0.1 Space Vector Pulse Width Modulation

Space Vector PWM has several advantages over Sine PWM

- Higher voltage utilization: SVPWM can utilize up to 15% more DC bus voltage compared to SPWM. This means for the same DC supply voltage, an inverter with SVPWM can provide a higher output voltage.
- Better harmonic performance: SVPWM results in lower total harmonic distortion (THD) compared to SPWM. This leads to a better quality of the output voltage and current waveforms, which is particularly important in applications like drives where harmonics can cause heating and torque pulsations.
- Reduced switching losses: SVPWM requires fewer switching operations for the inverter switches compared to SPWM. This results in lower switching losses, leading to higher efficiency and reduced heating of the inverter switches.
- Improved dynamic response: The space vector representation used in SVPWM allows for a more precise control of the output voltage vector, leading to an improved dynamic response. This is particularly beneficial in applications like motor drives where a fast dynamic response is required.
- Vector control capability: SVPWM allows for vector control of the output voltage, which is not possible with SPWM. This enables more complex control strategies, such as field-oriented control (FOC), which can provide better performance in applications like motor drives.
- Flexibility: SVPWM allows for flexible control of the output voltage magnitude and frequency, as well as the phase relationship between the output voltage and current. This flexibility makes it suitable for a wide range of applications.

0.1.1 Generation of Space Vector PWM with C2000 microcontroller

To generate space vector PWM wave for the switches C2000 series microcontroller offers a hardware level module called ePWM or enhanced PWM module. It enables to generate PWM waves with high flexibility.

To generate symmetrical waveform, the ePWM's internal timer is configured in up-down count mode.

$$T_{PWM} = (2 \times TBPRD \times T_{TBCLK}) \tag{1}$$

$$F_{PWM} = \frac{1}{T_{PWM}} \tag{2}$$

F_{PWM} - Frequency of PWM
T_{PWM} - Time period of PWM
T_{TBCLK} - Time base clock
$TBPRD$ - ePWM Time period

$$TBCLK = \frac{EPWMCLK}{HSPCLKDIV \times CLKDIV}$$

$EPWMCLK$ - ePWM clock derived from system clock. System clock is 200 Mhz

$HSPCLKDIV$ - High speed clock divider

$CLKDIV$ - Clock prescaler

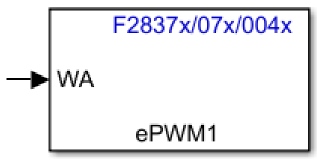

Figure 0.1: ePWM block in Simulink

Chapter 1

Conclusion