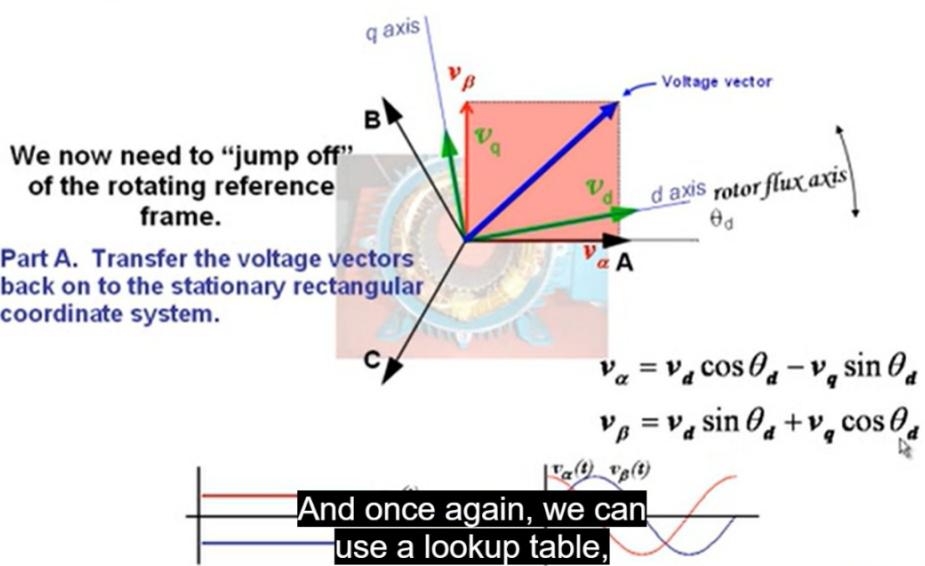
Park transformation

Motor Control

to derive \rightarrow use lookup table
(sin cos)

$i_d, i_q \rightarrow DC$

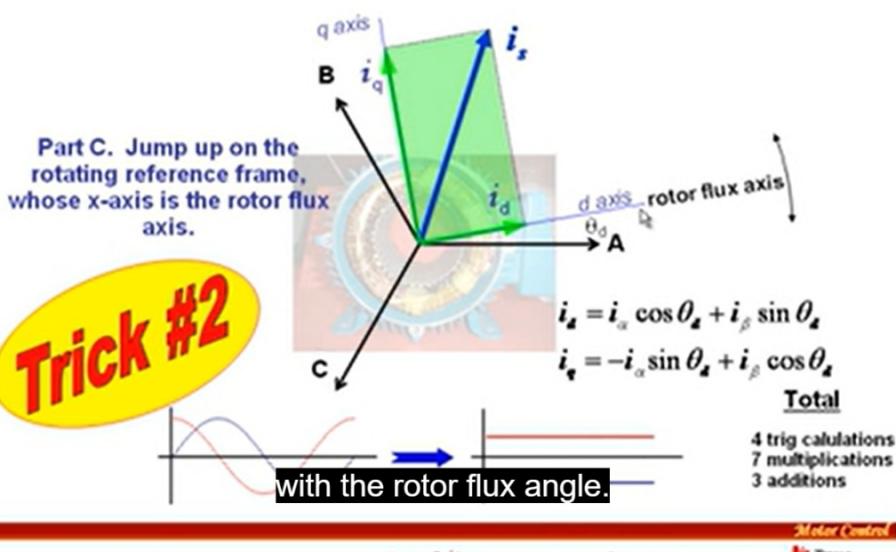
4. Modulate the correction voltages onto the motor terminals.



And once again, we can use a lookup table,

Motor Control

2. Compare the measured current (vector) with the desired current (vector), and generate error signals.



Current regulator pole + F \Rightarrow we don't need additional phase compensation

Sampling freq
Phase delay ϕ

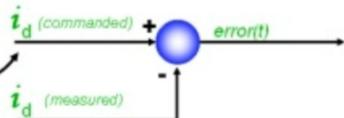
now should bring it to stationary frame

① reverse park transformation

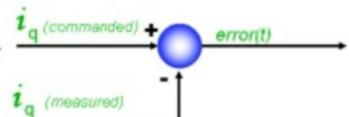
2. Compare the measured current (vector) with the desired current (vector), to exit full screen, press Esc error signals.

Part D. i_d and i_q are handled independently. Since the comparison is performed in the rotating frame, motor AC frequency is not seen. Thus, they are DC quantities!

Under normal conditions, we have all the d-axis flux we need supplied by the permanent magnets in the rotor. So commanded i_d is set to zero.



This is how much torque we want!



i_d can however control amount of field of the machine. Well, keep in mind we said earlier

reverse Clark = $2 \rightarrow 3$ phase

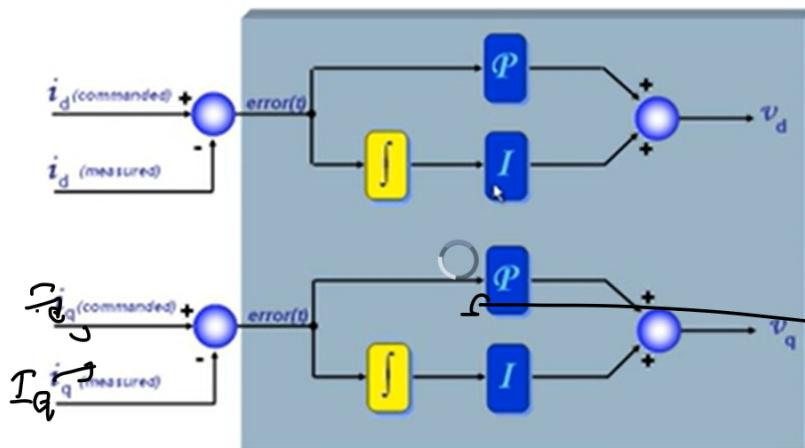
$$V_a = \frac{2}{3} V_\alpha$$

$$V_b = -\frac{1}{3} V_\alpha + \frac{1}{\sqrt{3}} V_\beta$$

$$V_c = -\frac{1}{3} V_\alpha - \frac{1}{\sqrt{3}} V_\beta$$

modulator

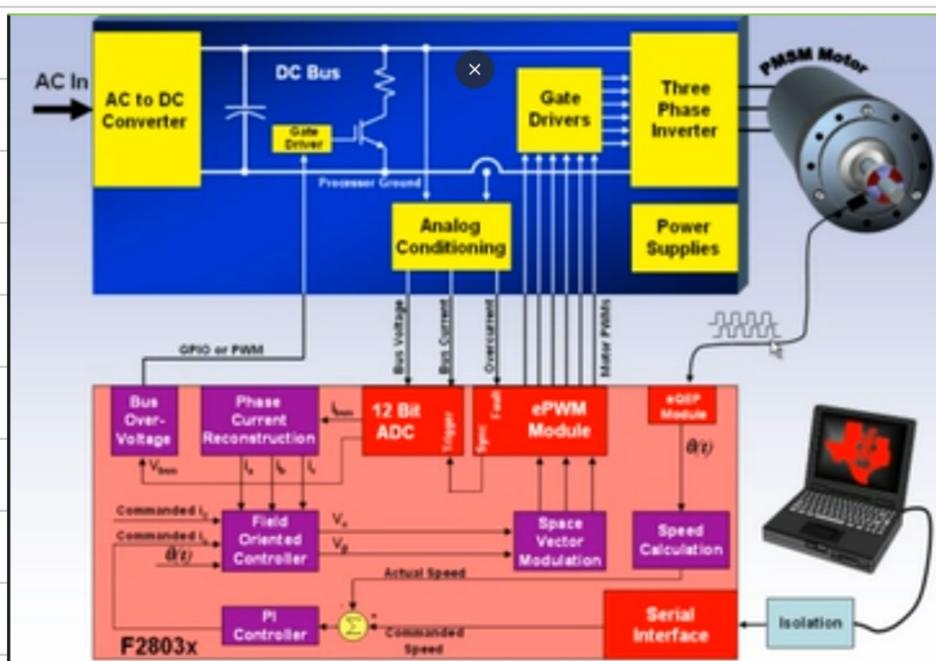
3. Amplify the error signals to generate correction voltages.



The PI regulator is it runs right here into current regulation
the q axis as iq current.

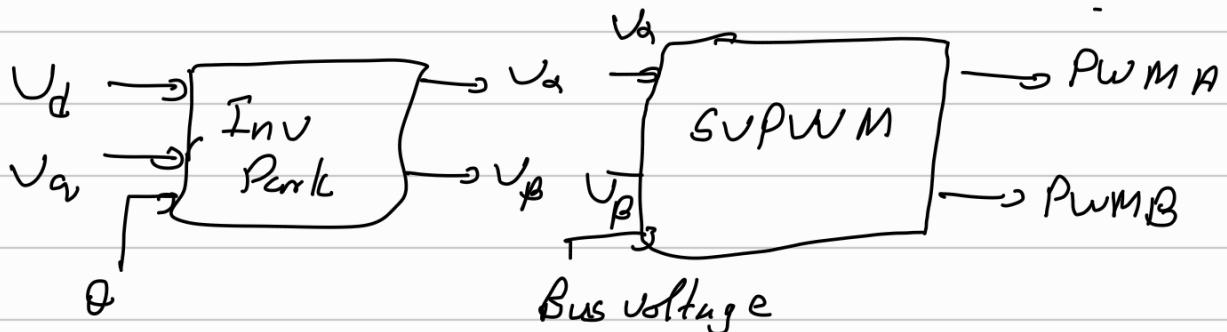
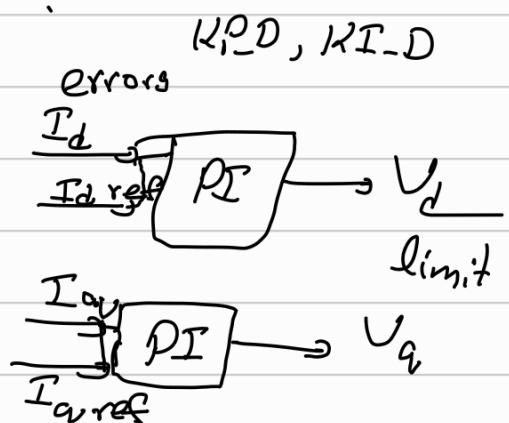
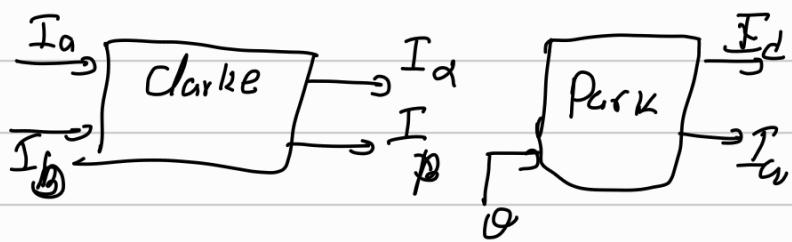
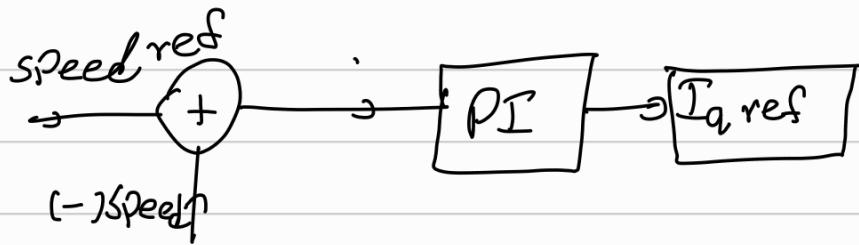
Samples scheduled each right time

Purple software



No inv Clark \rightarrow 2 phase

Clark $\rightarrow I_a, I_b$ are not orthogonal and not centered around $\alpha-\beta$ axis's



Speed in P

Interrupts

allow processor to respond promptly to specific event without polling \rightarrow ensure prescheduling

2 interrupt service routines \rightarrow ADC ISR
timer 0_ISR

hardware driven

* temporarily hold

stored in prevectorable